Urban gardening changes food consumption habits and decreases personal carbon footprint: A case study in Madrid

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CITIES: HETEROTROPHIC ECOSYSTEMS

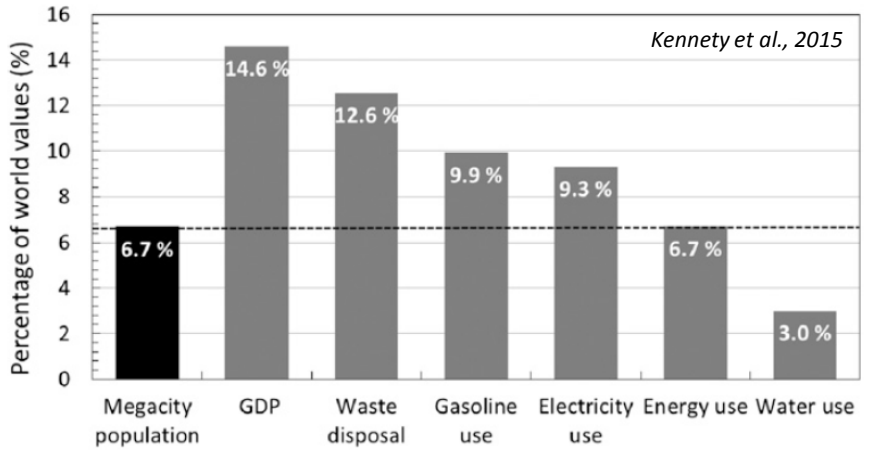


Fig. 2. Megacity resource and waste flows as a percentage of world values.

PRODUCTION

21,9 $MtCO_2e$

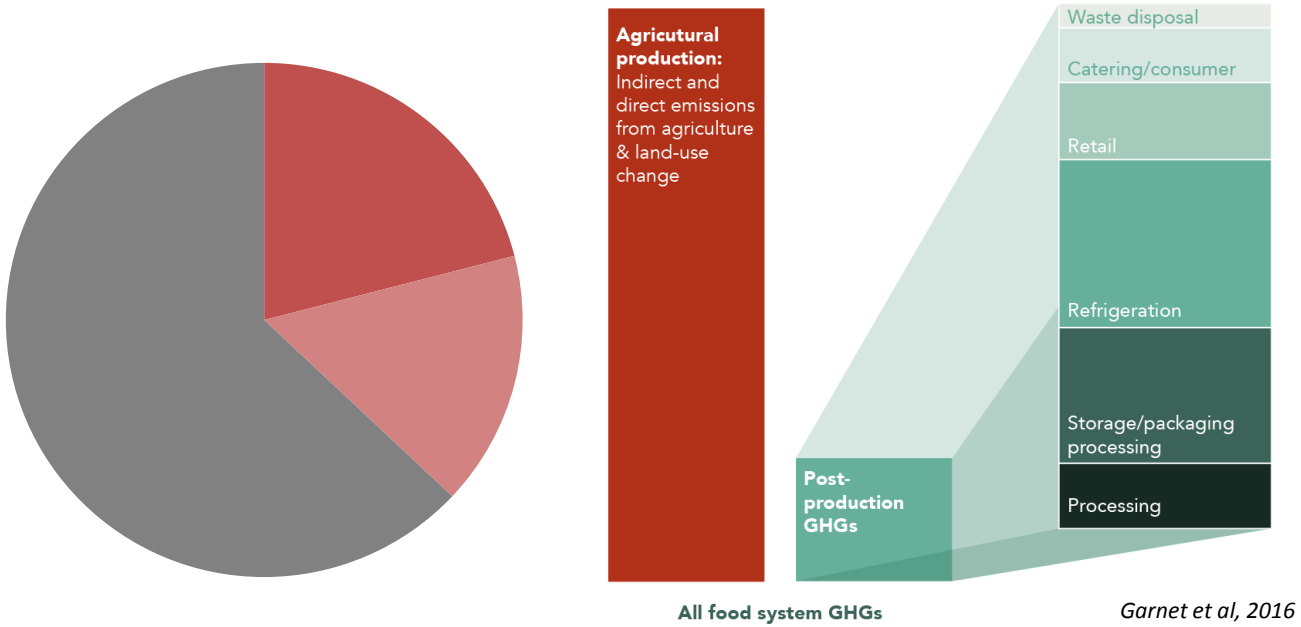
CONSUMPTION

86,2 $MtCO_2e$

GHG inventories and mitigation strategies

Average GHG emissions in Madrid region for the period 2006-2014 (*Inventarios de la Comunidad de Madrid; Ivanova y col., 2017*)

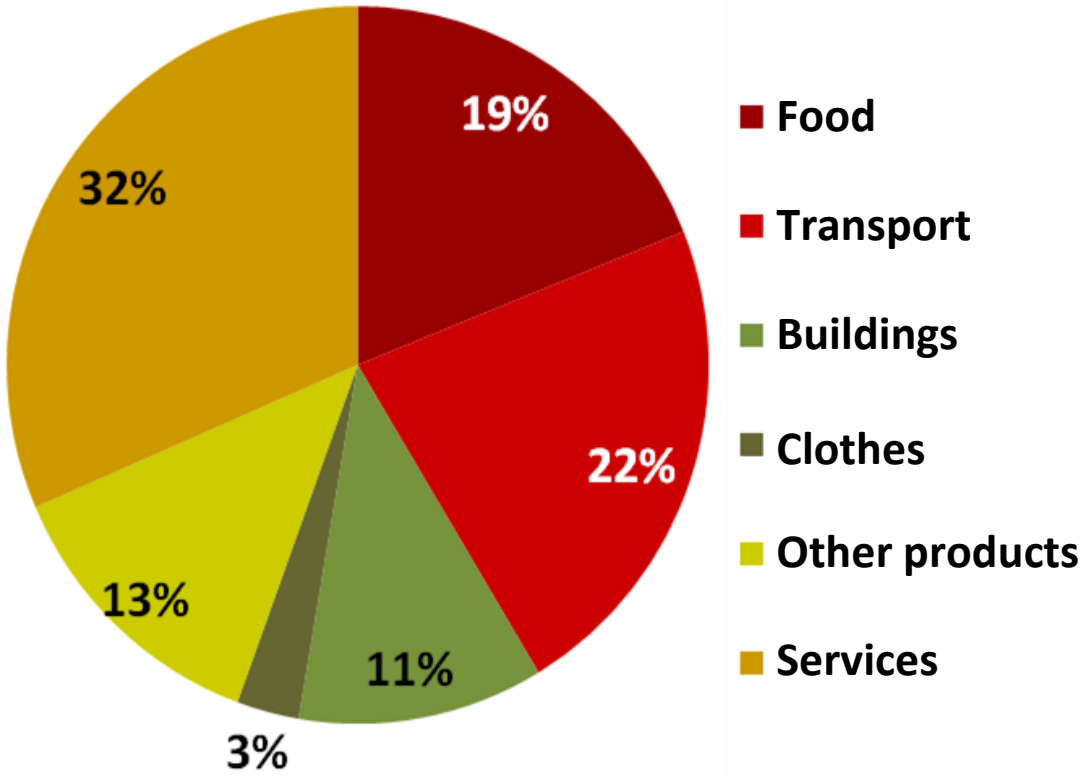
AGRIFOOD SYSTEM and CLIMATE CHANGE



Garnet et al, 2016
Based on Vermeulen S.J. et al., 2012

21-37% of all GHG

GHG emissions from household consumption in Madrid region
(*Ivanova y col., 2017*)



OPPORTUNITIES FROM BEHAVIORAL CHANGE

Production ⇆ Consumption (DISCONECTION)

"Human factor": ± 1.5 ºC global temperature

Social learning

URBAN GARDENS

Madrid: Urban garden network **2012** + public program

Multiple benefits: neighborhood bonds, health…

Pro-environmental behaviors?

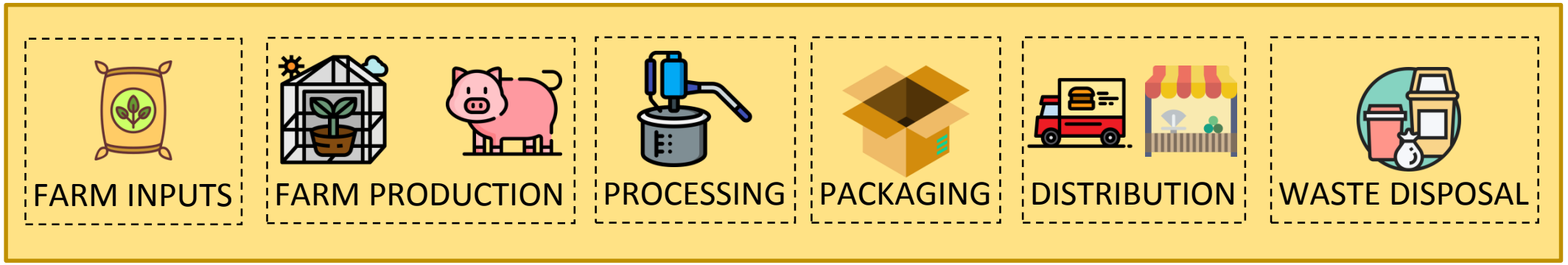
QUESTION:

Does participating in urban gardening initiatives

lead to a reduction in carbon footprint from food consumption?

STUDIED SYSTEM AND STUDIED COMPONENTS

HOUSEHOLD FOOD CONSUMPTION (MADRID CITY)



IN HOME REFRIGERATION

COOKING

Average carbon footprint from food consumption In 2012 (baseline)

HABIT CHANGE ASSESSMENT

Discussion group

Signaled habits (perceived change since the start of the participation in the urban garden

Online survey (n = 245)

How much have you change…?

- **Dietary choices**
- **Product choice:**
  - **Organic / conventional**
  - **Bulk**
  - **Food origin (regional / national / international)**
- **Mobility behavior**
- **Waste management**

URBAN GARDENERS
Since the start
of your participation

CONTROL

Since 2012

CHANGES IN FOOD HABITS

		Habit change	
		UG	C
DIET COMPOSITION	Low CF	+12.0%	+7.0%
	High CF	-17.0%	-9.9%
PRODUCTION MODALITY	Organic	+37.3%	+1.4%
	Conventional	-11.4%	-9.8%
PACKAGING	Bulk	+9.4%	+3.9%
	Packed	-16.4%	-1.7%
FOOD ORIGIN	Regional	+29.4%	+6.9%
	National	+29.0%	+19.0%
	International	-32.2%	-11.7%
SHOPPING TRANSPORTATION	Foot / bike	+4.1%	-9.6%
	Public transport	-2.7%	+20.8%
	Private vehicle	-4.9%	+2.4%
WASTE MANAGEMENT	Generation	-14.4%	+0.2%
	Composting	+40.7%	+4.5%

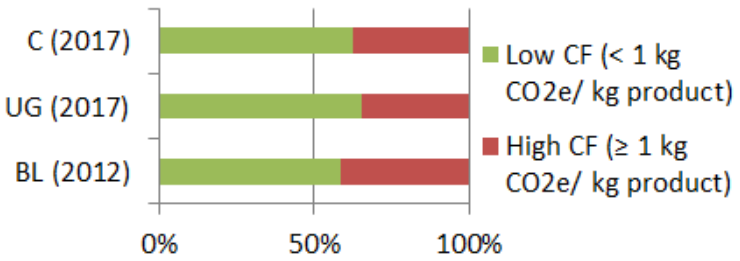
UG = Urban gardeners

C = Control

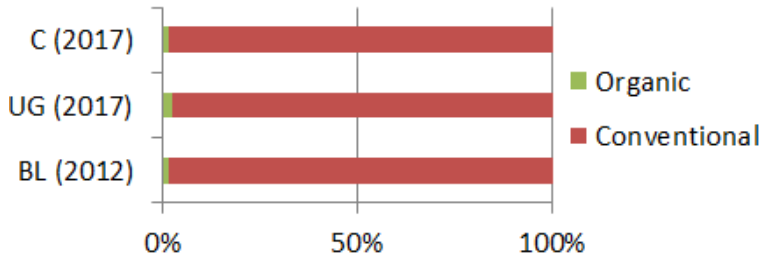
	UG	C
Animal source food:	↓17%	↓9.9%
Organic food:	↑ 37%	=
Bulk products:	↑ 9,4%	↑3,9%
Local food:	↑ 58,4%	↑25,9%
Waste generation:	↓ 14,4%	=
Waste composting:	↑ 40,7%	↑4,5%

CHANGES IN FOOD HABITS

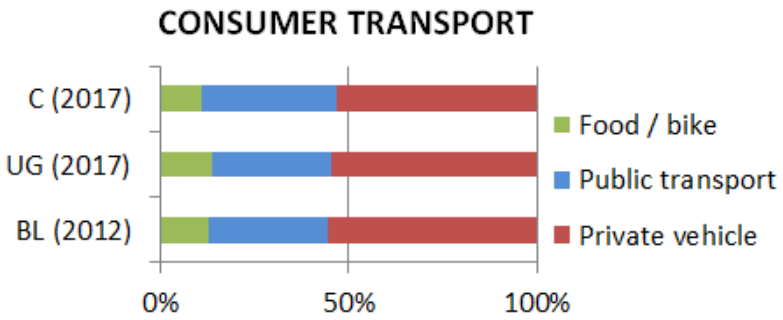
DIET COMPOSITION



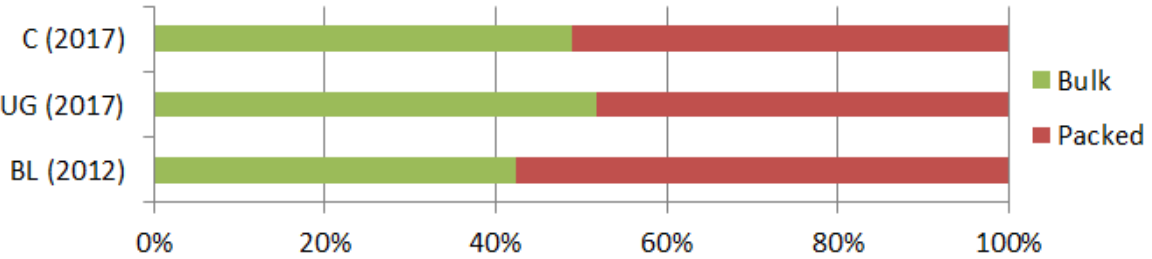
PRODUCTION MODALITY



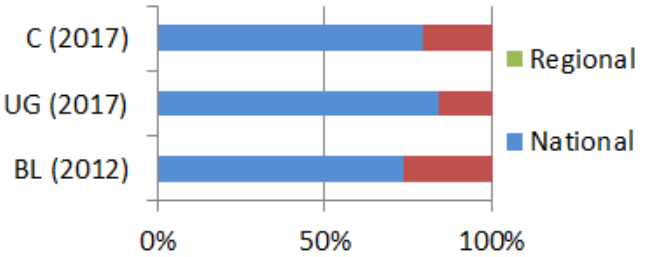
CONSUMER TRANSPORT



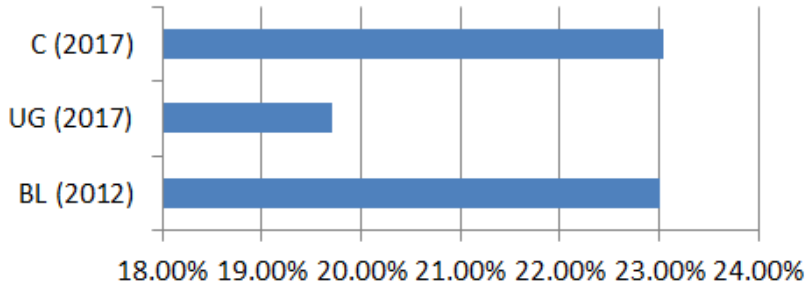
PACKAGING



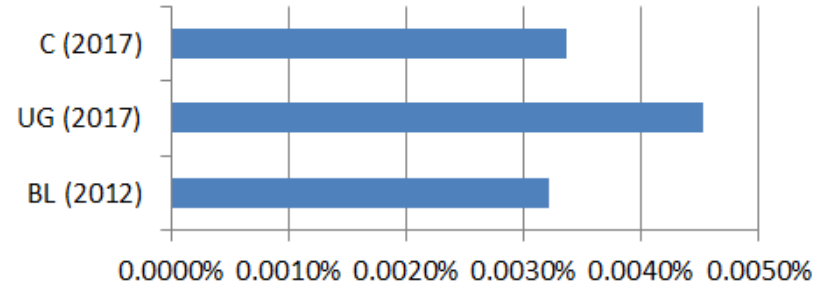
FOOD ORIGIN



WASTE GENERATION

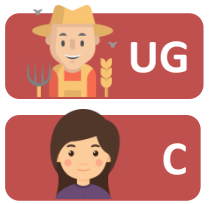


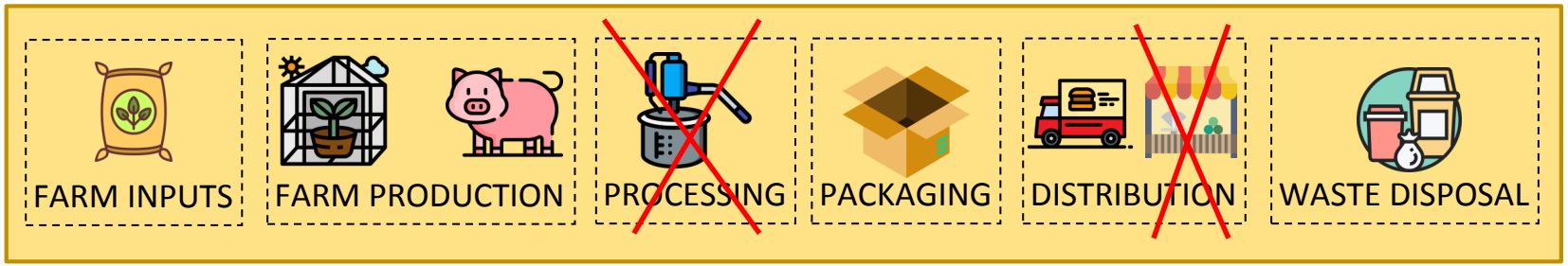
WASTE COMPOSTING



CHANGES IN CARBON FOOTPRINT

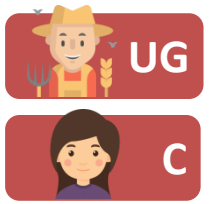
	CF (kg CO_2e / yr / pc)			CF change (%)			Avoided emissions (kg CO_2e / yr / pc)
	BL	UG	C	BL → UG	BL → C	C → UG	UG
Pre- and in-farm production	1,015	899	972	-11.3%	-4.2%	-7.5%	72.9
Processing	122	113	120	-7.4%	-1.3%	-6.2%	7.5
Packaging	15	14	14	-5.6%	-1.7%	-4.0%	0.6
Trade to Madrid	136	114	132	-16.2%	-2.9%	-13.7%	18.1
Retail	20	23	22	+12.9%	+10.9%	-4.0%	-0.4
Transport home	220	210	234	-4.4%	+6.4%	-10.2%	23.9
Waste management	14	13	15	-3.3%	+11.1%	-13.0%	2.0
Total (all)	**1,541**	**1,387**	**1,511**	**-10.0%**	**-2.0%**	**-8.2%**	**124.6**
Total (assessed categories)	1,399	1,251	1,368	-10.6%	-2.2%	-8.4%	117.5





CHANGES IN CARBON FOOTPRINT

	BL CF (kg CO_2e)						C → UG CF REDUCTION
	Farm and pre-farm	Processing	Packaging	Trade to Madrid	TOTAL	%	%
Eggs and dairy	180.57	66.67	5.96	22.57	275.77	21.43%	5.83%
Meat	635.14	32.68	1.11	7.64	676.57	52.57%	63.16%
Fish and seafood	125.85	17.03	0.50	29.78	173.15	13.45%	26.78%
Pulses	0.72	0.07	0.12	0.77	1.68	0.13%	0.03%
Cereals	23.18	3.25	2.65	15.80	44.87	3.49%	0.36%
Vegetables	26.15	1.17	2.43	18.16	47.91	3.72%	-
Fruits	16.68	0.11	1.16	39.52	57.46	4.46%	3.63%
Dry fruits and olive products	6.25	0.87	0.68	1.81	9.62	0.75%	0.20%
TOTAL	1,014.54	121.84	14.60	136.06	1,287.04	100.00%	100.00%



95,8% of carbon footprint reduction

84% of food carbon footprint

Conditions for social learning on food sustainability

Opportunity to tackle sensitive issues

Small changes in food habits → substancial impact (10% CF)

Madrid scale (3,2 million) → 396,5 kt CO2e / year (65% Industry)

Co-benefits:

- **Environmental**
- **Public health (habit change)**
- **Well-being, stress management, social bonds**

Effect of policies, structural barriers and social norms

Thanks!!

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