

Indoor farming: from theory to practice

4th Webinar AESOP and Le:Nottre

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WUR, Wageningen, 01-10-2017

Student Challenge:

Design the ultimate urban greenhouse

Students are being challenged to submit an urban greenhouse design which brings professional food production into urban neighbourhoods, connects it with local energy systems and encourages citizens to engage with sustainable production and consume healthy food.

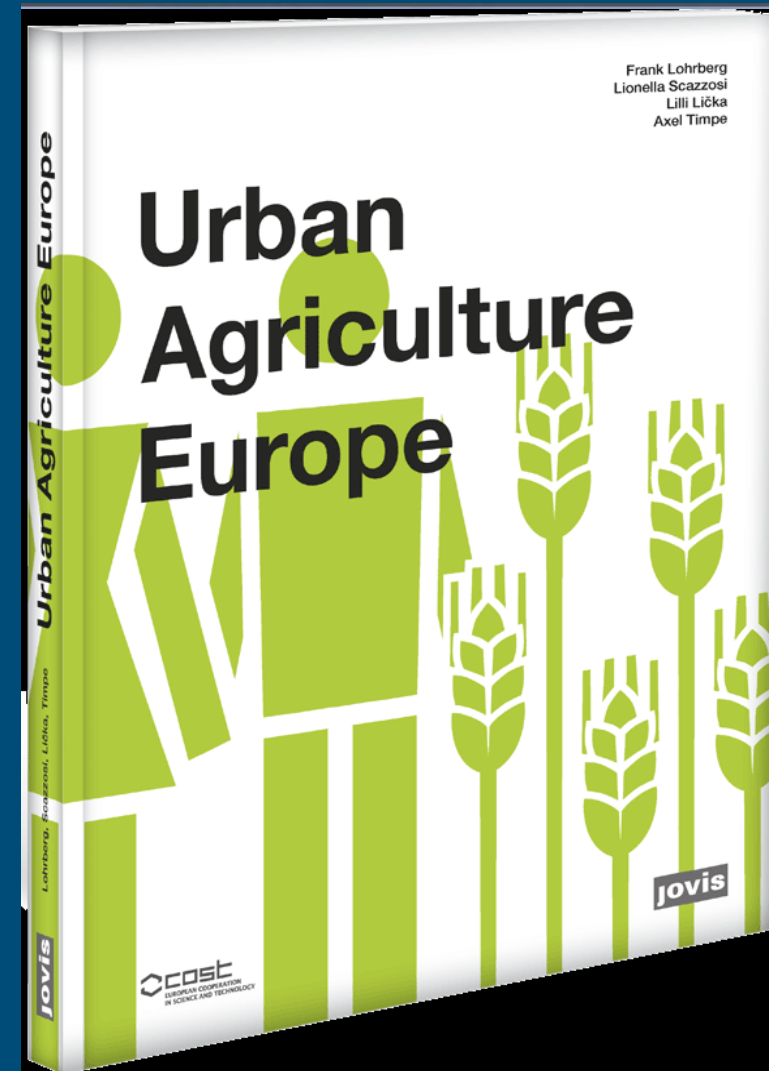
Registration between
1st and 31st October 2017

Check out www.wur.eu/studentchallenges

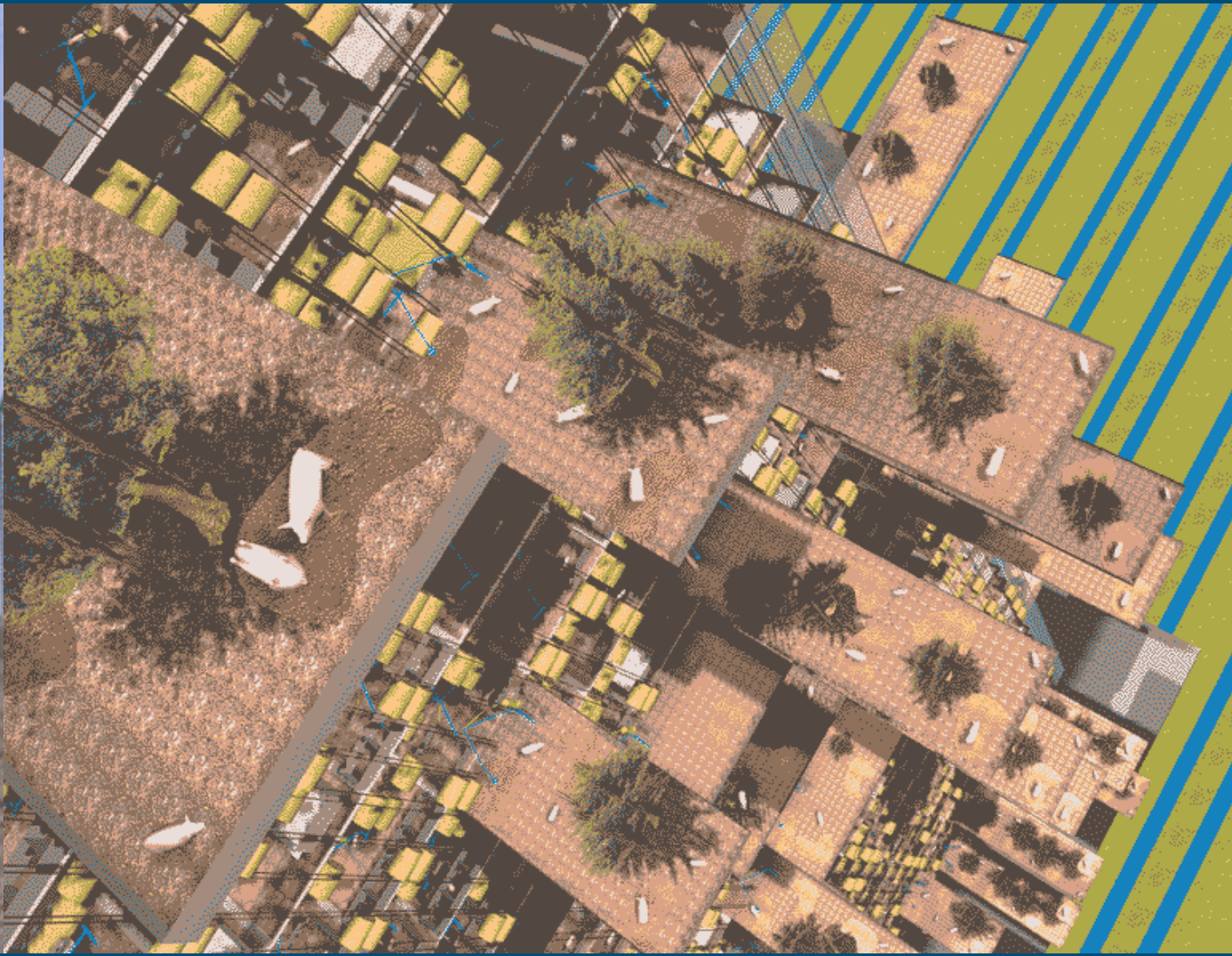


Introduction

- Researcher WEcR
Short and Ultra Short Food Supply Chains
- Co-founder Edible Rotterdam
- Board member of several UA initiatives



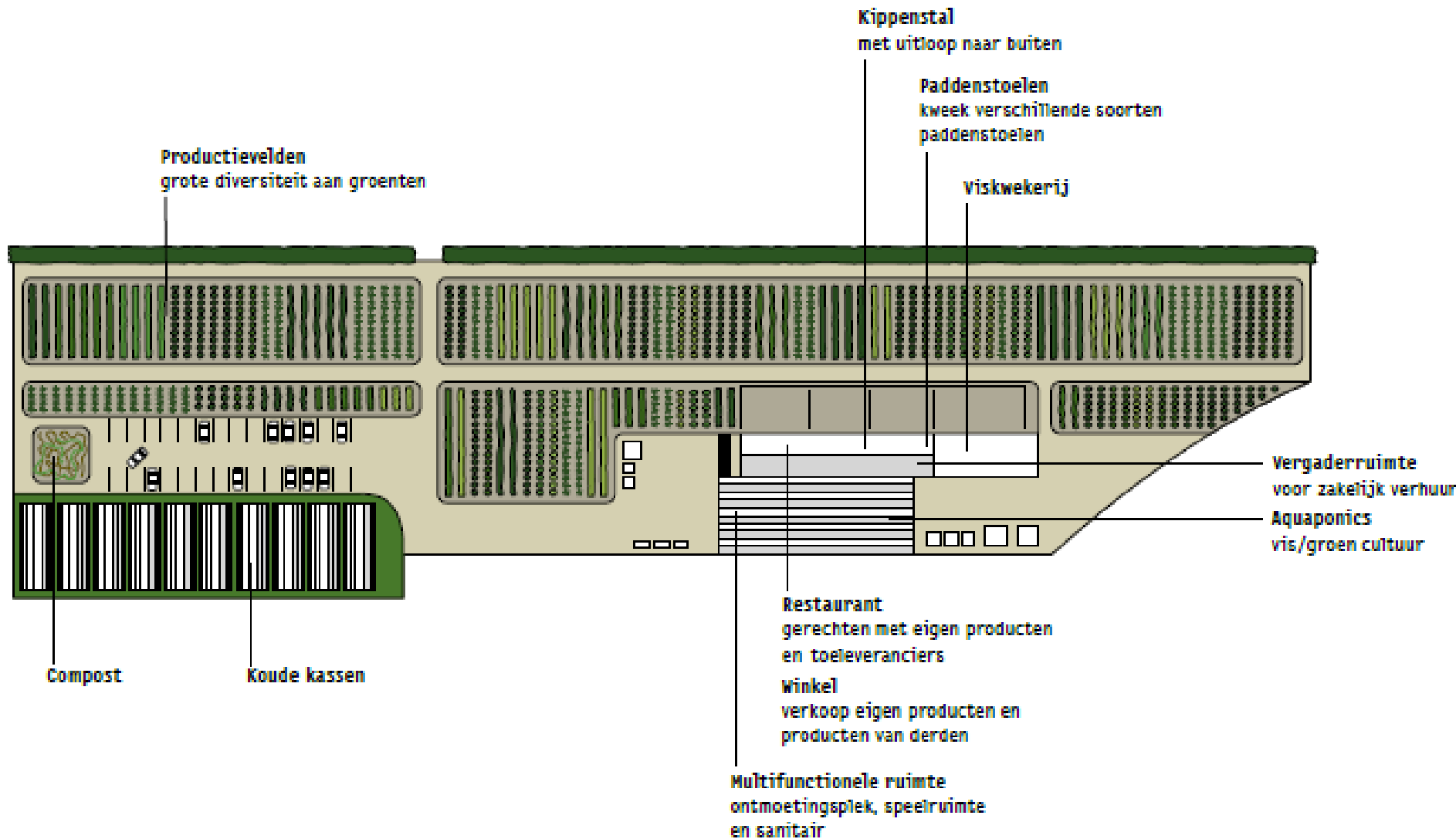
Pig City (MVRDV 2000)



Abandoned rail yard redevelopment



Abandoned rail yard redevelopment



Realisation Marconistrip (Uit je eigen stad)



Home > Campaigns > GROW > Campaigns > GROW > Dutch beat French and Swiss to top Oxfam's new global food table



Women from Azoza village, Chad, search for tiny scraps of cereals grains in the anthills. Photo: Irina Fuhrmann/Oxfam

Dutch beat French and Swiss to top Oxfam's new global food table

Published: 15 January 2014

The Netherlands is No. 1 in the world for having the most plentiful, nutritious, healthy and affordable diet, beating France and Switzerland into second place. Chad is last in 125th spot behind Ethiopia and Angola, according to a new

Downloads



Good Enough to Eat, Oxfam
Media Briefing, 15 January 2014
180.57 KB




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MEDIA CENTER

Dutch beat French and Swiss to top Oxfam's new global food table

Europe can cut import dependence and food prices by ditching biofuels mandates

[Read more »](#)

REPORTS & PAPERS

“Open” innovation in Netherlands

- Metfarm
- Amstelberry
- Symbicity
- Hortus Transvaal
- Stad+Kas
- Groenfabriek
- Farmcity
- GrownDowntown
- Plantlab
- RAI Amtrium
- De Schilde
- Amstelkwartier Hotel



Amstelberry



'Amsterdam moet eigen landbouw krijgen'

Redactie, 15 jul 2012, 13:25

De aardbei moet het symbool worden voor Amsterdamse landbouw. Daarbij horen ook kleding van brandnetels en het Amsterdam Food Center als marktplaats voor in en rond de stad verbouwd voedsel.



plant production unit





QO Hotel Amstelkwartier





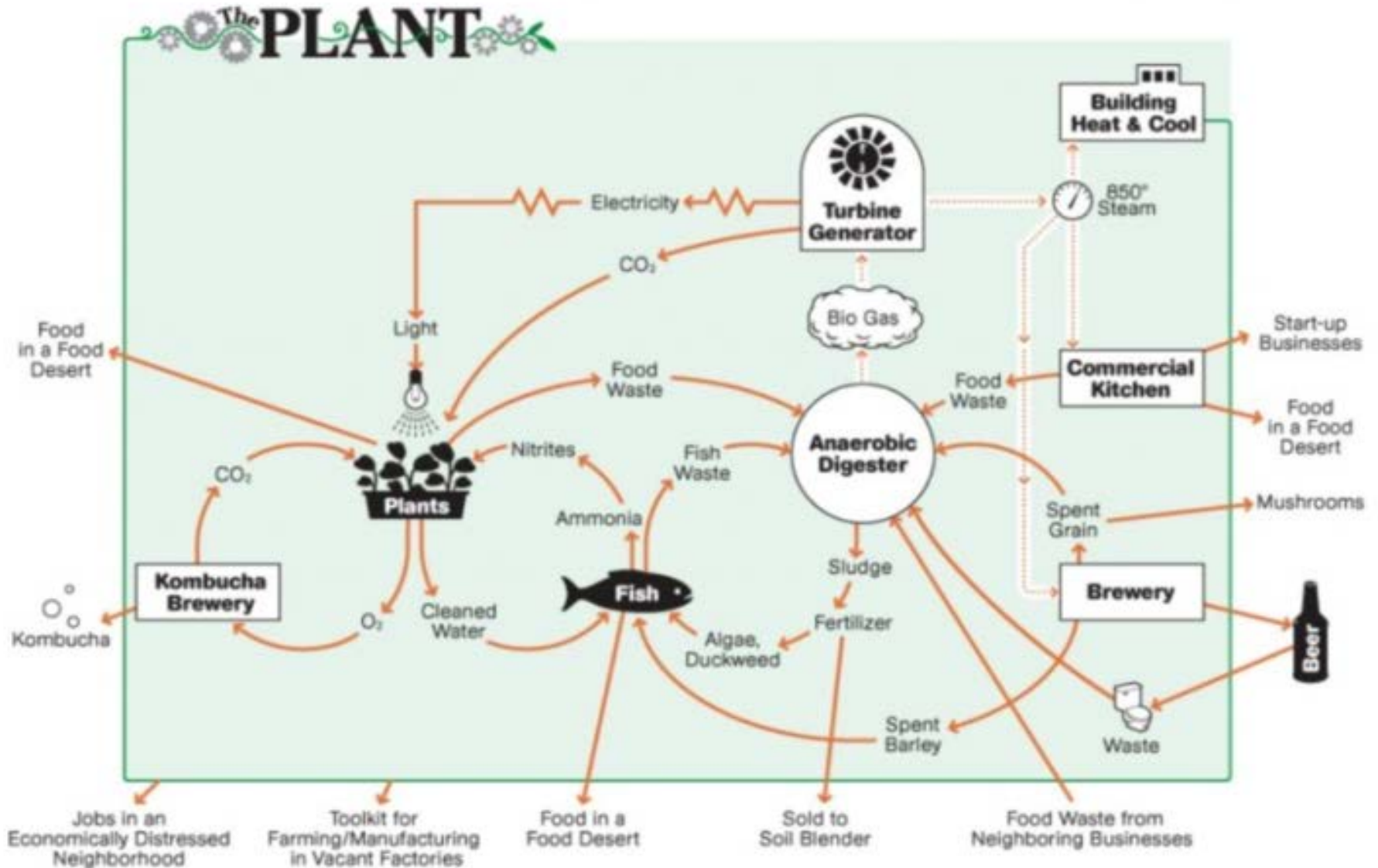
Challenges

- Ecology
 - Energy
 - Water
 - Nutrients
 - Carbon sequestration (spare or share the land)
- Economy
 - Clean, ultra fresh
 - New business models: controlled supply, grow to order
 - Food or Ag Tech?
- Social
 - Consumer acceptance
 - Affordability

Ecology

- Water
- Energy
- Nutrients
- Carbon sequestration (spare or share the land)

Circular rather than linear economy?



Feeding metropolises



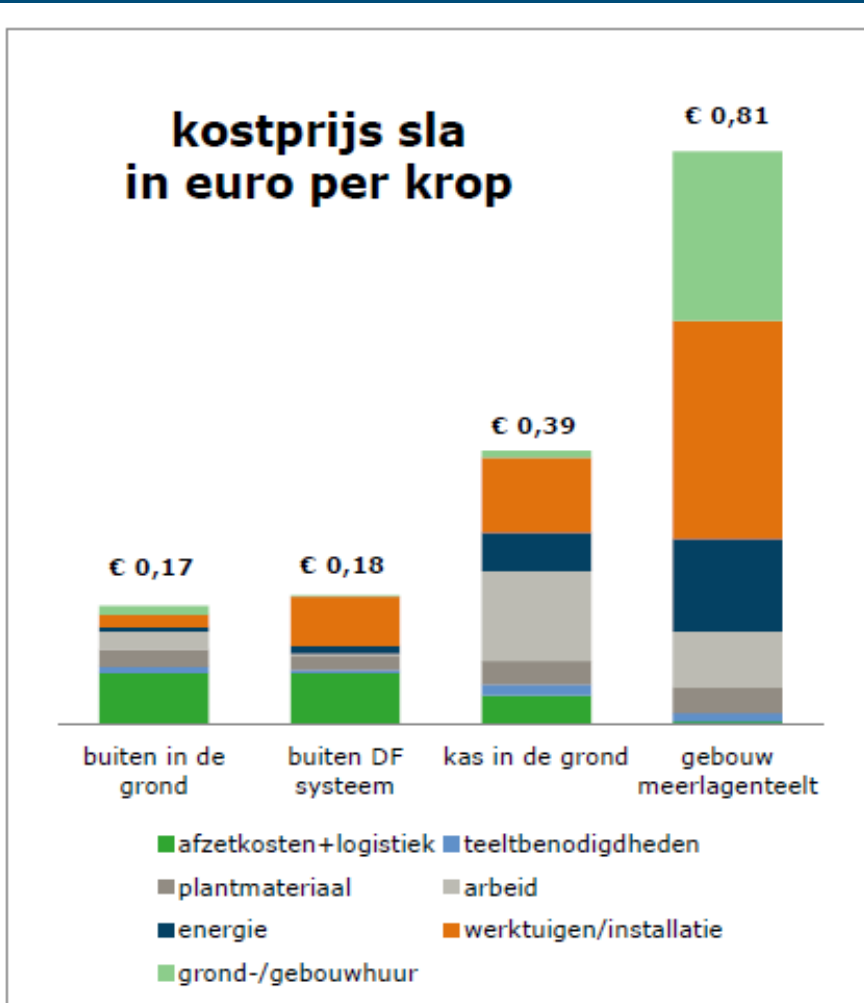
Share or Spare the Land?



Economy

- Clean, ultra fresh
- New business models: controlled supply, grow to order
- Food or Ag Tech?

Vertical farming in vacant office buildings



Figuur 13: Kostprijs sla in euro per krop voor verschillende teeltsystemen



Stadslandbouw in kantoorpanden:
Optie of utopie?
Joanette Spruijt*, Jan-Eelco Jansma†, Tycho Vermeulen†, Jero de Haan†
en Wynand Suckel†
† Praktijkonderzoek Park & Omgiving
‡ Wageningen UR-Gebouwbouwen

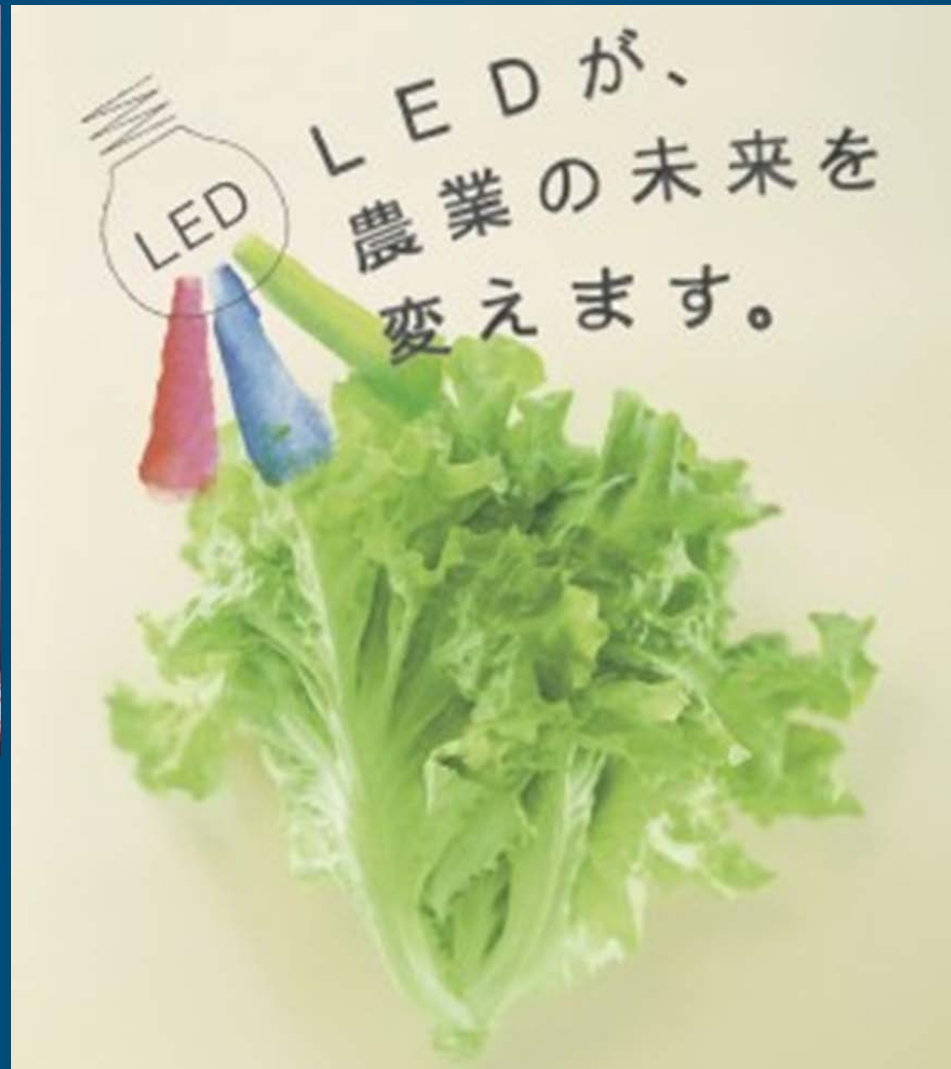
WAGENINGEN UR
For quality of life

“Food production in buildings is more expensive than food production in open fields or in green houses. (In NL) it will be difficult to create healthy business cases that are based solely on the production of crops” (Spruijt et al 2015)

Plant factories, Japan



Tamagawa University Tokyo



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One-time largest vertical farm shuts down

Free vertical farming newsletter

At one point FarmedHere was the nation's largest vertical farm. It was also the first to be certified organic by USDA. Now it's closing. What does that mean for the industry? Thoughts from Rosemont and FarmedHere founder inside.



This isn't the first of the capital intensive vertical farms we've seen close. [Mirai](#), [Panasonic](#), and Google have all abandoned vertical farming projects. Does that mean that the money just isn't there to do these things commercially at a large scale? Basically, what the owners of FarmedHere [said](#) is that they weren't making enough money and could leverage their investments better in other sectors. Reading between the lines, profits stank. Is that true with all of these larger commercial farms?

Honestly, maybe...

Hard core narrow viewed industry advocates will of course have explanations and excuses, but that really could be the case.

At the same time, we've seen [small-scale vertical farms with tons of success](#). Just guessing the reason based on our farm, their margins are probably higher since they don't have to worry about moving as much product.

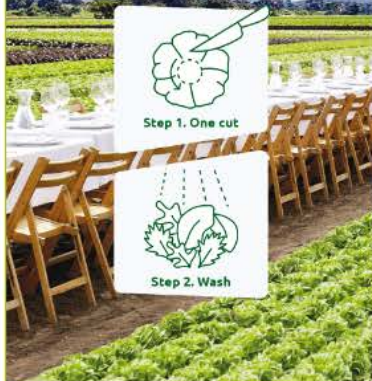
So, is the answer that without government or other outside assistance (like [Sky Greens](#) in [Singapore](#), which is still expanding), it's up to smaller farmers with better sales channels to develop the technology before vertical farming really becomes scalable?

production for supermarket
sabotage by employees

Exclusive shut down VFs panel:

https://www.facebook.com/Agriitecture/videos/1102187189885133/?hc_location=ufi

Salanova



one cut,

"The seeds from Anatolia
since the dawn of agriculture"
art of seed breeding



Staaay, Philips and Rijk Zwaan collaborate on vertical farm

Philips Lighting today announced that Staaay Food Group is building the first of its kind vertical farm in Europe, in Dronten, the Netherlands, which will use Philips GreenPower LED horticultural lighting. The facility will serve one of Europe's biggest supermarket chains and will be used for testing, and optimizing processes for future, large vertical farms.



Ahead of new legislation

The 900m² indoor vertical farm will have over 3,000m² of growing space and produce pesticide-free lettuce. With upcoming stricter regulations on the residual pesticide levels in a bag or bowl of lettuce, retailers will need to provide exceedingly high quality, pesticide-free lettuce.

Defining growth recipes

Staaay, Philips Lighting and vegetable breeder Rijk Zwaan collaborated and undertook intensive research over the past three years to determine the best combination of lettuce varieties and growth recipes to improve



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Challenges

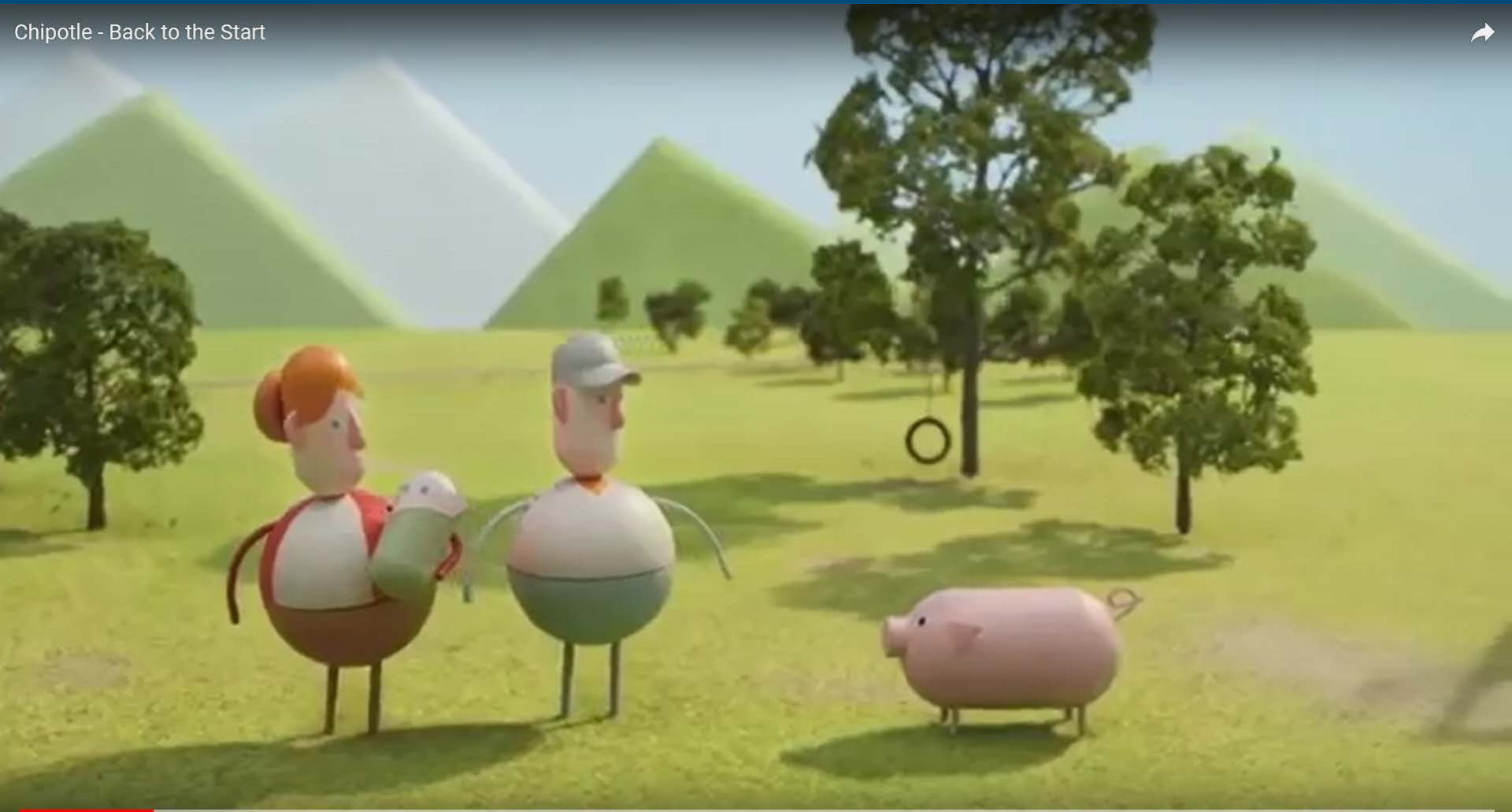
- Circularity (water, energy, nutrients)
- Empowerment
- Consumer acceptance high tech food
- Labour (green fingers next to technology)
- Business models

Social

- Consumer acceptance
- Affordability

BACK TO THE START (nobody said it was easy)

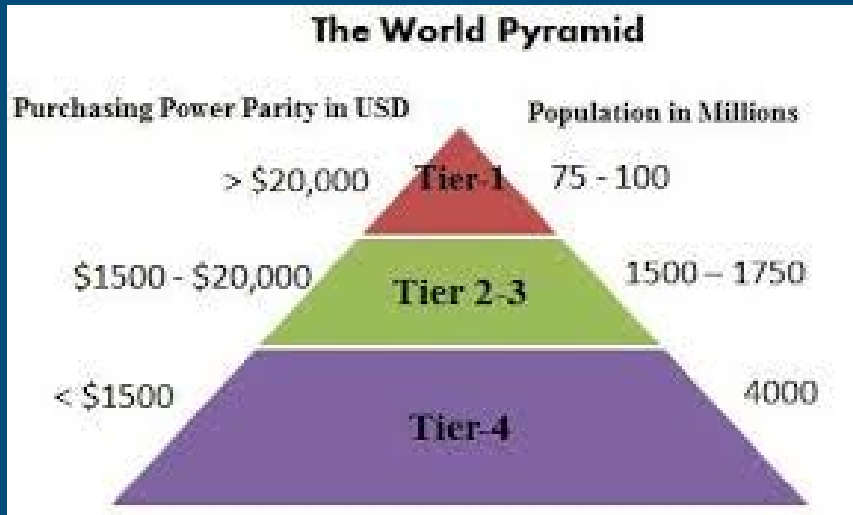
Chipotle - Back to the Start



0:12 / 2:20



Reaching out down the pyramid?



Desktope
Sybrandy, Den Besten et al (2013)

Jacobs, Den Besten, Blue Innovation Center Venlo 2014

How to feed cities?

Table 1. Types of urban agriculture, based on spatial location and level of control over production process

	open	mixed	controlled
building	Microclimates in and around the built environment (mushrooms, vines)	Rooftop gardens (vegetables)	LED light cabinets (vegetables) Urban livestock (rabbits) Aquaponics
inner city	Permaculture gardens (vegetables, fruits, nuts, roots) Urban livestock (bee keeping)	Kitchen and community gardens (vegetables) Urban livestock (chickens, sheep)	Urban livestock (worms, insects, etc.)
city fringe	Forest gardens (vegetables, fruits, nuts, roots)	Market gardens (vegetables)	Greenhouse nursery (vegetables)
periurban	Agroforestry (fruits, nuts) Extensive livestock (beef cattle, sheep) Ecological restoration	Mixed farming (livestock, staples, vegetables) Semi-intensive livestock (dairy)	Greenhouses and precision farming (vegetables, staples) Intensive livestock (pigs, poultry)

Source: Agriculture Economics Institute, Wageningen based on de Graaf (2011)

Five business models urban agriculture



<https://www.youtube.com/watch?v=9PIOuxzqS3U>

<https://www.youtube.com/watch?v=Bi3hNsTcda8>

Five business models urban agriculture

- Differentiation
- Diversification
- Low cost (urban waste)
- Community
- Experience

Meerstammigen
 Nestgelegenheden
 Kruidlaag met hangbeplanting

Grondbassins voor wortelgroei

Insecten hotel
 Grondbassins voor wortelgroei

Luchtzuiverende planten

Groene structuur

Openbaar observatiedek

Power Nest
 Lignet

Klimwand
 Expositiehul

Lumiduct

Waste Transformer

Verticale voedselproductie

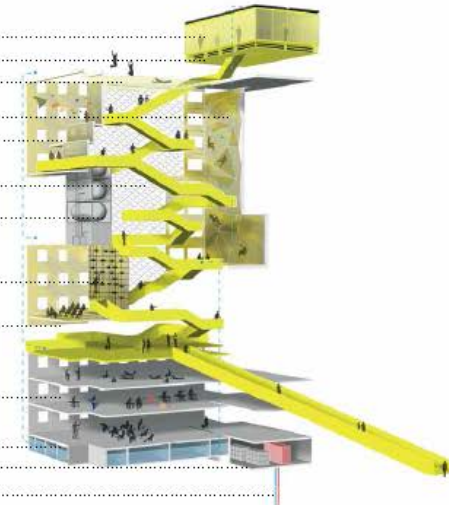
Hydroponic systeem

CoDe Maker Space

Regenwaterberging
 Buurtbatterij

WKO-systeem

Programma



Langsdoornede