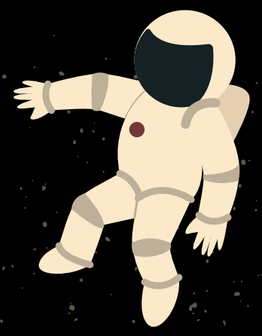
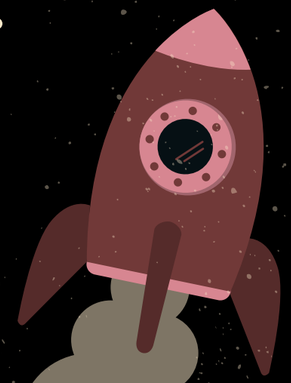


From waste to taste.

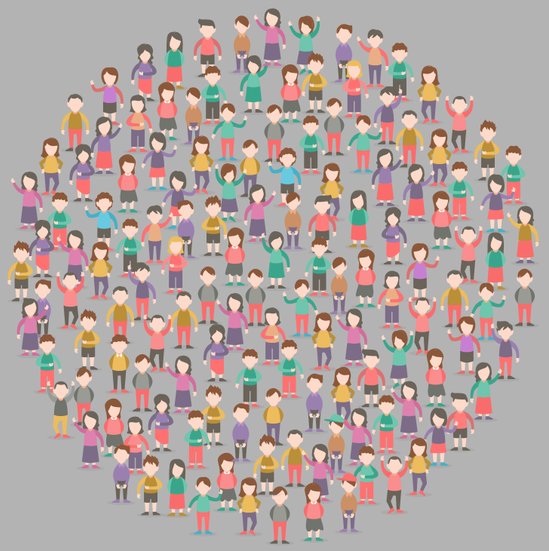
Closing the loops of MELiSSA waste processing
and higher plant compartments under the
framework of the SEMiLLA Sanitation Hubs project



Radu Mircea Giurgiu, PhD

MELiSSA Foundation

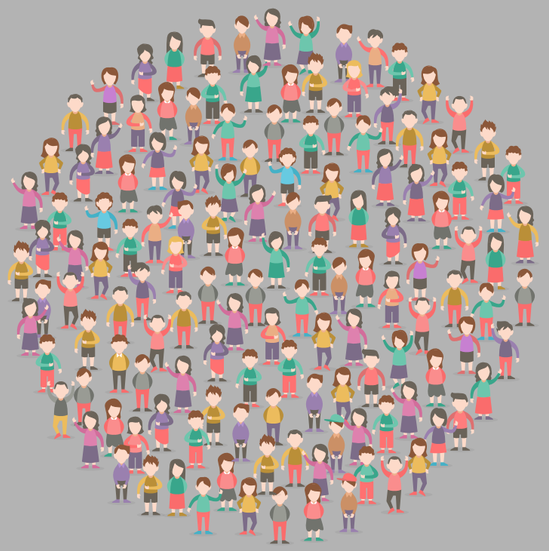
UASVM Cluj-Napoca



population

food

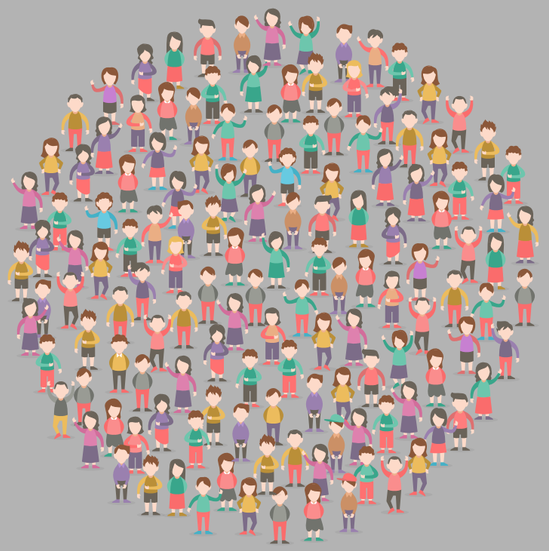
resources



population

food

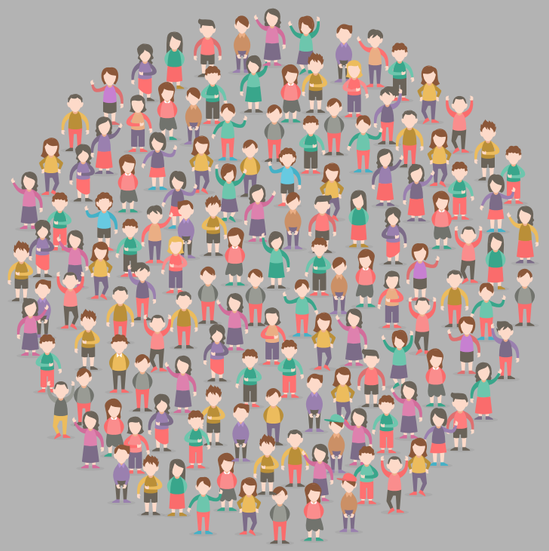
resources



population

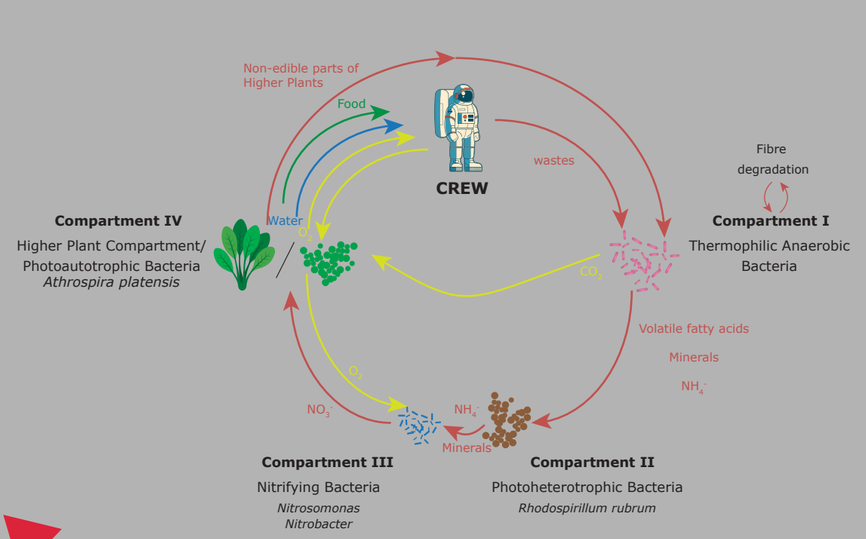
food

resources

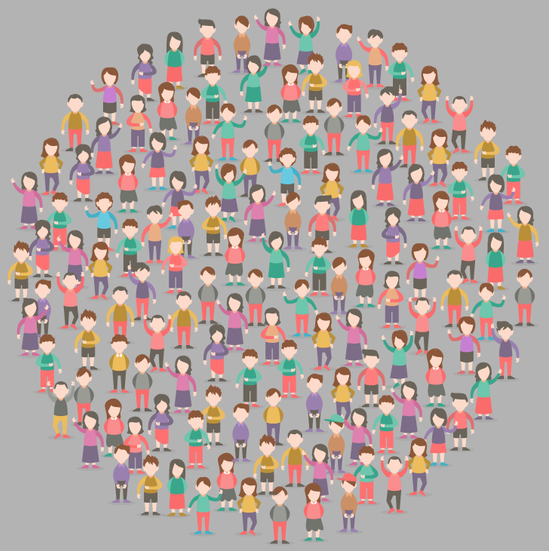


population

food

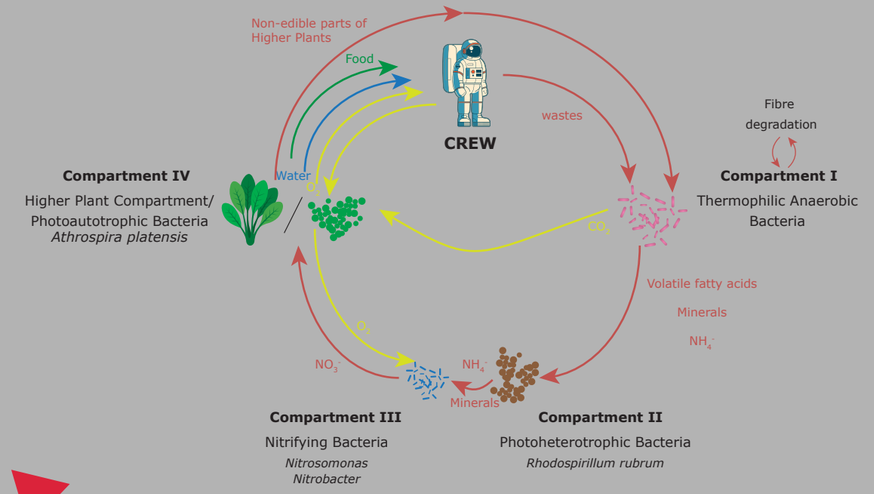


resources



population

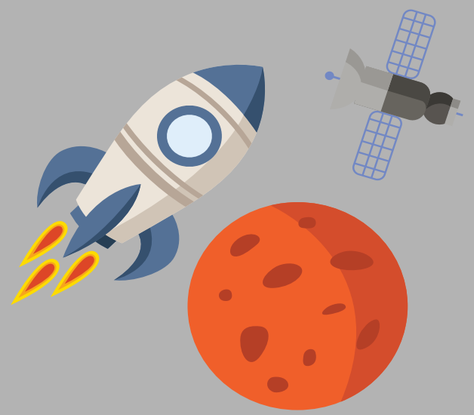
food



resources

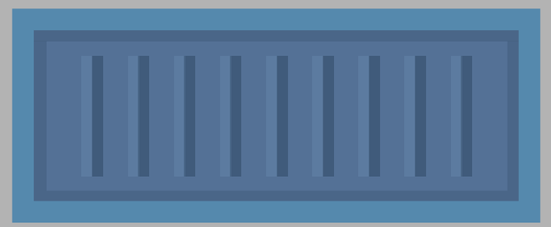
SEMILLA
sanitation hubs

www.semillasanitationhubs.com



space tech

waste water treatment



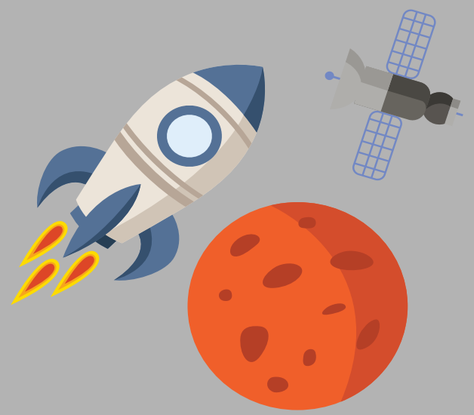
shipping container

clean water

nutrient for food production

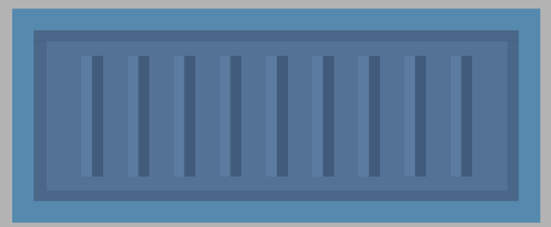
SEMILLA
sanitation hubs

www.semillasanitationhubs.com

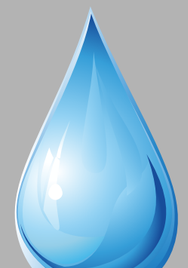


space tech

waste water treatment

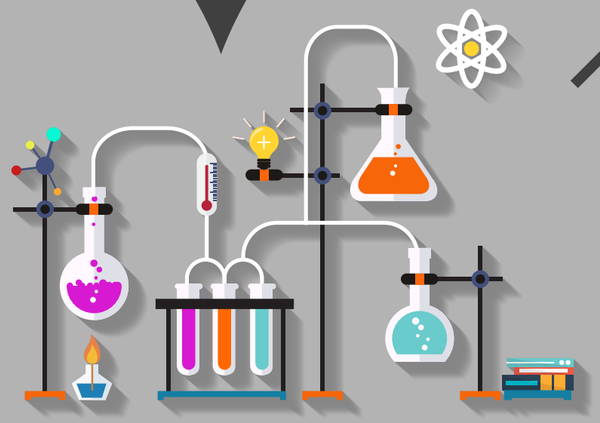


shipping container

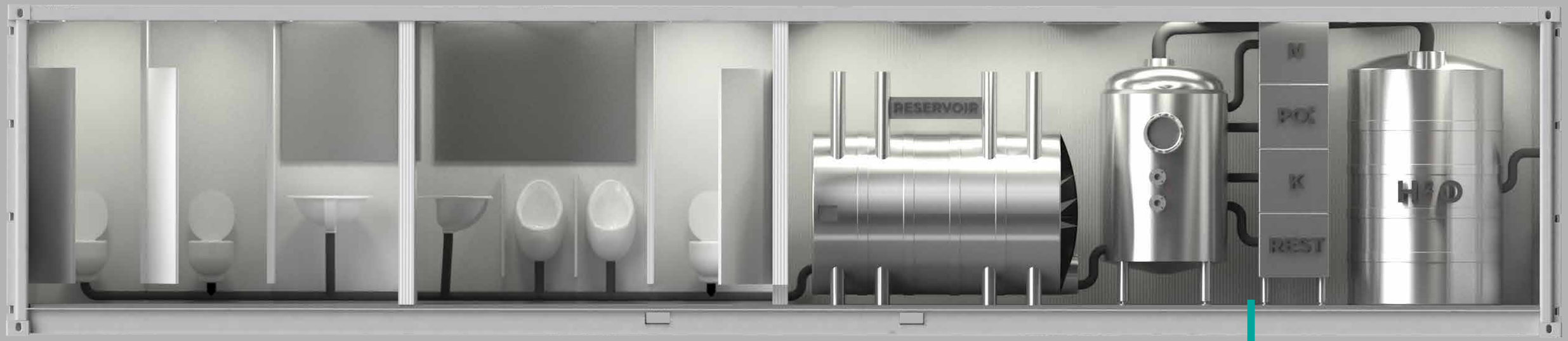


clean water

nutrient for food production



lab tests


RESERVOIR
N
PO
K
REST
H2O


Plant growth chamber
From WASTE...
Gents
...to TASTE
Urinal + Sink
2 L (Waste)water / person
(Waste)water Treatment
Irrigation Water
75 Mint Branches
25 Cups of tea
Powered by:
SEMILLA
Women toilets
Men toilets
Machine room


Thank you for your wastes!
Now please, come and taste!
By shortly visiting this toilet,
you contributed to advancing
the science and technology.
Thank you!
the result of your Bath Duties


FE628

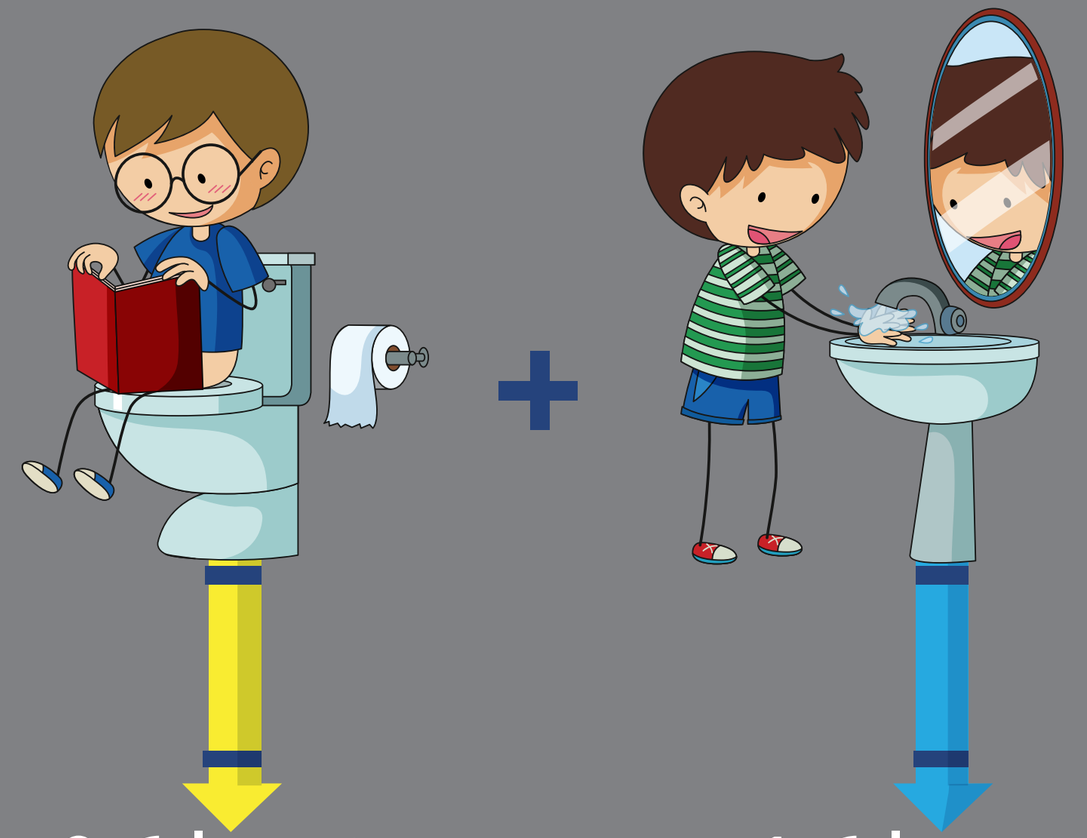

From waste to taste!


the result of your Bath Duties
#waste2taste
75 x
25 x
0.6 l water
&
4.2 g fertilizer
1.6 l water

SEMiLLA
sanitation hubs

the result of your Bath Duties

#waste2taste



0.6 l water
&
4.2 g fertilizer

1.6 l water

75 X

mint branches

25 x

cups of tea

don’t waste your waste

Eurosonic Noderslag

Groningen, January 2018

DGTL

Amsterdam, March 2018

DGTL

Amsterdam, March 2018

2 days of festival

over 2000 L yellow water treated

40% water reused (greywater)

over 500 of mint tea cups served

DGTL

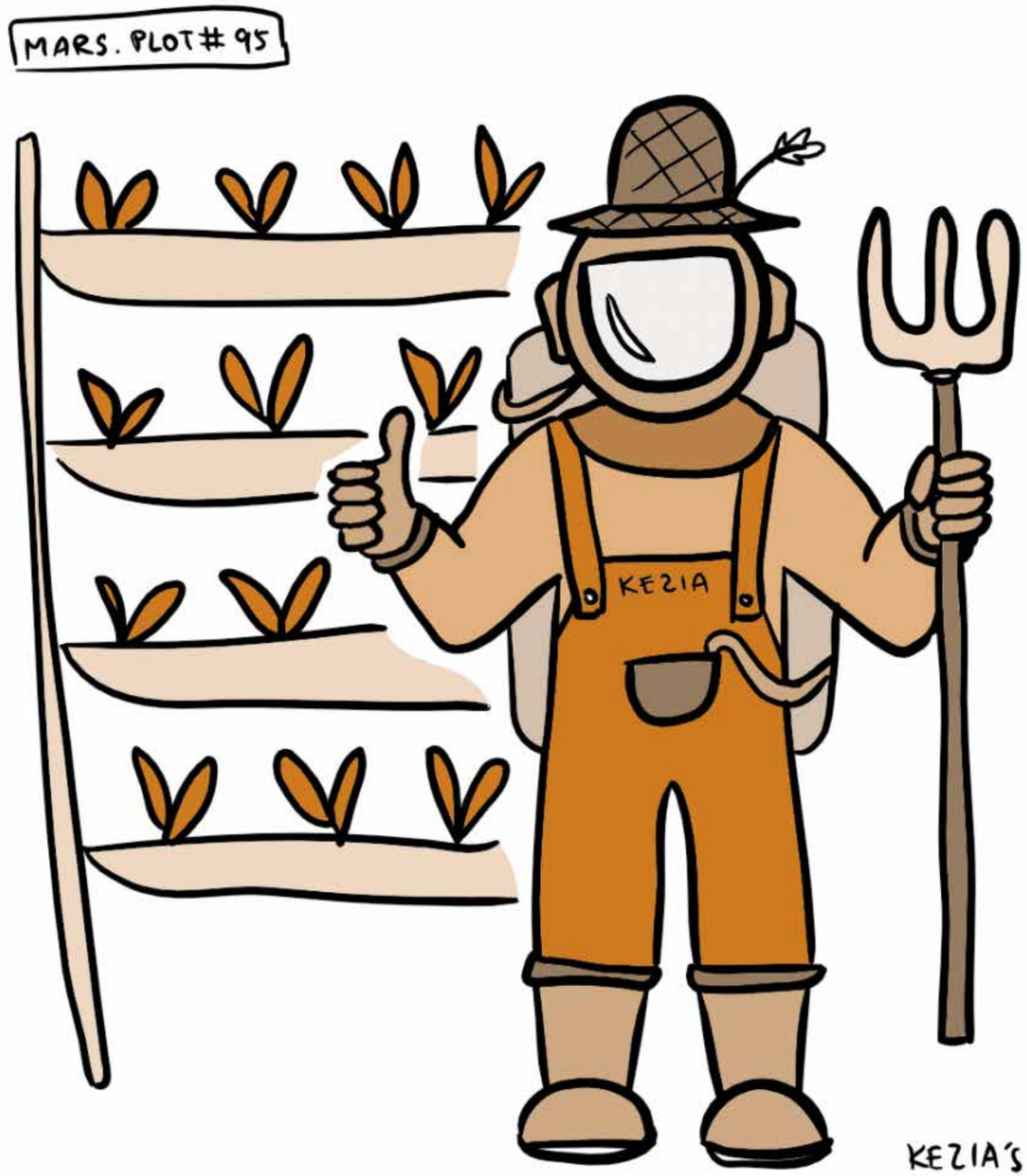
AmsterdamO, March 2018

2 days of festival

over 2000 L yellow water treated

40% water reused (greywater)

over 500 of mint tea cups served


MARS. PLOT # 95
KEZIA
KEZIA'S

		Fresh Urine	Condensate	Concentrate
1	Quantity [ml]	190 ±68.06	184.33 ±122.17	NA
2	pH	6.2 ±0.3	7.8 ±0.3	4.6 ±0.08
3	EC [mS/cm]	10.11 ±10.04	0.06 ±0.008	26.08 ±3.28
4	TN [mg/L]	11334 ±1860.21	12.03 ±1.06	11294.33 ±2281.92
5	PO_4 - P [mg/L]	668.66 ±388.44	0.33 ±0.088	692 ±418.59
6	K [mg/L]	5500.33 ±362.14	13.83 ±0.32	5902.66 ±271.31
7	NH_4 - N [mg/L]	397.33 ±142.32	6.23 ±0.06	317.96 ±103.35
8	COD [mg/L]	15533 ±4345.41	594 ±47.98	10516.77 ±3195.63

		Fresh Urine	Condensate	Concentrate
1	Quantity [ml]	190 ±68.06	184.33 ±122.17	NA
2	pH	6.2 ±0.3	7.8 ±0.3	4.6 ±0.08
3	EC [mS/cm]	10.11 ±10.04	0.06 ±0.008	26.08 ±3.28
4	TN [mg/L]	11334 ±1860.21	12.03 ±1.06	11294.33 ±2281.92
5	PO_4 - P [mg/L]	668.66 ±388.44	0.33 ±0.088	692 ±418.59
6	K [mg/L]	5500.33 ±362.14	13.83 ±0.32	5902.66 ±271.31
7	NH_4 - N [mg/L]	397.33 ±142.32	6.23 ±0.06	317.96 ±103.35
8	COD [mg/L]	15533 ±4345.41	594 ±47.98	10516.77 ±3195.63

		Fresh Urine	Condensate	Concentrate
1	Quantity [ml]	190 ±68.06	184.33 ±122.17	NA
2	pH	6.2 ±0.3	7.8 ±0.3	4.6 ±0.08
3	EC [mS/cm]	10.11 ±10.04	0.06 ±0.008	26.08 ±3.28
4	TN [mg/L]	11334 ±1860.21	12.03 ±1.06	11294.33 ±2281.92
5	PO_4 - P [mg/L]	668.66 ±388.44	0.33 ±0.088	692 ±418.59
6	K [mg/L]	5500.33 ±362.14	13.83 ±0.32	5902.66 ±271.31
7	NH_4 - N [mg/L]	397.33 ±142.32	6.23 ±0.06	317.96 ±103.35
8	COD [mg/L]	15533 ±4345.41	594 ±47.98	10516.77 ±3195.63

Final fertilizer

1	Quantity [ml]	385 ±185
2	pH	4.57 ±0.07
3	EC [mS/cm]	53.85 ±29.45
4	TN [mg/L]	7762±162
5	PO_4 - P [mg/L]	462.50 ±73.50
6	K [mg/L]	6213.50 ±331.50

		Final fertilizer
1	Quantity [ml]	385 ±185
2	pH	4.57 ±0.07
3	EC [mS/cm]	53.85 ±29.45
4	TN [mg/L]	7762±162
5	PO_4 - P [mg/L]	462.50 ±73.50
6	K [mg/L]	6213.50 ±331.50

2 days of urine collected

1.4 L of urine treated

0.3 L of fertilizer

+

140 L of tap water

=

1 mS/cm

		Final fertilizer
1	Quantity [ml]	385 ±185
2	pH	4.57 ±0.07
3	EC [mS/cm]	53.85 ±29.45
4	TN [mg/L]	7762±162
5	PO_4 - P [mg/L]	462.50 ±73.50
6	K [mg/L]	6213.50 ±331.50

2 days of urine collected

1.4 L of urine treated

0.3 L of fertilizer

+

140 L of tap water

=

1 mS/cm

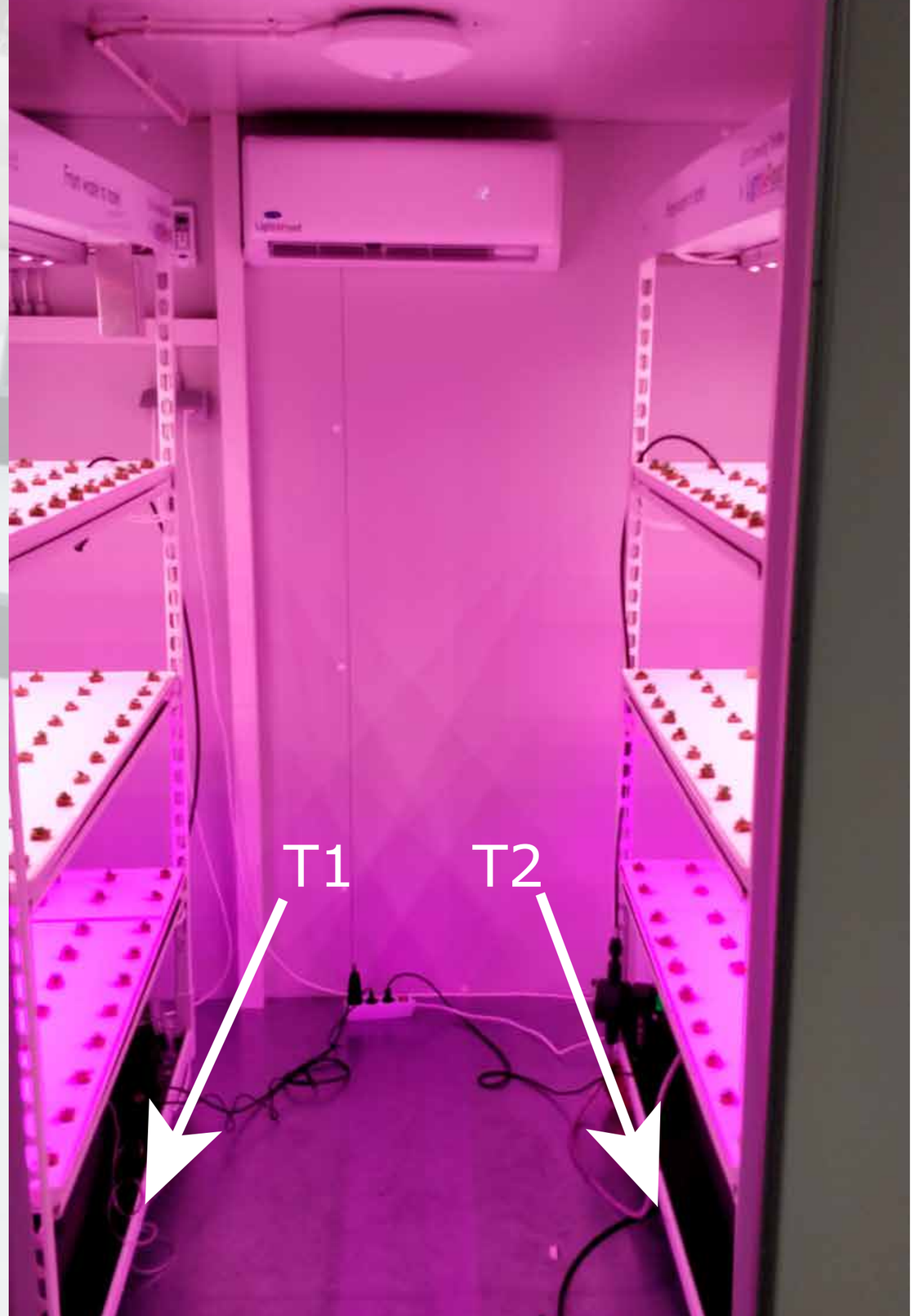
1 day of UT

=

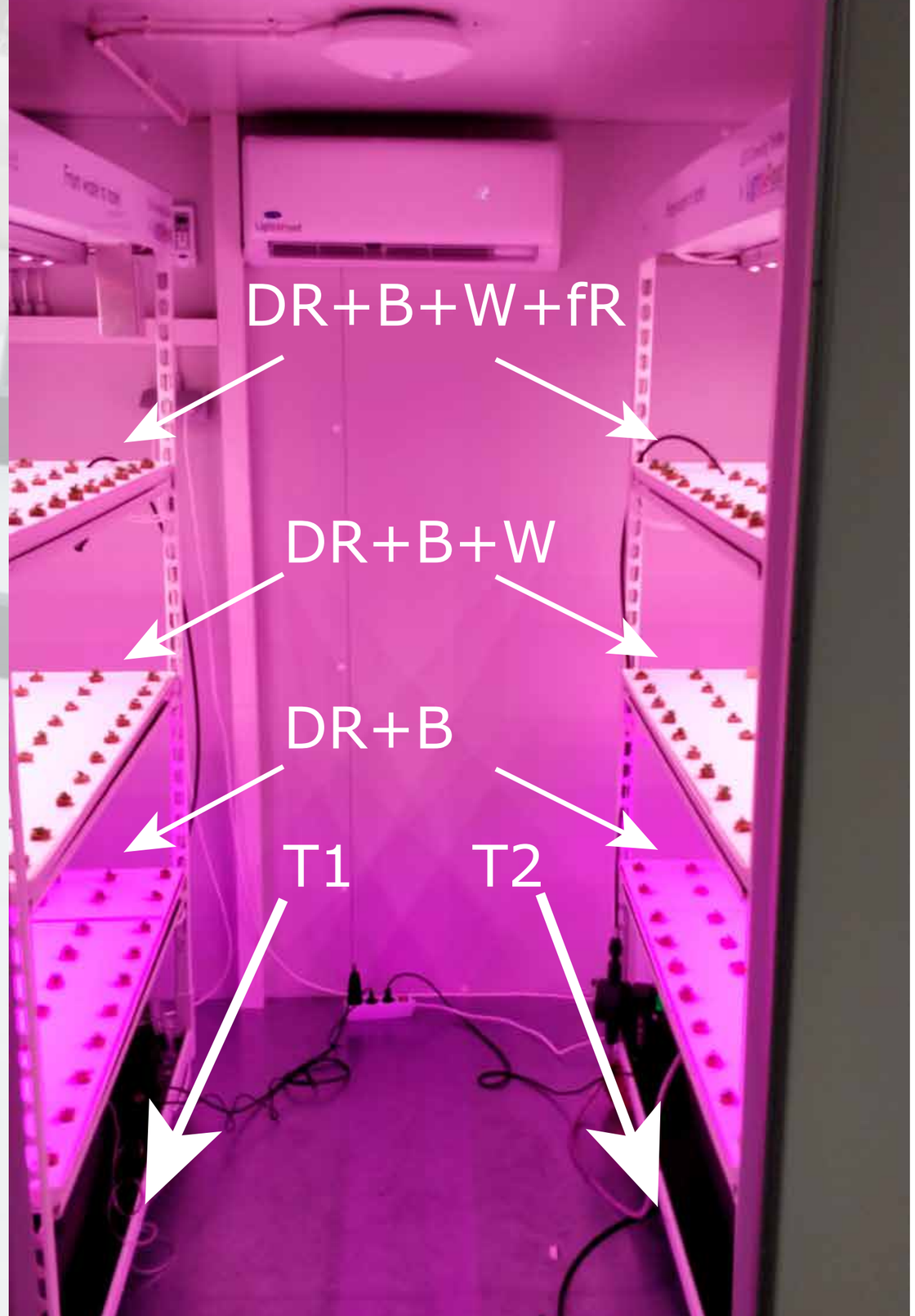
2 mp/ 10 days

15 Plants/person/day

		Final fertilizer
1	Quantity [ml]	385 ±185
2	pH	4.57 ±0.07
3	EC [mS/cm]	53.85 ±29.45
4	TN [mg/L]	7762±162
5	PO_4 - P [mg/L]	462.50 ±73.50
6	K [mg/L]	6213.50 ±331.50

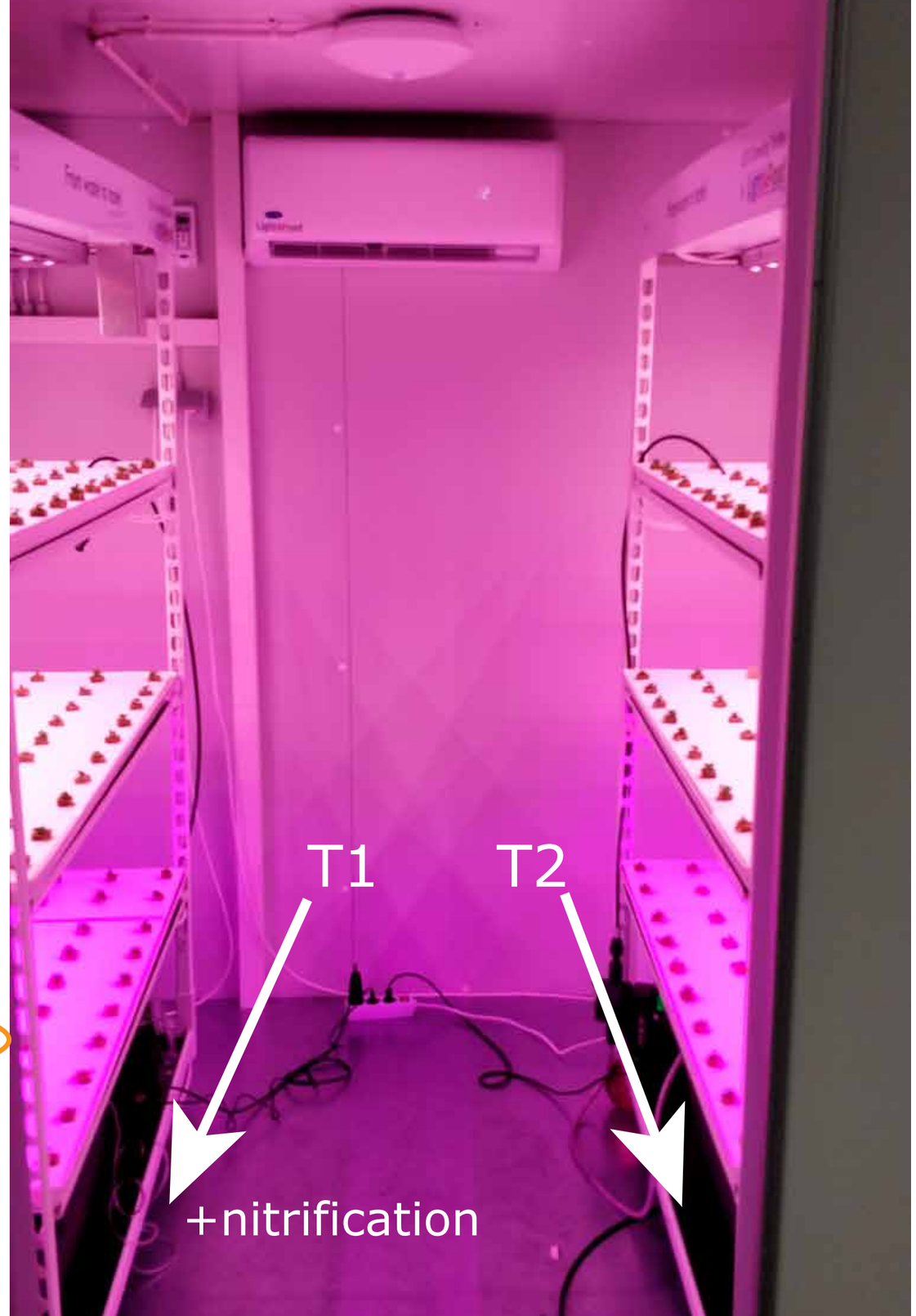


		Final fertilizer
1	Quantity [ml]	385 ±185
2	pH	4.57 ±0.07
3	EC [mS/cm]	53.85 ±29.45
4	TN [mg/L]	7762±162
5	PO_4 - P [mg/L]	462.50 ±73.50
6	K [mg/L]	6213.50 ±331.50



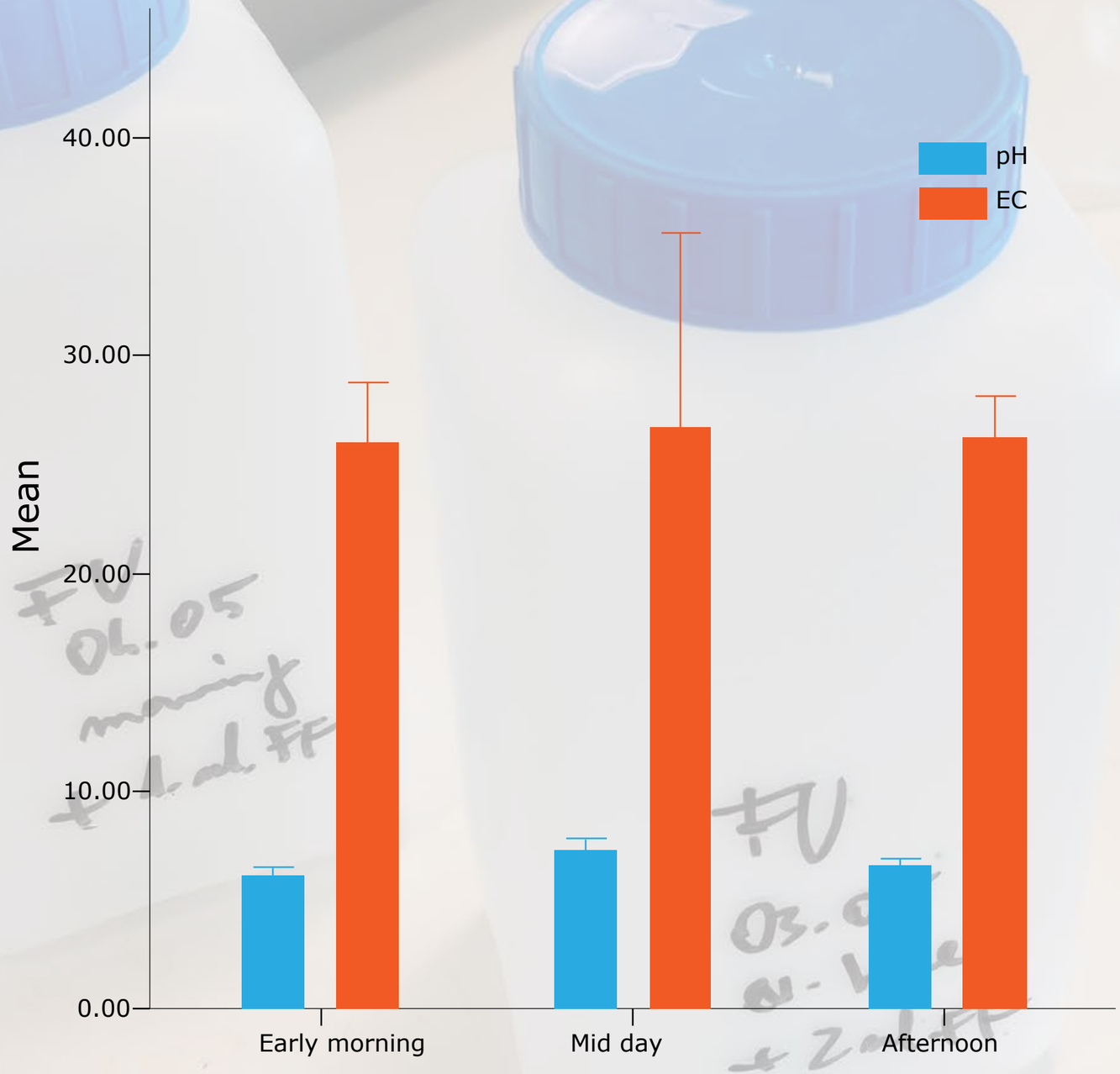
		Final fertilizer	Tank1	Tank2
1	Quantity [ml]	385 ±185	70000	70000
2	pH	4.57 ±0.07	5.90	6.04
3	EC [mS/cm]	53.85 ±29.45	1	1
4	TN [mg/L]	7762±162	182	186
5	PO_4 - P [mg/L]	462.50 ±73.50	14.1	14.6
6	K [mg/L]	6213.50 ±331.50	54.8	57.1
7	NH_4 - N [mg/L]	NA	9.29	9.82
8	COD [mg/L]	NA	205	230
9	NO_3 [mg/L]	NA	1.11	1.12

		Tank1	Tank2
1	Quantity [ml]	70000	70000
2	pH	5.90	6.04
3	EC [mS/cm]	1	1
4	TN [mg/L]	182	186
5	PO4 - P [mg/L]	14.1	14.6
6	K [mg/L]	54.8	57.1
7	NH_4 - N [mg/L]	9.29	9.82
8	COD [mg/L]	205	230
9	NO_3 [mg/L]	1.11	1.12

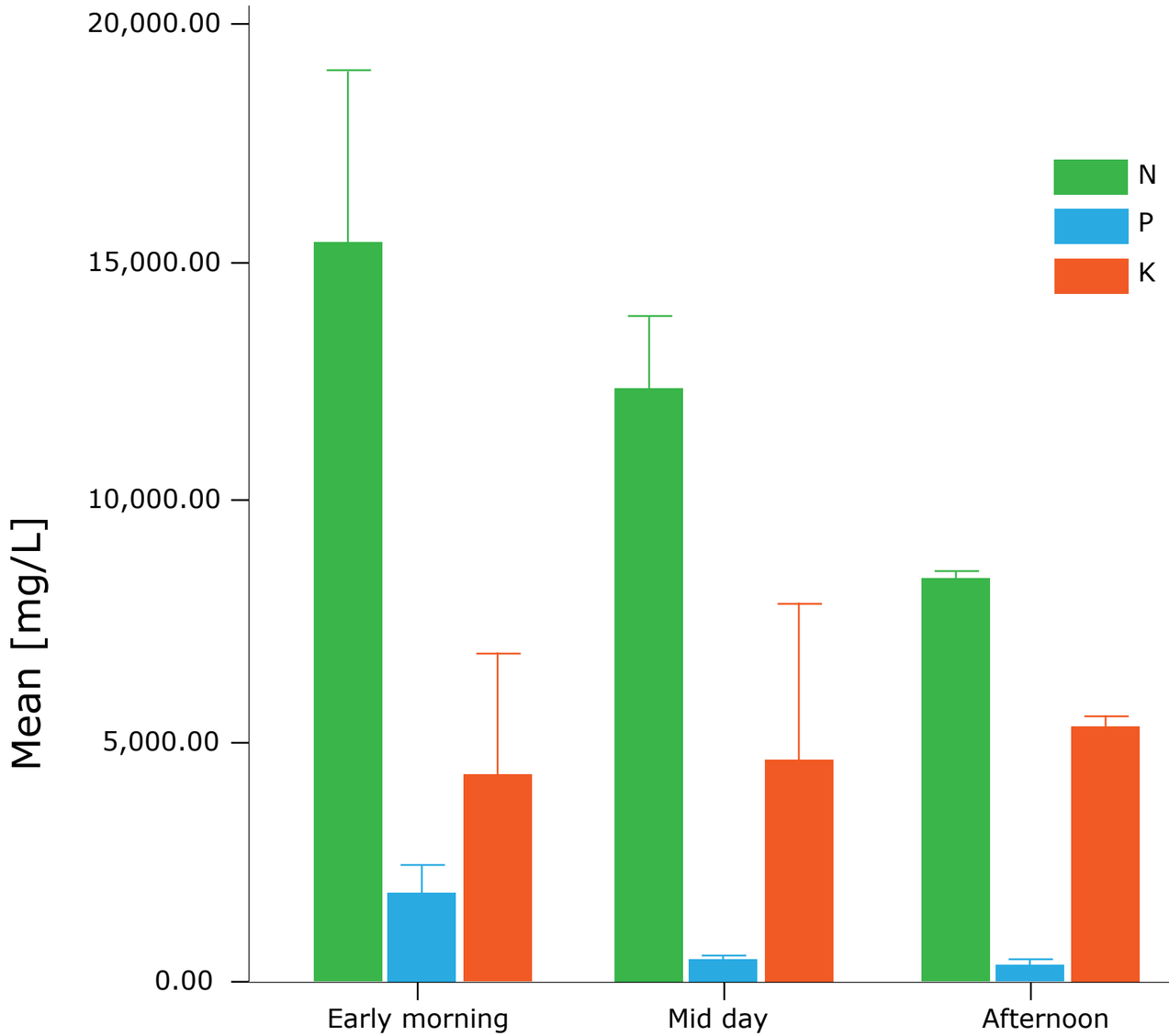


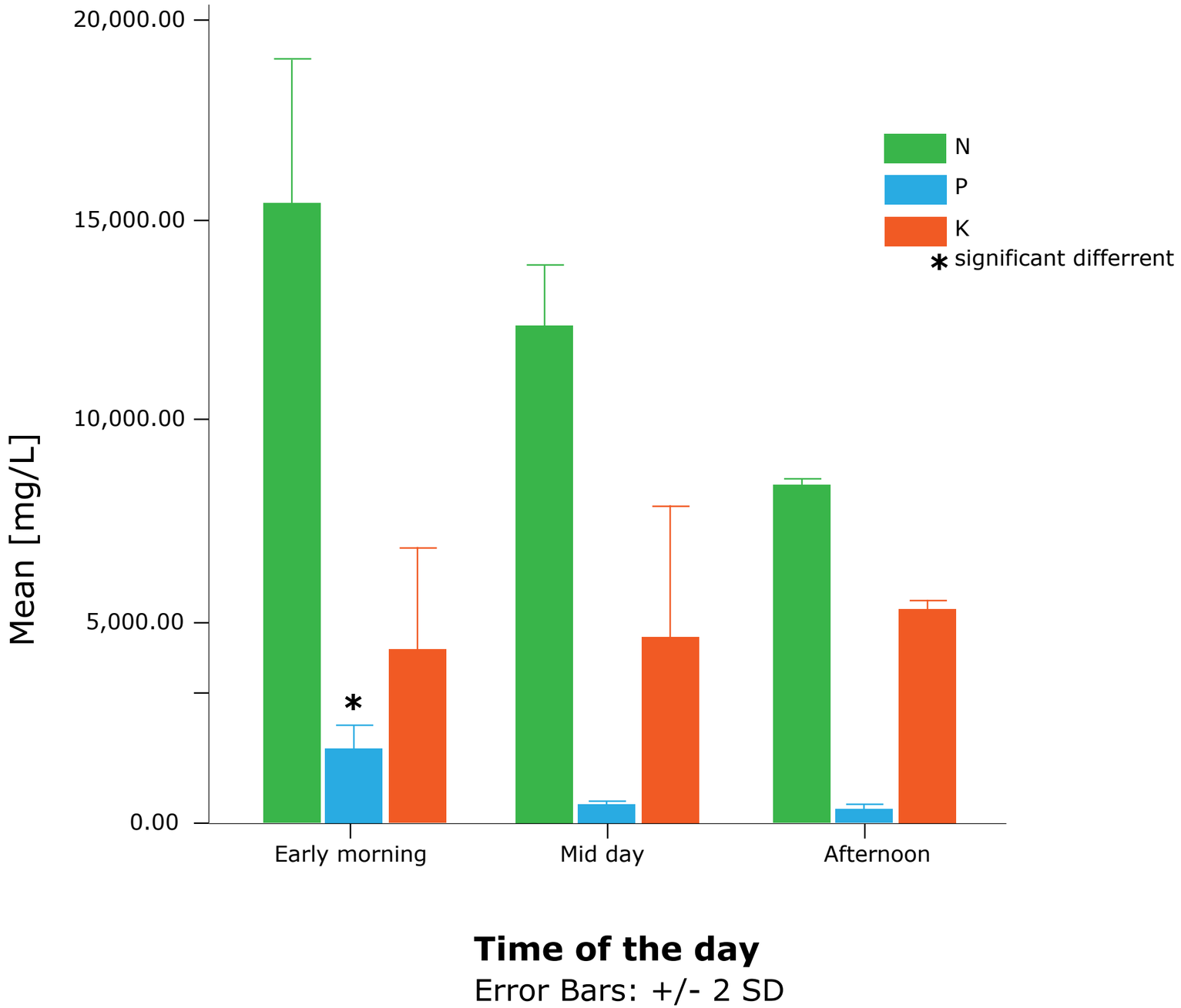
FV
04.05
morning
+ 1 ml FF

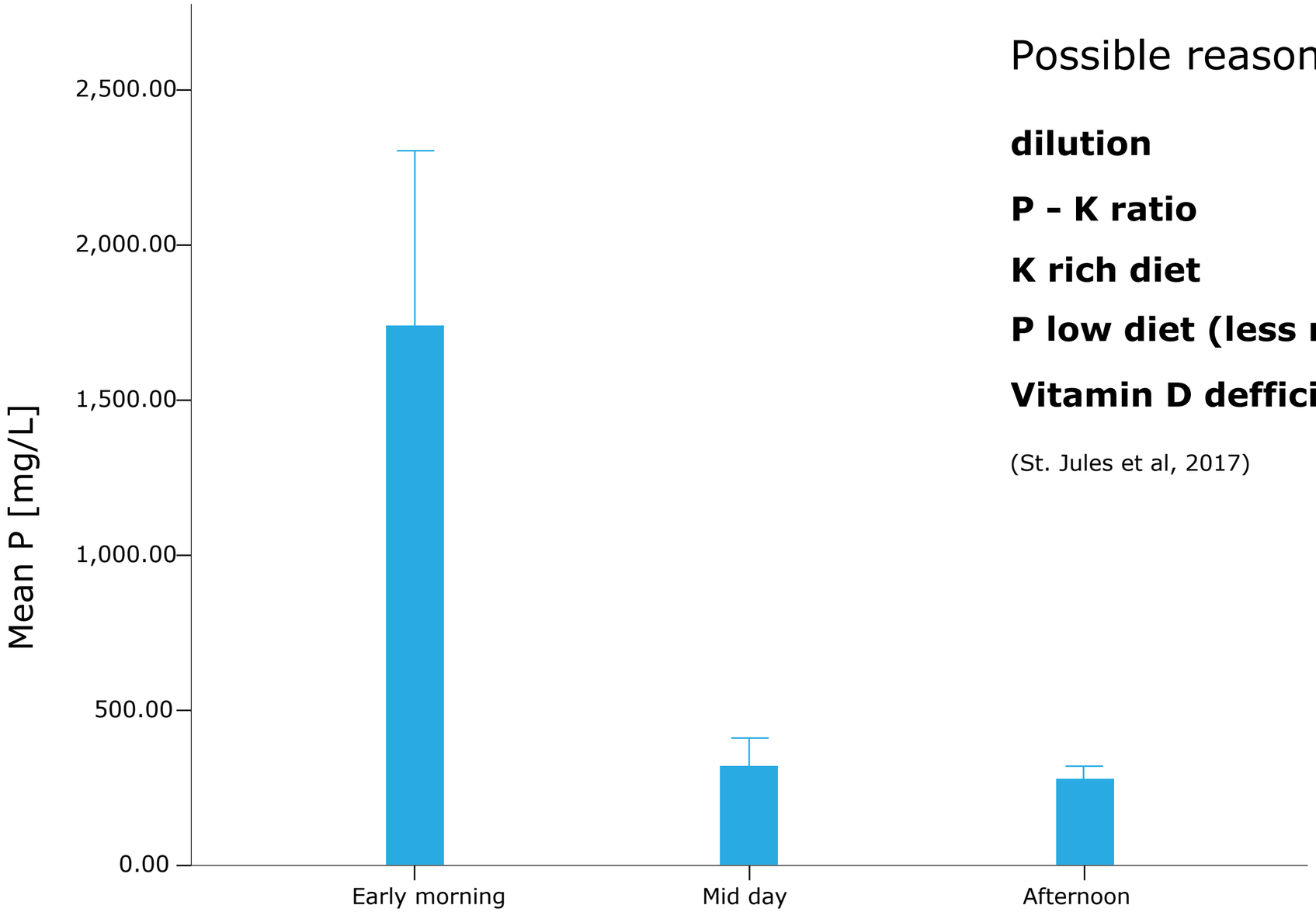
FV
03.05
at home
+ 2 ml FF



Error Bars: +/- 2 SD


20,000.00
15,000.00
10,000.00
5,000.00
0.00
Mean [mg/L]
N
P
K
Early morning
Mid day
Afternoon
Time of the day
Error Bars: +/- 2 SD


20,000.00
15,000.00
10,000.00
5,000.00
0.00
Mean [mg/L]
N
P
K
* significant differrent
*
Early morning
Mid day
Afternoon
Time of the day
Error Bars: +/- 2 SD



Possible reasons:

dilution

P - K ratio

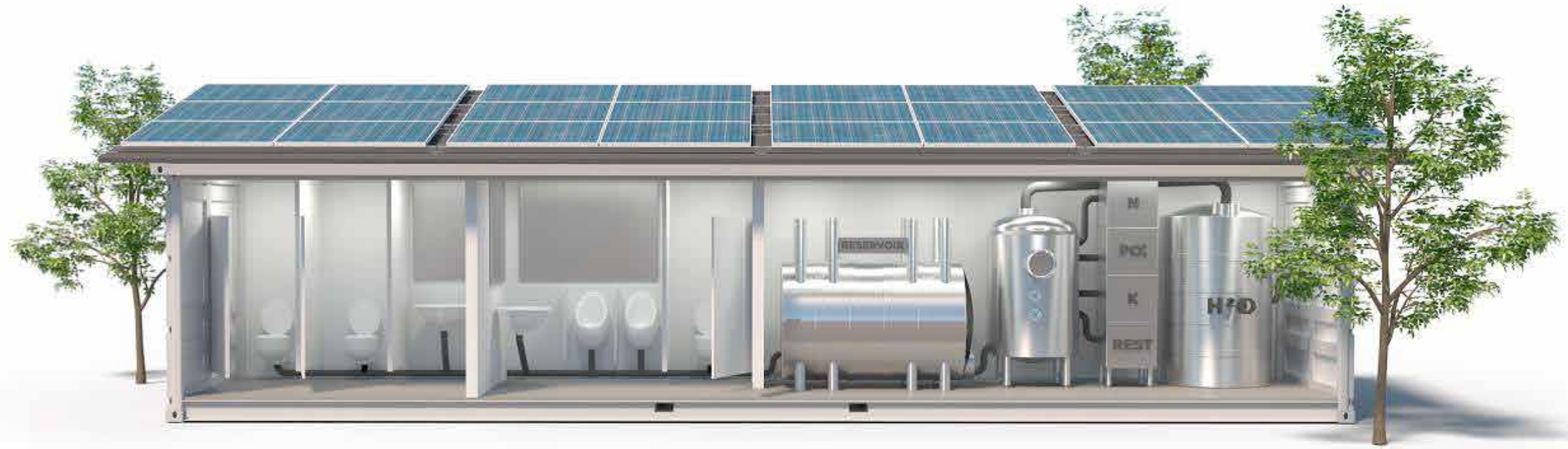
K rich diet

P low diet (less meat)

Vitamin D defficiency (lab work)

(St. Jules et al, 2017)

Decentral wastewater treatment



Disaster relief

Remote rural area

Smart Cities

Plug and play villages

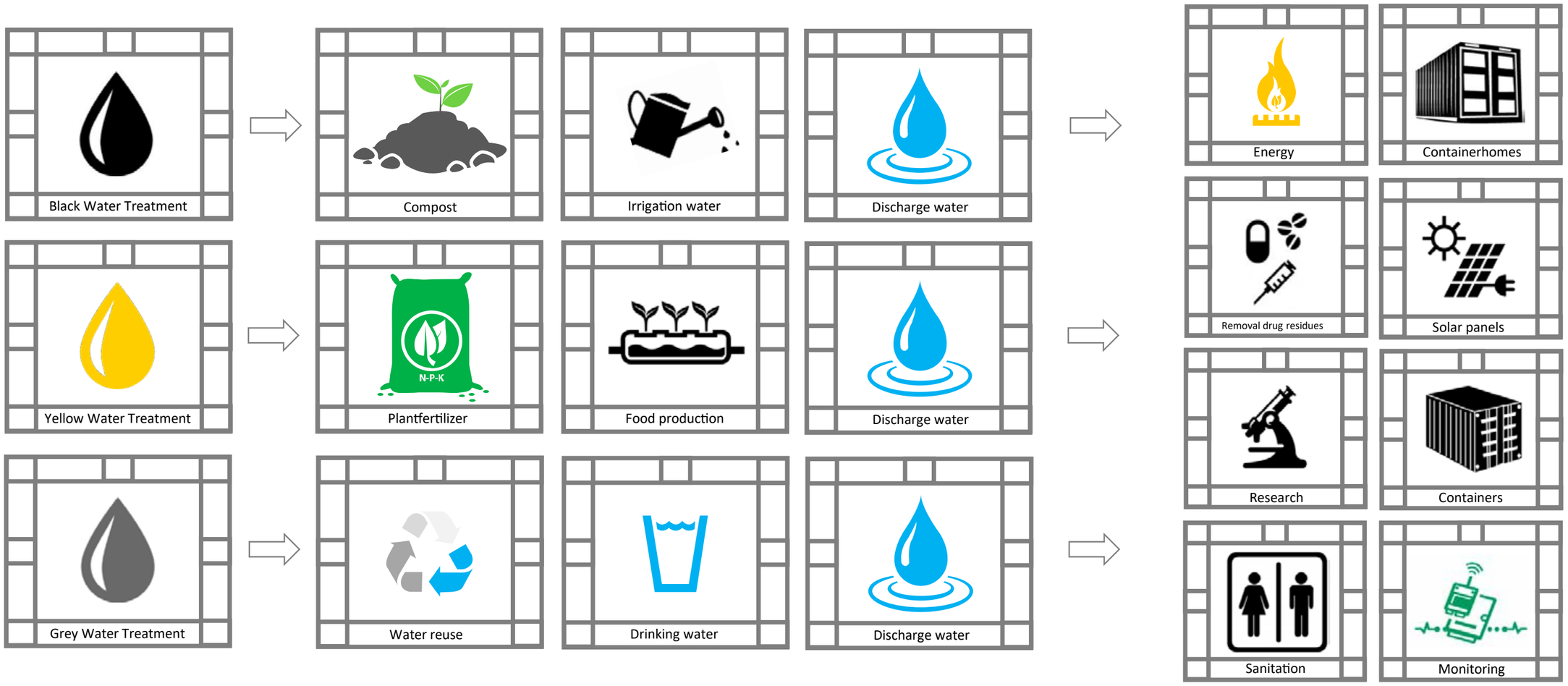
Food production

Remote holiday resorts

Themepark sanitation

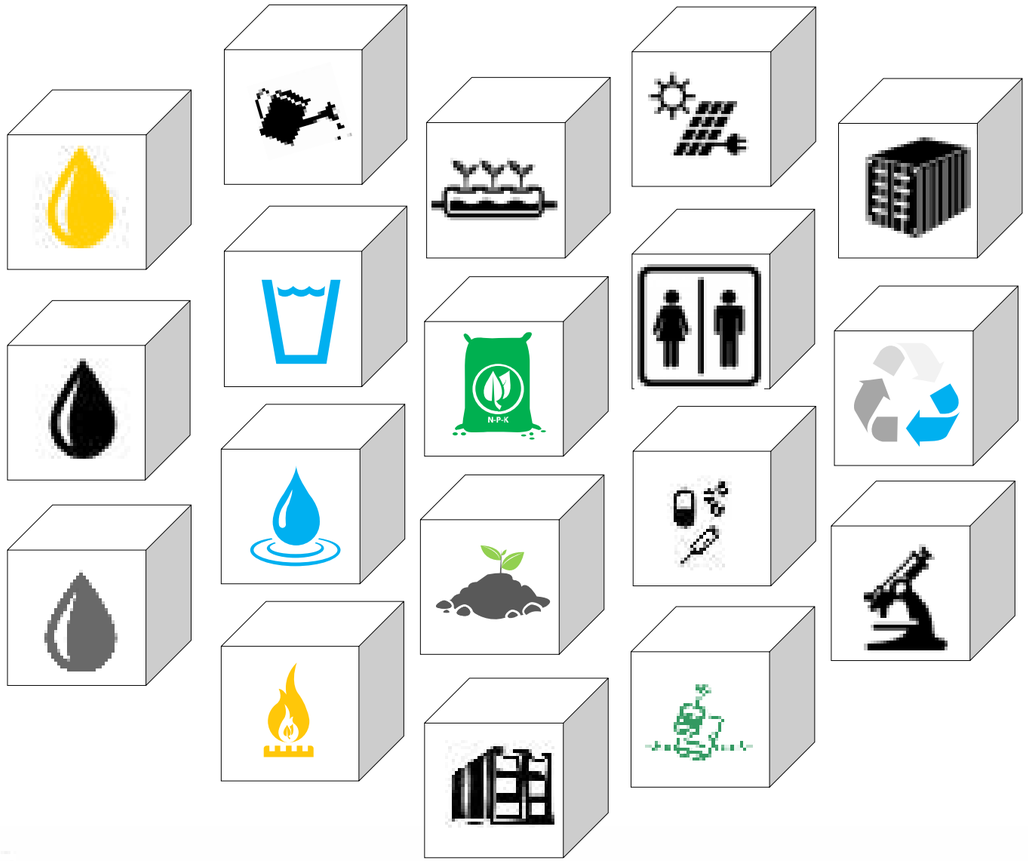
Public Bathrooms

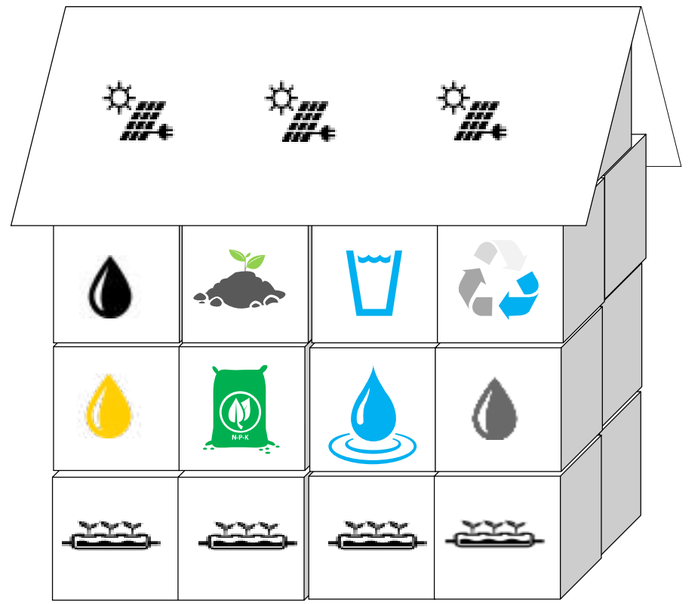
Building blocks



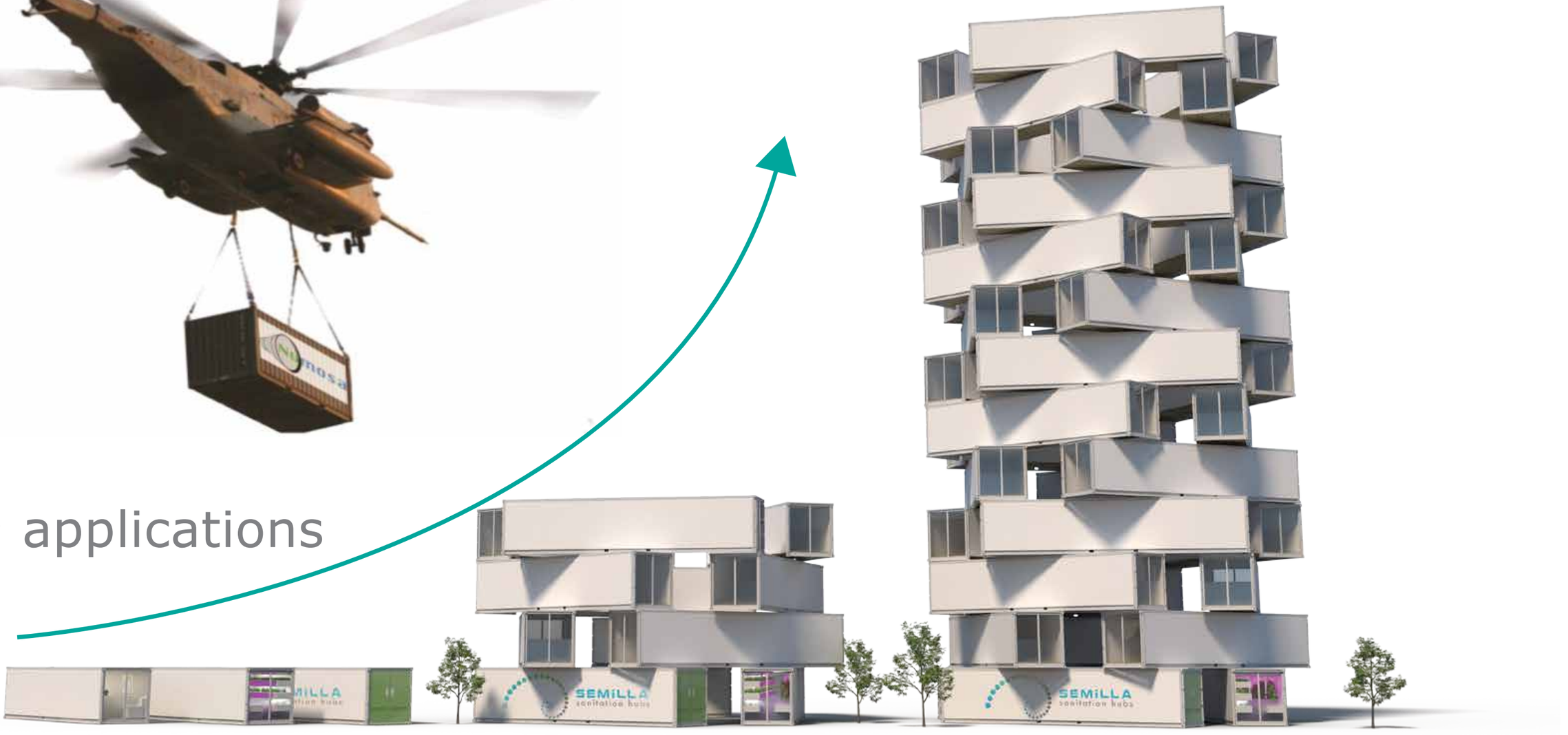
Building blocks

towards fuly customizable/ tailored made





basic *necessities* for life



Earth applications

SEMiLLA
sanitation hubs

MELISSA

esa
European Space Agency

SEMILLA

sanitation hubs

OUR TEAM:

Rob Suters

Myrthe Maurice

Max Rosenberg

Ruud Speyer

Peter Scheer

Ralph Lindeboom

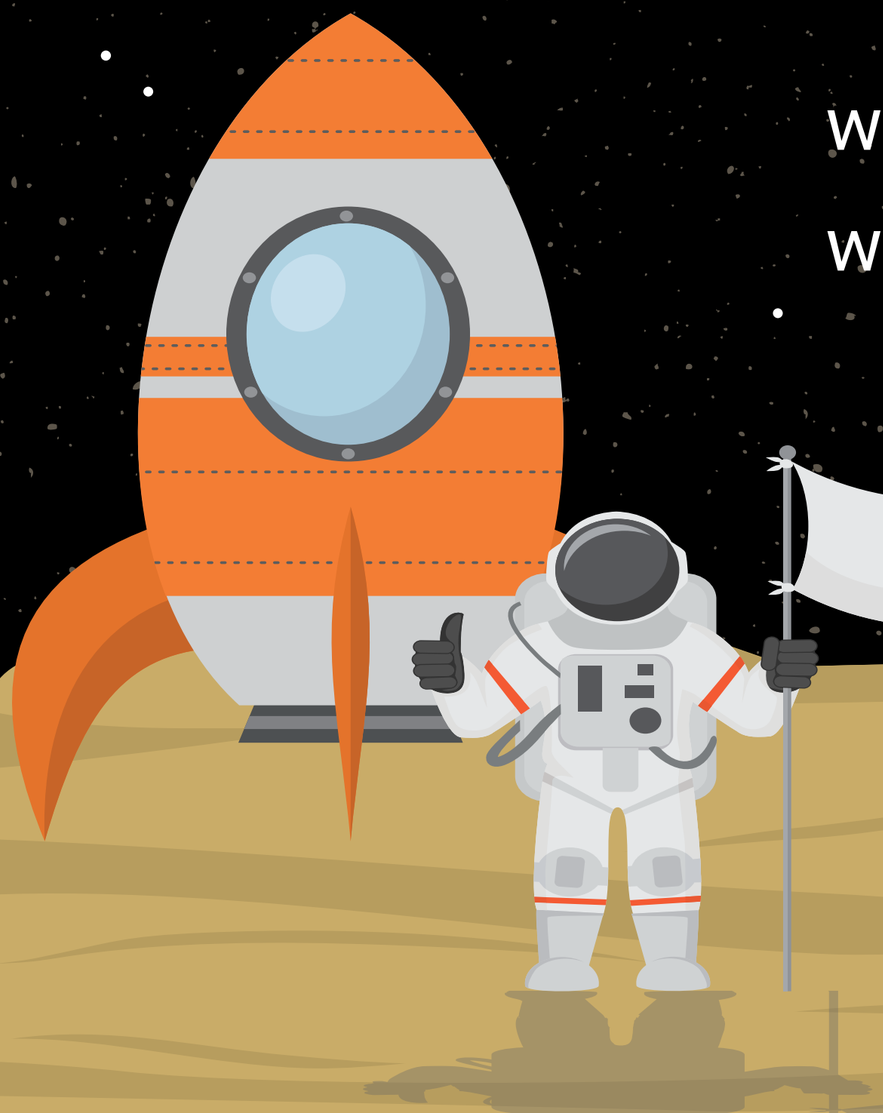
Radu Giurciu

OUR PARTNERS:

Thank you!

www.semillasanitationhubs.com

www.semilla.io



Radu M. Giurgiu

radu@semilla.io

#waste2taste