

#### The sustainability of aquaponics

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# High increase and diversification of urban food systems (UFS) initiatives











## Can urban agriculture feed the world?











Evan Long

HOW GREEN WAS MY ALLEY?

#### Urban farms won't feed us, but they just might teach us

By Nathanael Johnson on Apr 29, 2014



## Can urban agriculture feed the world?

- Alternative food system
- Local & organic production
- Producer Consumer relationship
- Environmental awareness
- Educational services
- Social justice issues
- Community building
- Connecting UA & PA farmers





#### Are Urban Farms More Hype than Hope? Report Raises Questions

How does the urban farm grow? BY BARBARA ELDREDGE | @BARBARAELDREDGE | MAY 12, 2016, 9:16AM EDT





All photos via Center for a Livable Future

#### Is urban agriculture only a trend?

Social acceptance

10

- Policy context (!! Urban planning)
- Development of a local economy (settlement of business-run UA)
- Administrative support to social initiatives
- Community engagement



A new report from the <u>Center for a Livable Future</u> suggests city farms aren't necessarily a magic bullet



#### **Guardian sustainable business** Is urban farming only for rich hipsters?

Farms are springing up in cities across Europe, but if they exclude lower income groups they'll do little to help shift towards sustainable food system



Gina Lovett

Monday 15 February 2016 12.35 GMT



I A new wave of urban agriculture enterprises faces challenges around making the technology and produce accessible to everyone. Photograph: Mandy Zammit/GrowUp Box



pending on ethical food and drink products - including organic, Fairtrade,
free range and freedom foods - hit £8.4bn in the UK in 2013, making up
8.5% of all household food sales.























#### Multifunctionality Social justice issues















#### Multifunctionality Social justice issues



REEN DESIGN NORTH END DETROIT RENOVATIONS

## America's first sustainable urban agrihood is growing in Detroit

BY ROBIN RUNYAN | DEC 1, 2016, 1:03PM EST

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#### Farms That Rise to the Challenge

By CONRAD DE AENLLE MAY 17, 2016



An organic vegetable garden tended by residents on the ninth-floor rooftop of a building in Osaka, Japan. Companies are pursuing similar projects, both outdoors and indoors, with a variety of strategies.

Furanaan Presenhoto Agang

\*\*\*\* \* \* \* MARIE 0 It is a staggering challenge: feeding the seven billion-plus people in the world and delivering fresh food to the rapidly rising number of them who live in cities.

One solution, more theoretical than practical so far, amounts to killing two birds with one stone and adding a third benefit: vertical farming.

By growing crops on the sides or roofs of buildings, or in stacks inside, in the large cities where they will be consumed, food can be produced in a way that saves energy and time, proponents of vertical farming assert.

The advantages will become even clearer, they say, as techniques and technologies improve, urban populations expand and factors such as increasing water scarcity and <u>climate change</u> hamper traditional





#### Resource efficiency Economic competition









By TAMMY La GORCE JULY 22, 2016







#### Resource efficiency Economic competition





Urban F**ĕ€ds** 







A disused office in The Hague has been revamped as a sprawling rooftop greenhouse, with a fish farm operating on the floor below. Are we entering a new age of urban agriculture?



🚯 'It's sometimes said that city children think tomatoes grow in the supermarket' ... the UrbanFarmers greenhouse atop an abandoned Philips office building in The Hague







#### **Resource efficiency Economic competition**















#### Urban agriculture is a mixture of different typologies of initiatives







### **SUSTURBANFOODS**

# Integrated sustainability assessment of social and technological innovations towards urban food systems





### The concept of sustainability





#### **Environmental** sustainability

- + <u>Social</u> sustainability
- + Economic sustainability

### **SUSTAINABILITY**







## Quantifying the sustainability of UFS



Study	Research	Type of UFS	Location	Dimension	Method	
Sanyé-Mengual et al., 2015a	Case	Rooftop garden	Bologna, Italy	Environment & economy	LCA & LCC	
Sanyé-Mengual et al., 2015b	Case	Rooftop greenhouse	Barcelona, Spain	Environment & economy	LCA & LCC	
Sanyé-Mengual, 2015	Case	Rooftop garden	Barcelona, Spain	Environment	LCA	
Goldstein et al., 2016	Case	Diverse	Boston, United States	Environment	LCA	
Benis & Ferrao, 2017	Theoretical	-	Lisbon, Portugal	Environment	LCA	
Kulak et al., 2013	Theoretical	-	United Kingdom	Environment	LCA	
He et al., 2016	Case	Suburban greenhouse	Beijing, China	Environment	LCA	
Hall et al., 2014	Case	Suburban farm	Sydney, Australia	Environment	LCA	
Astee & Kishnani, 2010	Case	Rooftop garden	Singapur, Singapur	Environment	Food production Carbon emissions factor	
Orsini et al., 2015	Case	Rooftop garden	Bologna, Italy	Social	Food self-supply	
Grard et al., 2015	Case	Rooftop garden	Paris, France	-	Food production	
Grewal & Grewal, 2012	Theoretical	Diverse	Cleveland, USA	Social	Food self-supply	







#### **PROJECT GOALS**

Improve knowledge of the sustainability of UFS

Design an interdisciplinary methodological scheme to value the global sustainability of UFS

Quantify the sustainability of diverse social and technological innovations of UFS in Europe

List policy recommendations towards a sustainable development of UFS





## On-going process





#### SUSTAINABILITY ASSESSMENT OF URBAN FOOD SYSTEMS

Application to case studies

Evaluation of results (trends, social vs. Technological innovations, urban space)

Policy brief: recommendations















**Design recommendations:** Selection of cultivation techniques and types of urban agriculture





Sanyé-Mengual (2015) Sustainability assessment of urban rooftop farming using an interdisciplinary approach. PhD thesis. Universitat Autònoma de Barcelona.





**Design recommendations:** Selection of cultivation techniques and types of urban agriculture





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**Design recommendations:** Selection of cultivation techniques and types of urban agriculture





Sanyé-Mengual (2015) Sustainability assessment of urban rooftop farming using an interdisciplinary approach. PhD thesis. Universitat Autònoma de Barcelona.





#### **Design recommendations: Selection of CROPS**







Sanyé-Mengual et al. (2015) Techniques and crops for efficient rooftop gardens in Bologna, Italy. Agronomy for Sustainable Development 35(4), 1477–1488.



### **Case studies**





		Case	Urban space	
SOCIAL	Bologna	Via Gandusio	Roof	
INNOVATION	Bologna	Arvaia	Periurban	
	Bologna	Allotment	City	
	Bologna	Spazio Battirame	Periurban	
	Berlin	Himmelbeet	City	
TECHNOLOGICAL	Bologna	Serra Pellerossa	Periurban	
INNOVATION	Bologna	LED-farm	Building	
	Dortmund	Heitro	City	
	Dortmund	Heitro-SWUAS	City	
	Barcelona	RTG-Lab	Roof	
	Barcelona	MR-16	Roof	
	Paris	T4P	Roof	





### **Case studies**





















lokal. kreativ. lebendig.

#### **Die Urbanisten**

Aquaponics

Resource efficiency (Water closed flow)

die urbanisten

Diverse products (greens and fish)















### Aquaponics



#### THE AQUAPONICS CYCLE



What are the advantages of aquaponics?

- Closing the cycle:
  - Resource efficiency
  - Circular economy
- Product diversity:
  - Animal protein (!!climate change)
  - Market opportunities
- Intensive production:
  - Low area requirement
  - High revenues





Aquaponics





\*Survey to 400 inhabitans

Bologna, Italy

#### I would buy

#### **Social acceptance**

- Willingness-to-buy: >90%
- Most prefered animal product



Sanyé-Mengual et al. (Forthcoming) Social Acceptance and Perceived Ecosystem Services of Urban Agriculture in Southern Europe: The Case of Bologna, Italy. PLoS ONE.







• Set methodology to evaluate the sustainability (environment, economy, society) of aquaponics within SustUrbanFoods



 Set guidelines for the aquaponics community of Europe for evaluating the sustainability of their systems via COST Action "The Aquaponics hub"







### Aquaponics





Geben Sie die Gruppe an, die Sie am besten repräsentiert:

🗌 Verwaltung 🗌 Non-Profit 🗌 Hochschule 🗌 Aquaponik Firma 🗌 Dienstleister 🗌 Andere

Beurteilung von Ökosystemdienstleistungen durch Aquaponik: Bereich Umwelt

Bitte beurteilen Sie die unterschiedlichen Ökosystemdienstleistungen durch Aquaponik mit der Beantwortung edr Frage "Aquaponik trägt zu ... bei". Werte rangieren von 1 – "stimme gar nicht zu" bis 5 – "stimme vollkommen zu"

Ökosystem-	keine Zu- stimmung				Volle Zu- stimmung	Weiss nicht /	
Dienstleistungen	1	2	3	4	5	Antwort	
Versorgung mit:							
- Nahrungsmitteln							
<ul> <li>Medizinischen und aromatischen Pflanzen</li> </ul>							
<ul> <li>Andere Rohmaterialien (Bsp. Wolle)</li> </ul>							
Regulierungsdienste							
Verbesserung von							
- Lokalem Klima							
- Luftqualität							







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http://www.twitter.com/susturbanfoods http://www.twitter.com/esanyemengual http://www.twitter.com/rescueab

#### Contact: esther.sanye@unibo.it



#### The project

SustUrbanFoods "Integrated sustainability assessment of social and technological innovations towards urban food systems" is a Marie Skolodowska-Curie Action (MSCA) individual fellowship. The project has a duration of 24 months and is funded by the European Commission.

Improvement of current knowledge on sustainability and urban agriculture

Urban food systems are sprouting around cities of developed countries to improve the sustainability of cities and citizens' diets. In particular, urban food systems are being developed upon social and technological innovations to become competitive in the urban environment. A limited number of studies have worked on quantifying the sustainability performance of urban food activities. Even more, studies lack of a three-bottom perspective that integrates the environment, economy and society dimensions.

#### TWITTER

Esther Sanyé-Mengual @esanyemengual What is going on in #rcoftopfarming? Check out this new #openaccess paper on the topic mdpicom/2071-1050/8/11.... @MDPIOpenAccess







