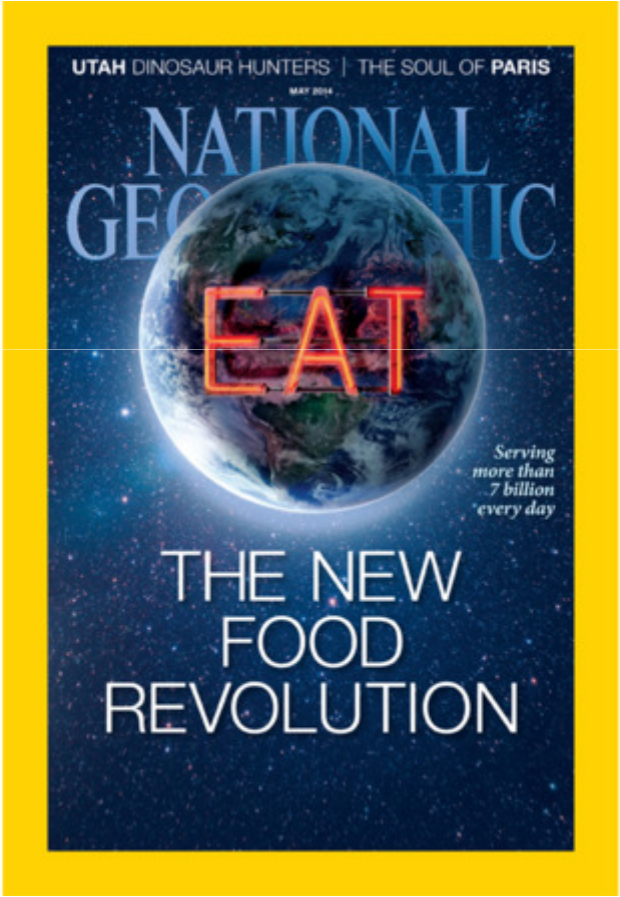
How technology will help us with choices and preparation of healthy food

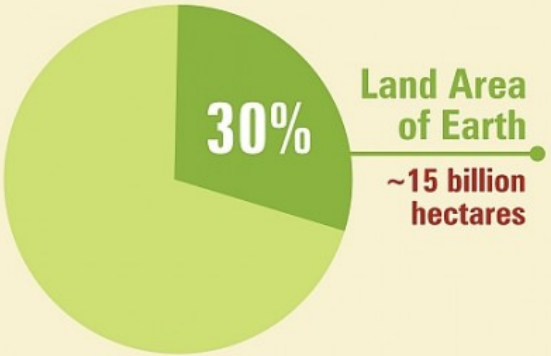


Jaap Seidell, VU University, Amsterdam

How too feed 9-10 billion people in 2050: Challenges

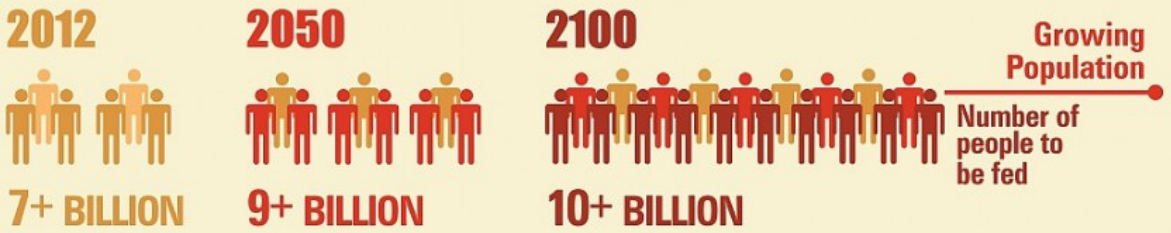
- Population growth
- Food production (scarcity fertile soil, water)
- Distribution of food; inequity
- Food waste
- Food and health

Can Mother Earth Feed 9+ Billion by 2050?



ARABLE LAND PER PERSON IN 2010

~ 0.2 hectare, equivalent to a plot of land 45m x 45m in 2010
compared to a required minimum area of 0.5 hectare per person



Can we produce sufficient food from 0.2 hectare?

Food security is a formidable challenge

The citizens of the world must work together for a hunger-free and more peaceful world using the best conventional crop technology and the best of biotechology in a policy framework conducive to crop production.

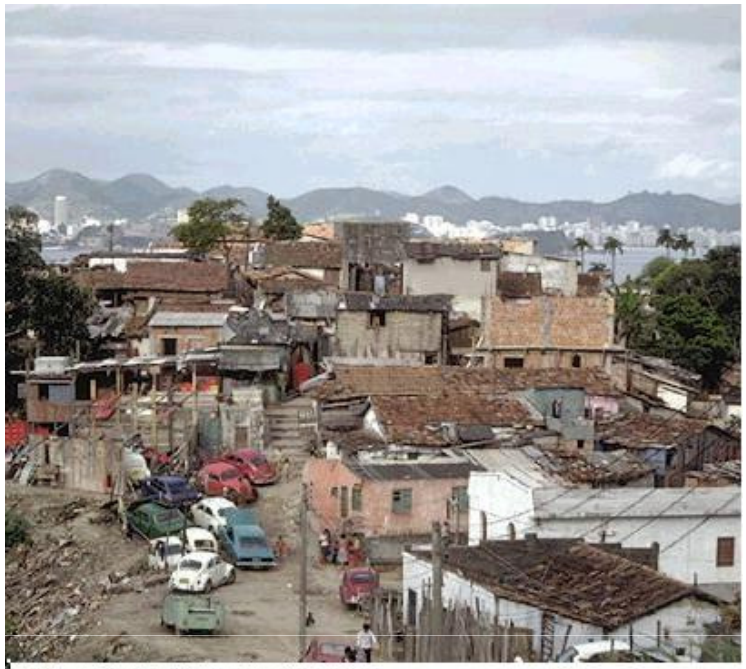
For more information, please visit - www.isaaa.org

“What we do know is that business as usual will ensure growing health burdens, increasing inequality, rising environmental damage and deteriorating democracy”

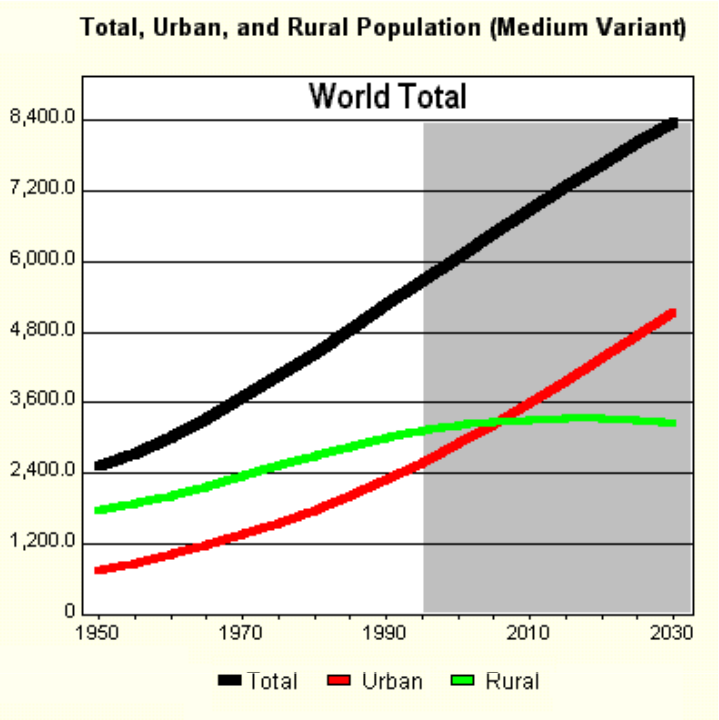
Nicholas Freudenberg;

Lethal but legal: corporations, consumption, and protecting public health.

Oxford University Press, 2014



A favela in Rio de Janeiro



The Paleo Diet

Vegetables




Tart Fruits



Nuts

Wild Meats



Eggs

Coconut & Olive Oil


Not in the Paleo Diet

Refined, Processed Foods



Sugars, Candy Bars


Sweet Fruits, Juices

Grains, bread, beans, GMO foods




Extracted Seed Oils

Dairy

Mediteranean diet


Lay's
TEXAS
Gatorade
ImgurPeterMenzel

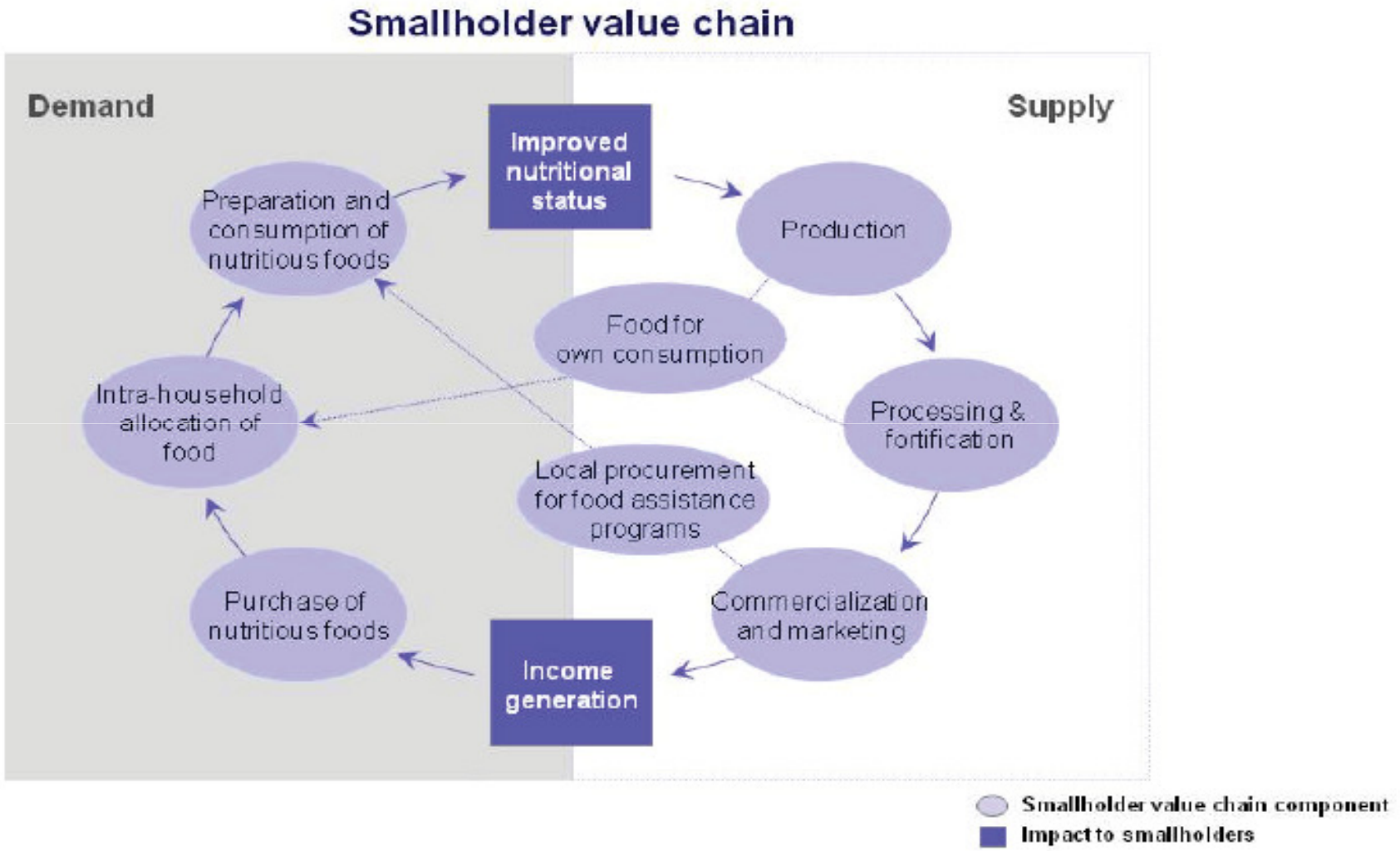

दोना और
टंकी में फेंके


FUN STIX
Parle's
BOOMER

Food production and distribution

Short chains

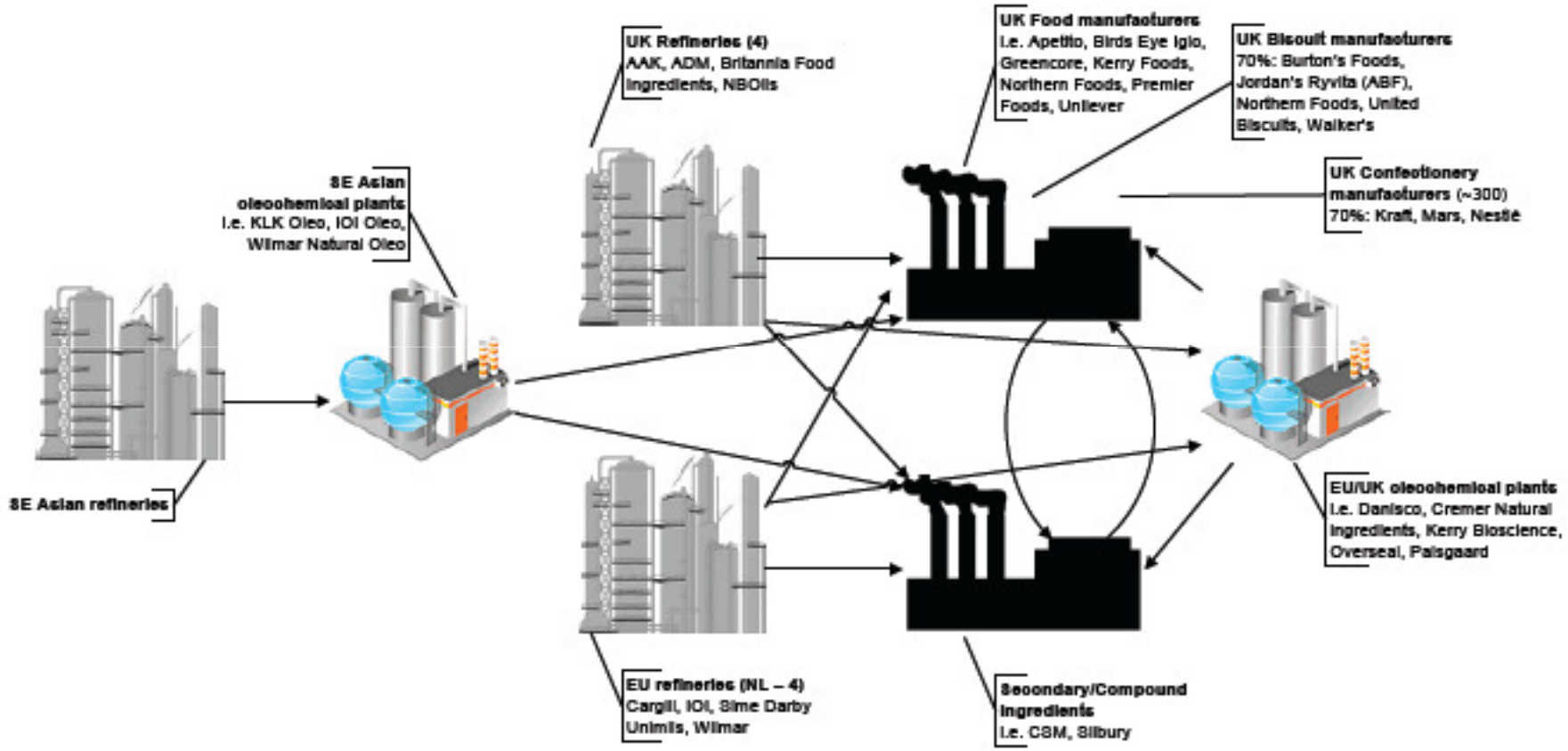
World Cancer Research Fund International



Source: Torgerson et al in Hawkes and Ruel 2010

e.g. Food production in households producing for own consumption in poor rural areas in low income countries, local production for local markets in small island states, "farmers markets" in high income countries where producers sell their products direct to consumers

Long chains

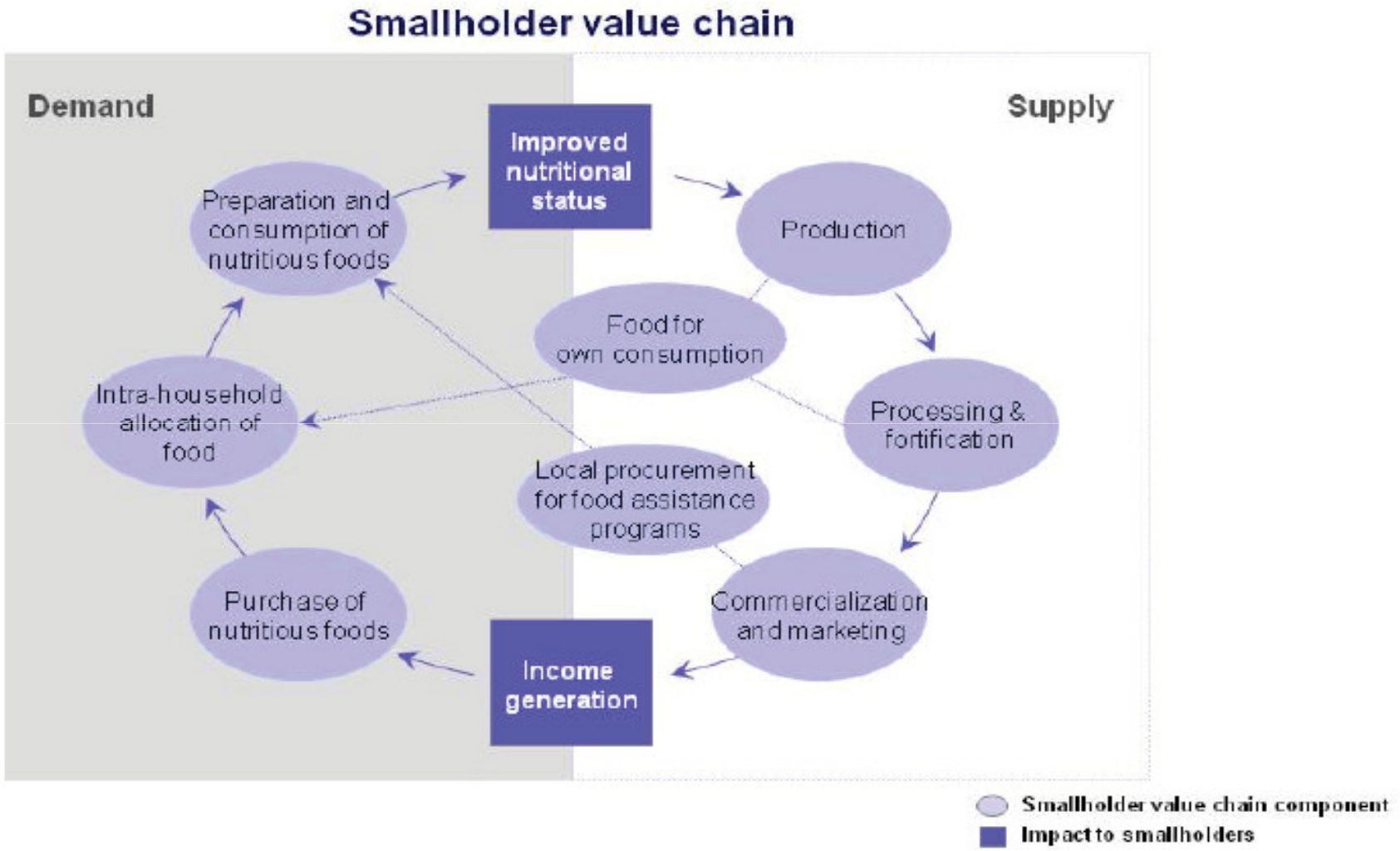


Source: DEFRA, 2007

A longer, more complex chain, often involving a number of steps “midstream” which lead to significant transformations in the availability, affordability and acceptability of the food

Short chains

World Cancer Research Fund International

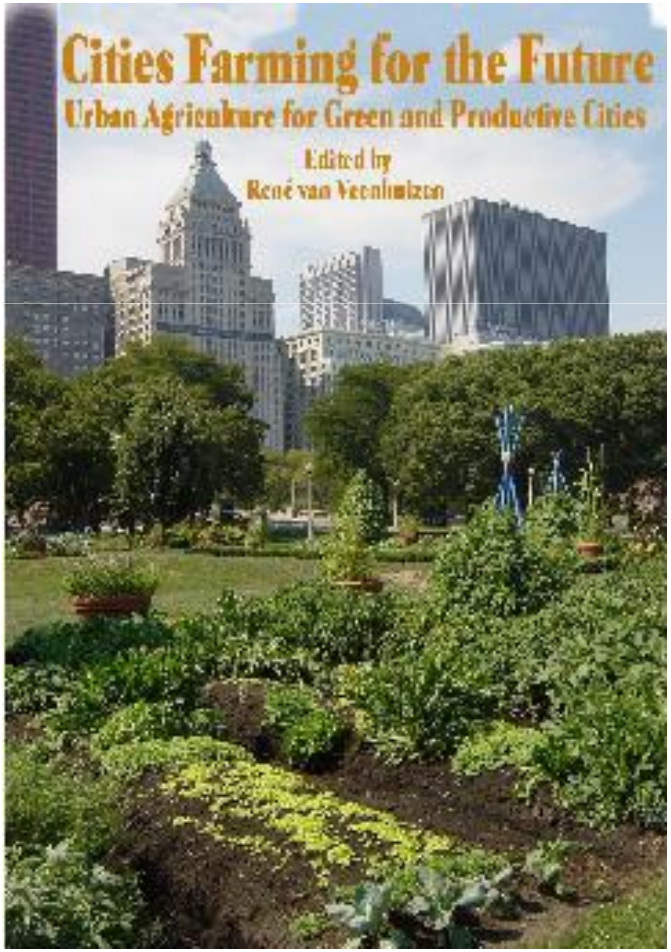


Source: Torgerson et al in Hawkes and Ruel 2010

e.g. Food production in households producing for own consumption in poor rural areas in low income countries, local production for local markets in small island states, "farmers markets" in high income countries where producers sell their products direct to consumers

RUAF Foundation

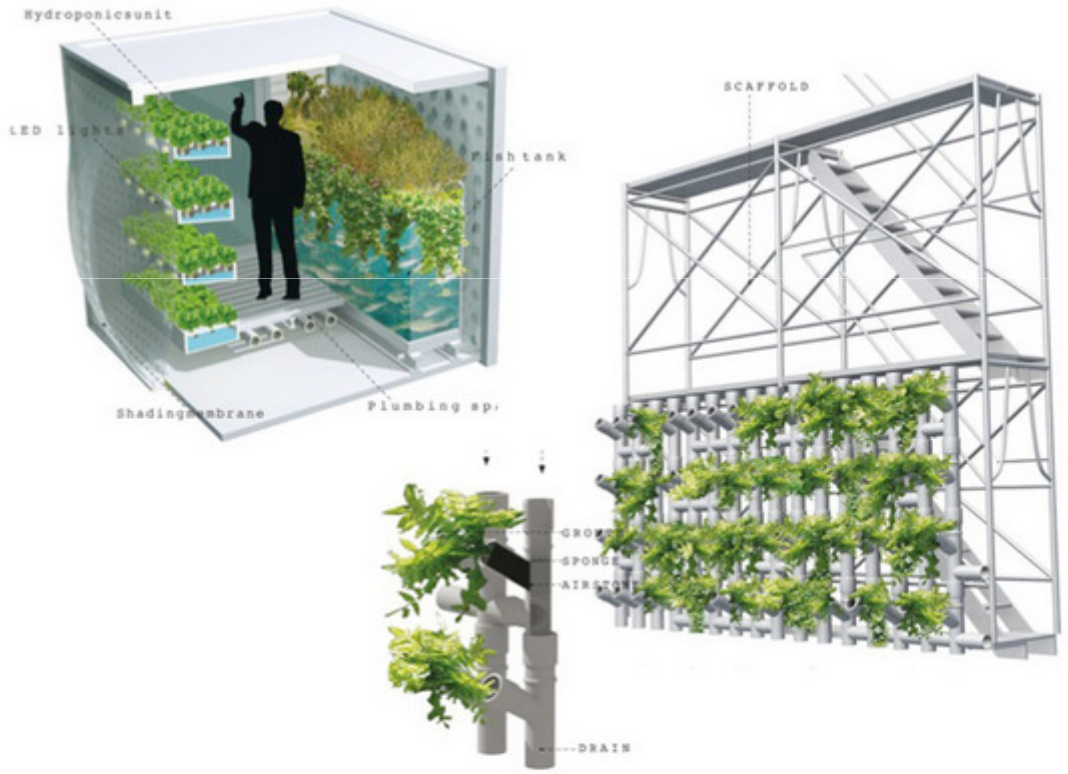
RESOURCE CENTRES ON URBAN AGRICULTURE & FOOD SECURITY



Why urban agriculture ?

- enhancing urban food security, nutrition and health;
- creating urban job opportunities and generation of income especially for urban poverty groups and provision of a social safety net for these groups;
- contributing to increased recycling of nutrients (turning urban organic wastes into a resource);
- facilitating social inclusion of disadvantaged groups and community development;
- urban greening and maintenance of green open spaces.

Iedereen zijn eigen boerderij ?

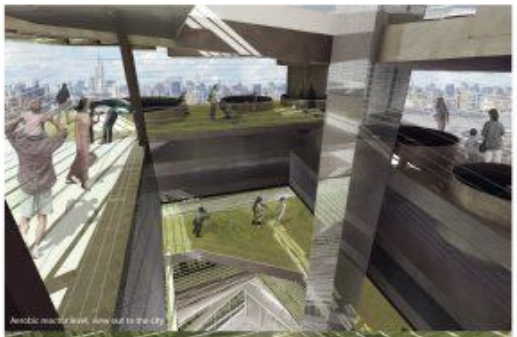


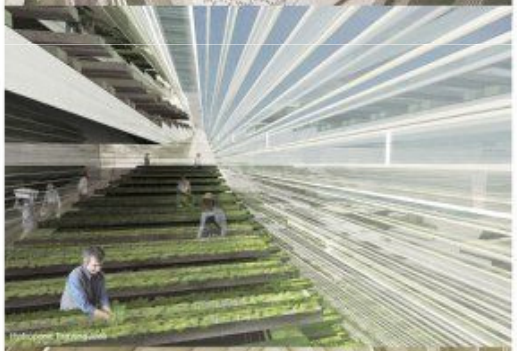
These food-growing 'cells' are intended for widespread distribution, in backyards, on rooftops, sidewalks and other small spaces. Miniature greenhouses, they are designed to be personal farms, allowing individuals to raise their own food.

Midtown Manhattan

Bird's-eye view of Midtown Manhattan's neighbourhood food hubs in New York City (Steady) State.

Amsterdam Avenue, dramatically reconfigured. As dependency on private cars wanes, the space would be recuperated for public transportation, agriculture, waste management, bikes and pedestrians. *All images supplied by the author*





Farming Area Typical Plan

Growing Area, Daylight Illuminance Test

Warm Group Vegetable

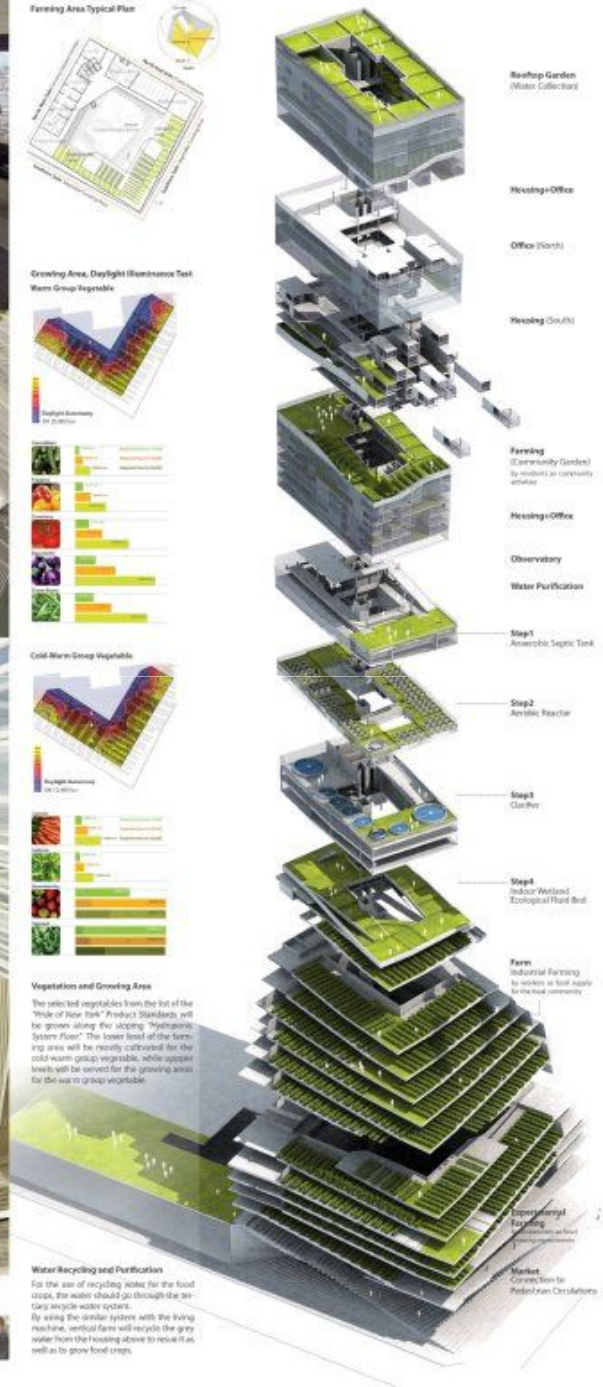
Cold-Warm Group Vegetable

Vegetation and Growing Area

The selected vegetables from the list of the "Pride of New York" Product Standards will be grown along the sloping "Hydroponic System Floor". The lower level of the farming area will be mainly cultivated for the cold-warm group vegetable, while upper levels will be served for the growing areas for the warm group vegetable.

Water Recycling and Purification

For the use of recycling water for the food crops, the water should go through the tertiary recycle water system.
By using the similar system with the living machine, vertical farm will recycle the grey water from the housing above to reuse it as well as to grow food crops.




Toilets

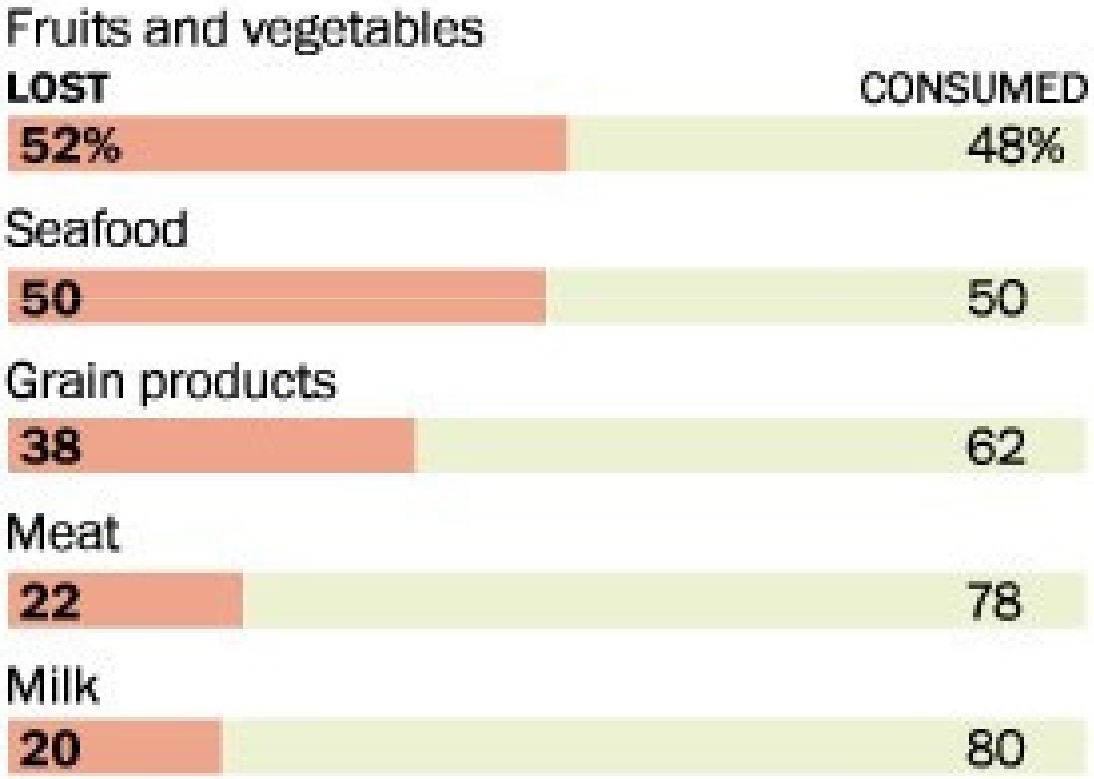
Stadslandbouw en opvoeding - relatie tussen kind en voeding

Students who are involved in gardening are more likely to eat fruits and vegetables

Food waste

Down the drain

Food lost and consumed, in percent, calculated collectively for the United States, Canada, Australia and New Zealand



Sources: Natural Resources Defense Council, U.N. Food and Agriculture Organization | The Washington Post

Tackling the food waste challenge with technology

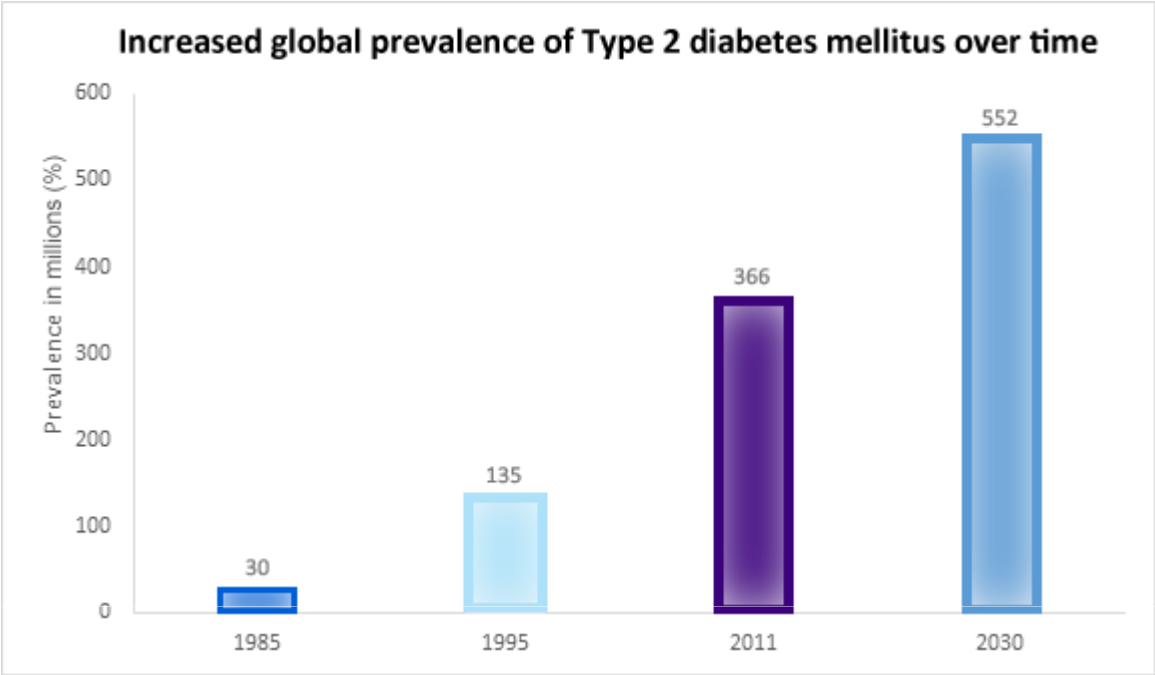
Innovation in packaging and refrigeration can reduce waste – as can changes in behaviour

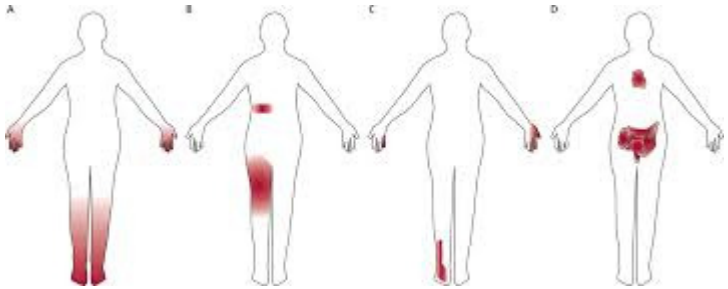
Modified atmospheric food packaging which uses a protective gas mix could help extend food freshness. Photograph: Jochen Tack /Alamy

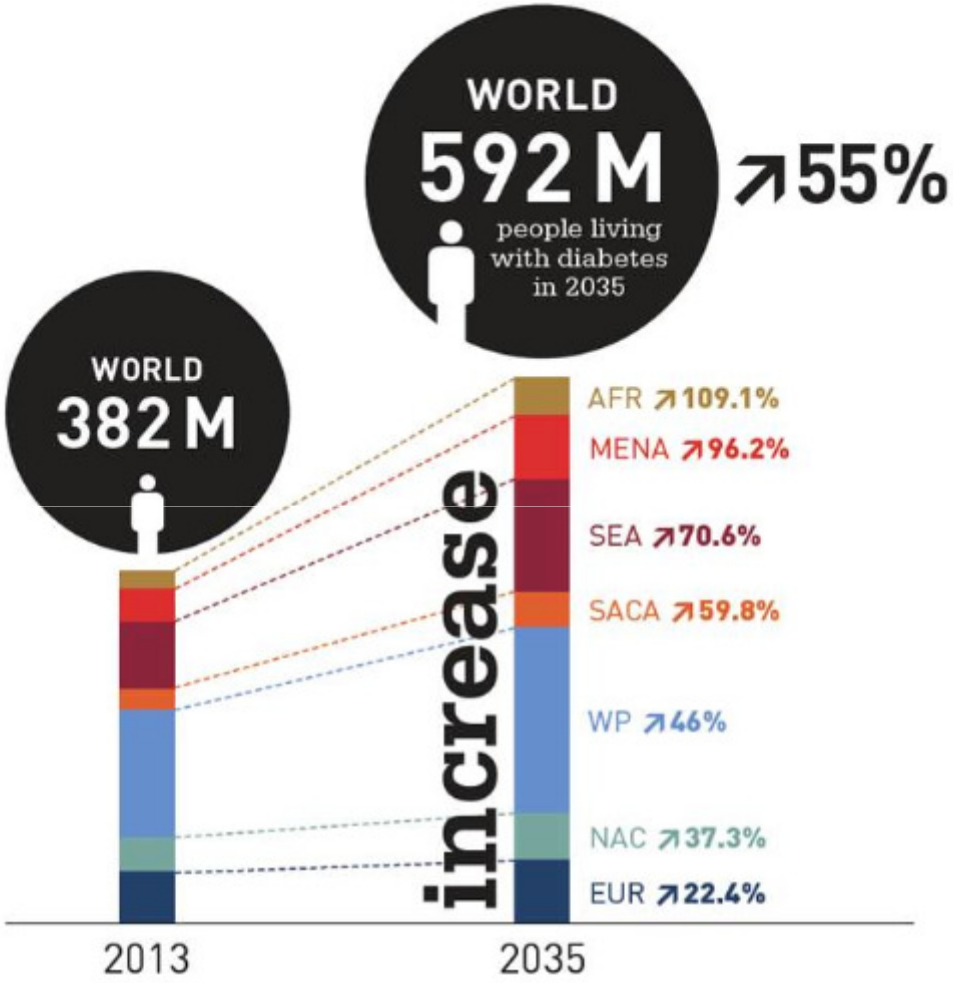
Food and health

New York, 14 November 2013 – UN Secretary-General's message on World Diabetes Day

- While many people are genetically at greater risk of diabetes, the condition is largely driven by unhealthy lifestyles (obesity, poor diet and lack of exercise) which are due to:
- the globalization of marketing and trade of unhealthy food,
- rapid urbanization with reduced opportunity to be physically active,
- population ageing.

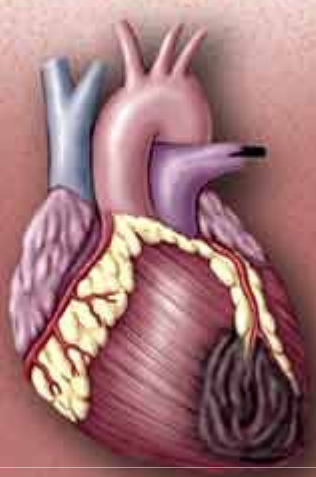

Increased global prevalence of Type 2 diabetes mellitus over time
Prevalence in millions (%)
600
500
400
300
200
100
0
30
135
366
552
1985
1995
2011
2030




WORLD
592 M
people living with diabetes in 2035
↗55%
WORLD
382 M
increase
AFR ↗109.1%
MENA ↗96.2%
SEA ↗70.6%
SACA ↗59.8%
WP ↗46%
NAC ↗37.3%
EUR ↗22.4%
2013
2035

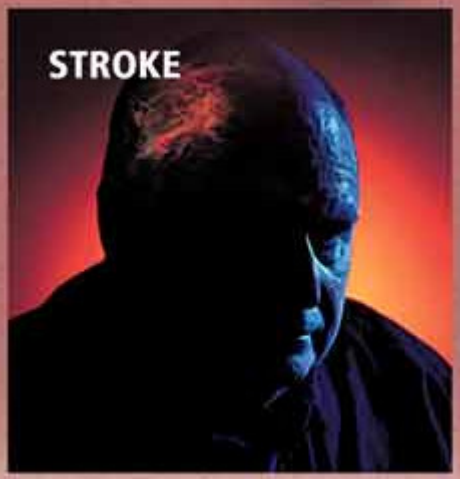
Major COMPLICATIONS from diabetes

Wounds in foot that won't heal, leading to **AMPUTATION**



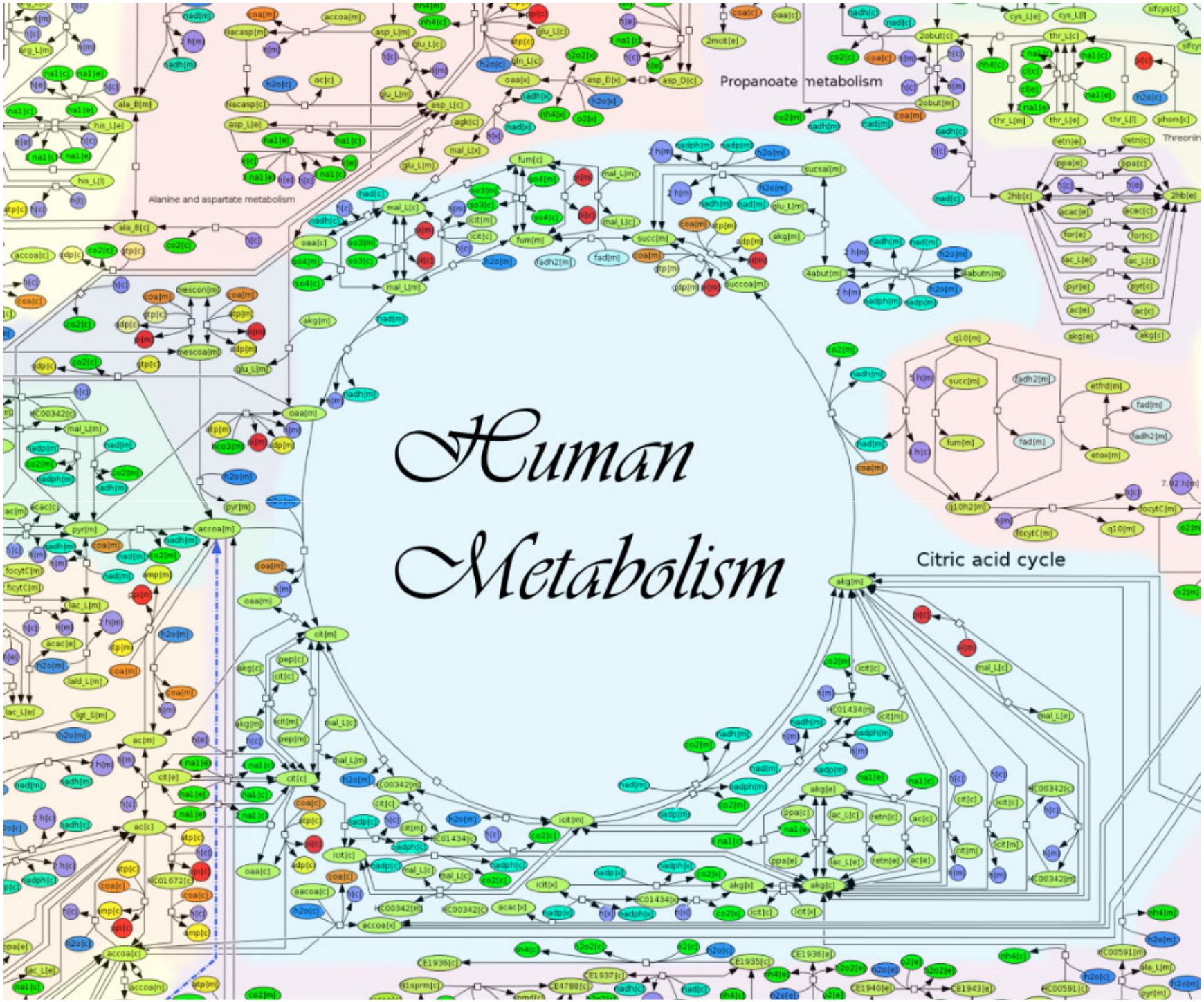
HEART DISEASE

Damaged blood vessels in retina which can cause **BLINDNESS**



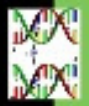
Food and health: technology

- Improved nutrition: not just quantity but also quality of food.
- Improved health care


Human Metabolism
Propanoate metabolism
Alanine and aspartate metabolism
Citric acid cycle

Big Data: Integrating Health Data Streams

New Data Streams


Genome
SNP mutations
Structural variation
Epigenetics ✓


Microbiome ✓


Transcriptome


Metabolome


Proteome


Diseasome ✓


Environmentome ✓

Traditional Data Streams

Personal and Family Health History ✓

Prescription History ✓

Lab Tests: History and Current ✓

Demographic Data ✓

Standardized Instrument Response ✓

Quantified Self Data Streams


Self-reported data: health, exercise, food, mood journals, etc. ✓


Mobile App Data ✓


Quantified Self Device Data ✓

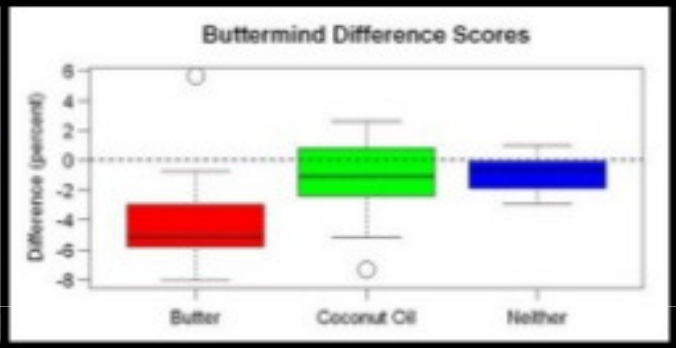

Biosensor Data Objective Metrics

Swan, M. Health 2050: The Realization of Personalized Medicine through Crowdsourcing, the Quantified Self, and the Participatory Biocitizen. J Pers Med 2012, 2(3), 93-118.

Legend: Consumer-available ✓

Quantified Self Project Examples

- Food consumption (1 yr)[1] and the Butter Mind study[2]



- Low-cost home-administered blood, urine, saliva tests

Cholestech LDX
home cholesterol test

OrSense continuous non-invasive
glucose monitoring

ZRT Labs dried
blood spot tests

[1] *Source: http://flowingdata.com/2011/06/29/a-year-of-food-consumption-visualized*
[2] *Source: http://quantifiedself.com/2011/01/results-of-the-buttermind-experiment*

Telekom.de 08:21 91 %

Back **THE EATERY**

WEEK OF

JAN 16, 2012

67% HEALTHY

You ate 67% healthy this week, 5% better than last week. Monday was your best day, and Tuesday was your worst.

DAY BY DAY EATING

MON TUE WED THU FRI SAT SUN

HOW YOU STACK UP

Telekom.de 08:22 90%

Back **THE EATERY**

HOW YOU STACK UP

You ate better than 60% of people.

WEEK'S BEST MEAL

Add a Comment Like Share

Soylent

How too feed 9-10 billion people in 2050: Technology solutions

- Population growth; technology ?
- Food production (scarcity fertile soil, water): technological solutions for sustainable production, processing, storage and transportation.
- Distribution of food; inequity: technological solutions for shorter value chains; urban agriculture

- Food waste; technological advances in production, packaging, storage, transportation

- Food and health; technological advances in improving the quality of food; biomonitoring, systems biology.


PEPSI