

Trends und Zukunftsperspektive n der Lebensmittelherstellung

„Zukunftswerkstatt Südtirol“ – Veranstaltungsreihe der Handelskammer Bozen
am 04.05.2015

Dr. Volker Heinz, Dr. Knut Franke

German Institute of Food Technologies (DIL e.V.)

Quakenbrück



Trends und Zukunftsperspektiven der Lebensmittelherstellung

Agenda

Was ist das Deutsche Institut für Lebensmitteltechnik e.V.?

Wie ist der aktuelle Stand der Lebensmittelherstellung?

Welche Herausforderungen erwarten die Lebensmittelherstellung in den nächsten Jahrzehnten?

Bevölkerungswachstum und Nahrungsmittelversorgung

Nachhaltigkeit und Gesundheit

Urbanisierung

Was ist aus verfahrenstechnischer/technologischer Sicht zu erwarten?



Daten & Fakten

gegründet	1983
Rechtsform	reg. Verein
Direktor	Dr. Volker Heinz
Mitglieder	> 150
Mitarbeiter	160
Patente 2012	29
Mission	‘Wissen für innovative Lebensmittel‘





Mitgliedschaft

Vorteile



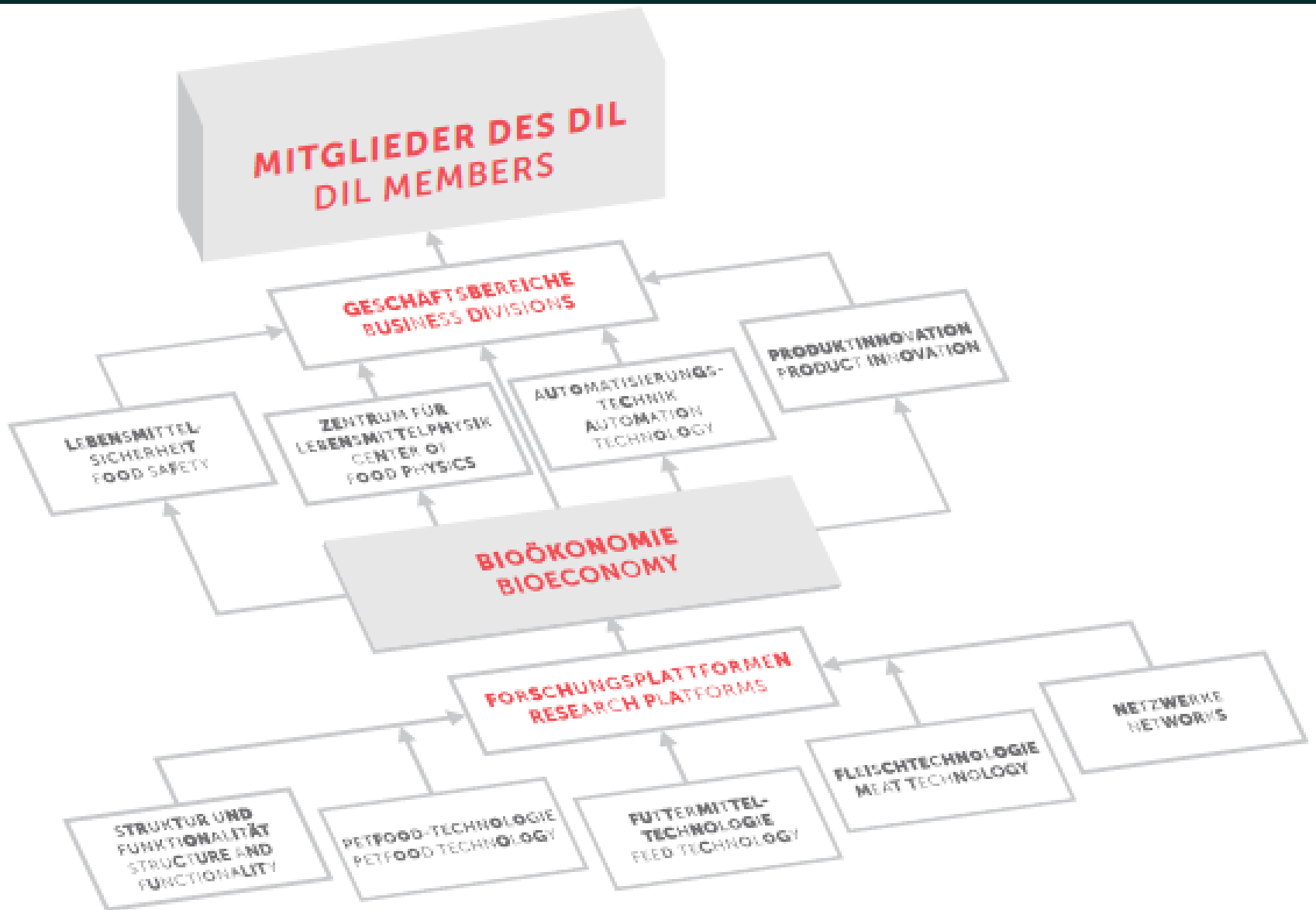


DIL - Mitgliedsunternehmen und -organisationen





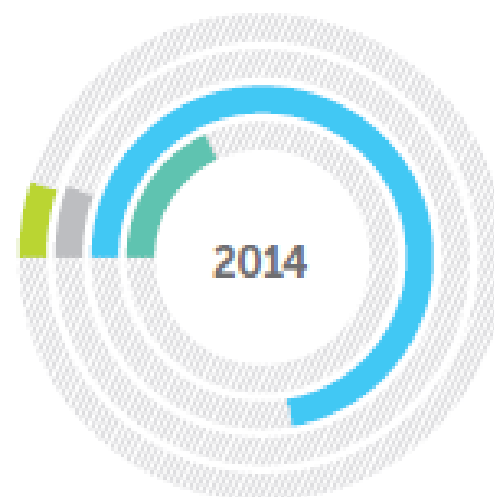
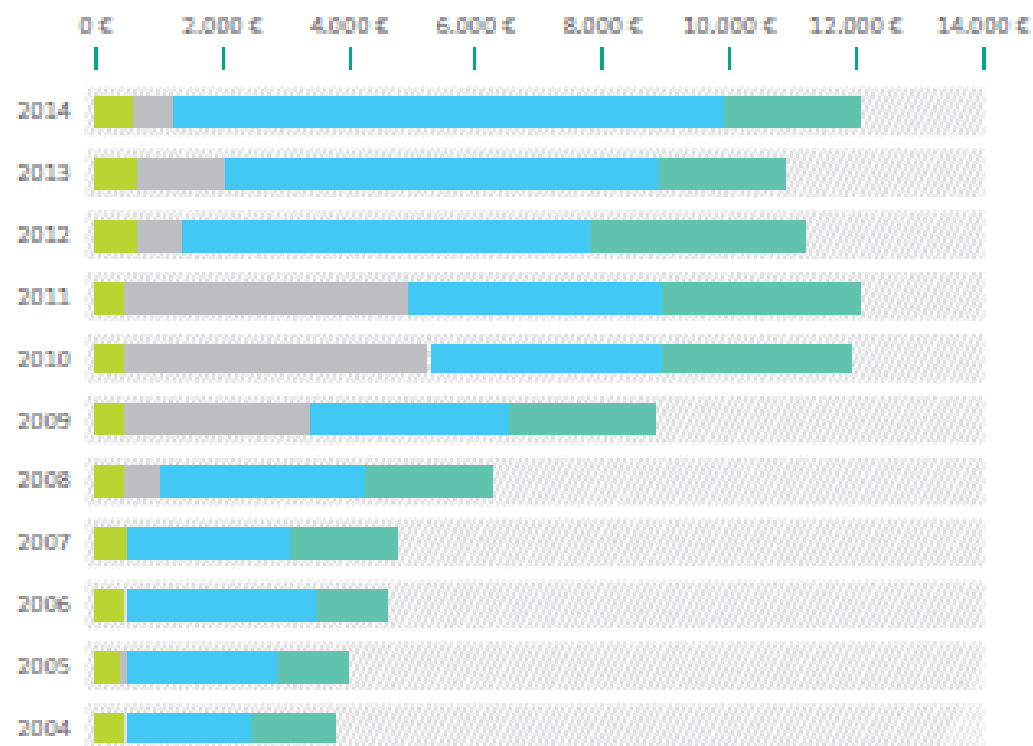
DIL - Organisationsstruktur





ERTRAGSANTEILE INCOME SHARE

Werte in 1.000 € - value in 1,000 euros



4,79%

5,30%

72%

17,91%

 INSTITUTIONELLE FÖRDERUNG
INSTITUTIONAL FUNDING

 SONDERPROGRAMM
SPECIAL PROGRAM

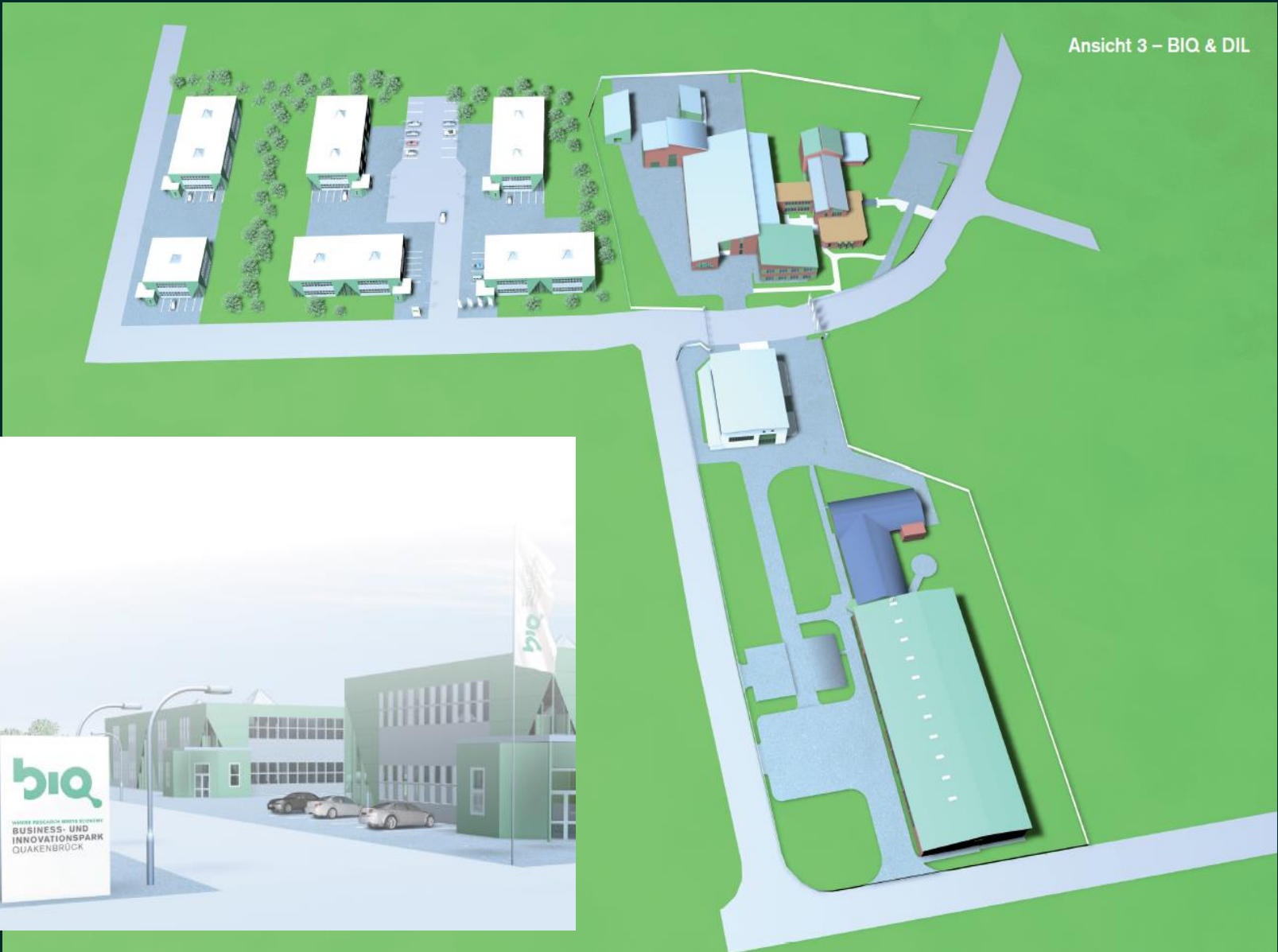
 WIRTSCHAFT
INDUSTRY

 ÖFFENTLICH
PUBLIC

Erweiterung des DIL



Ansicht 3 – BIQ & DIL



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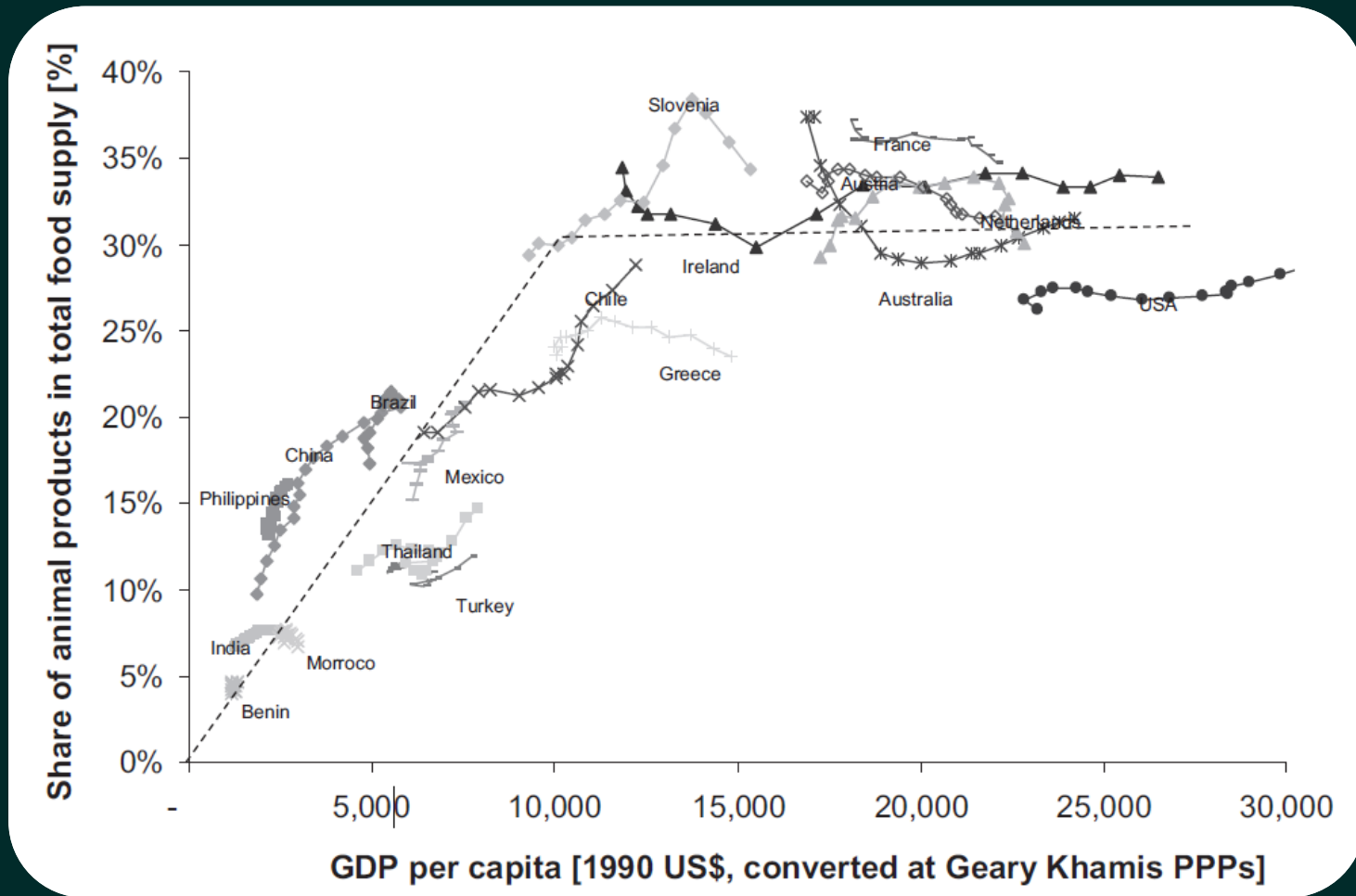
COMMODITY ANNUAL PRODUCTION [mio t]

MEAT	280
MILK (DRIED)	2.9
WHEY (DRIED)	2.3
BUTTER	9.6
CHEESE	191
WHEAT	690
RICE	685
SOY	231
MAIZE	823
PALM OIL	39
SOY OIL	38



The relative consumption of animal origin food products (share in total calories consumed) in relation to GDP per capita

Data are for the years 1990-2005 (GGDC , FAOSTAT)

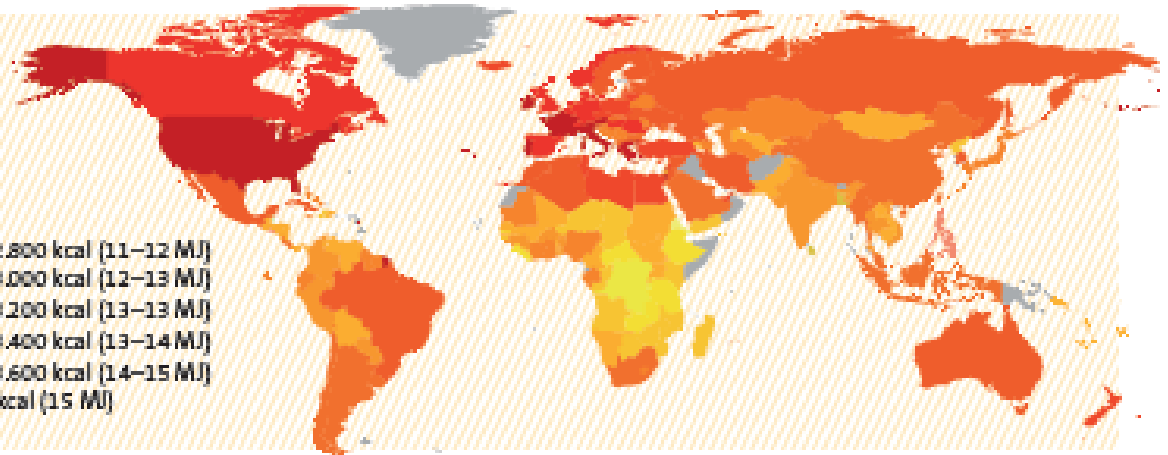
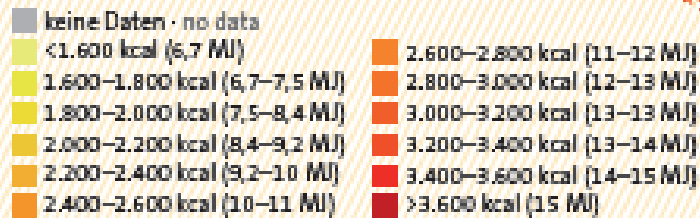


Source: Nonhebel, S. Global food supply and the impacts of increased use of biofuels Energy 37 (2012) 115-121

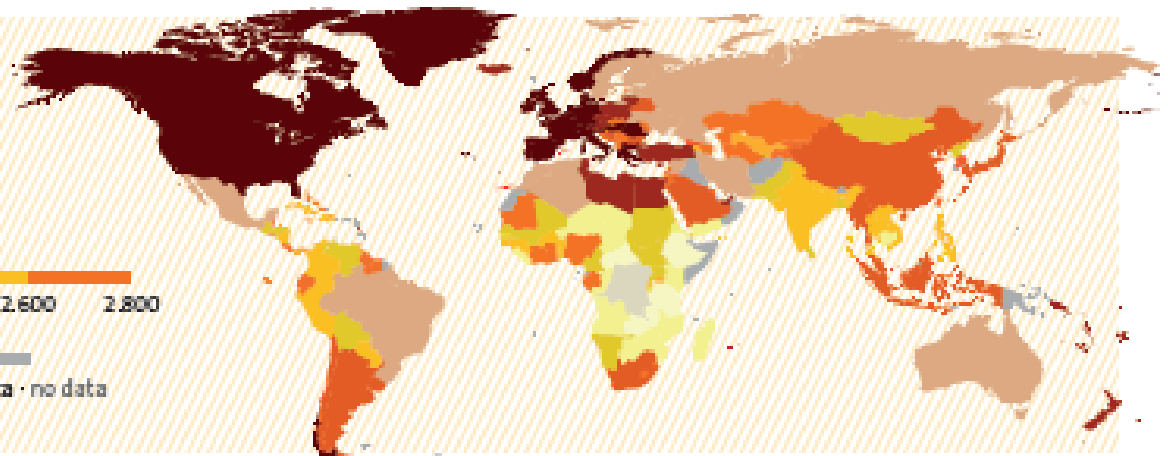
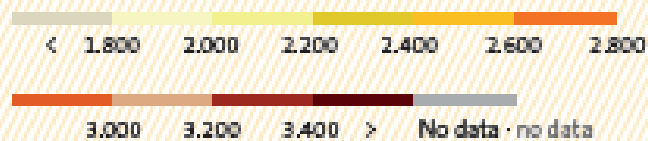


Energieaufnahme aus Lebensmitteln und Übergewicht

ENERGIEVERBRAUCH FÜR LEBENSMITTEL
FOOD ENERGY CONSUMPTION



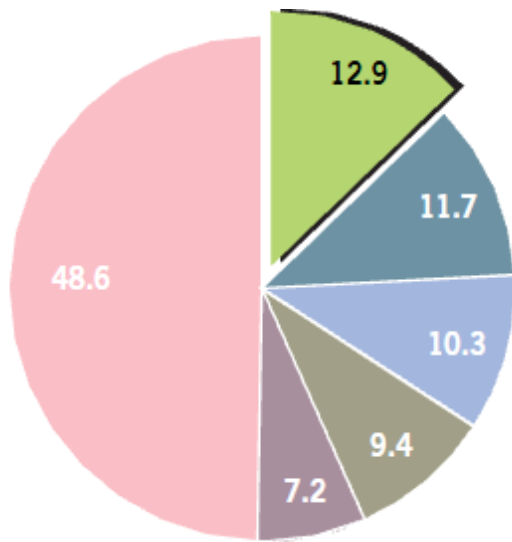
ADIPOSITAS
OBESITY





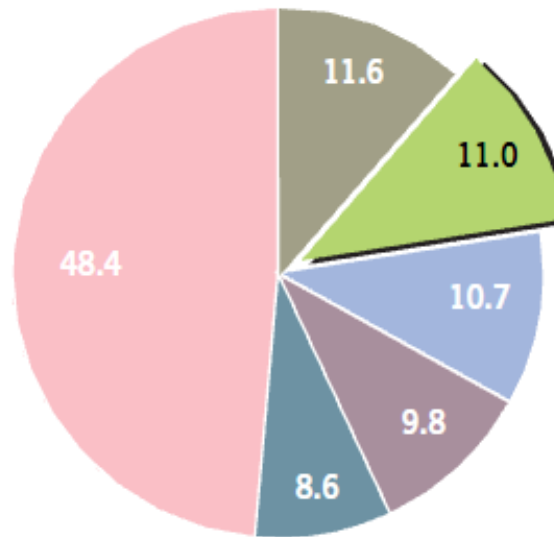
STRUCTURE OF THE EU FOOD INDUSTRY

Turnover



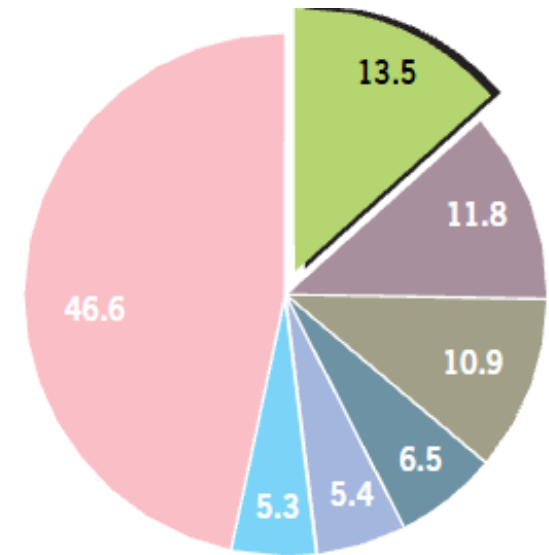
Share of turnover in the manufacturing industry (%)

Value added



Share of value added in the manufacturing industry (%)

Employment



Share of employment in the manufacturing industry (%)

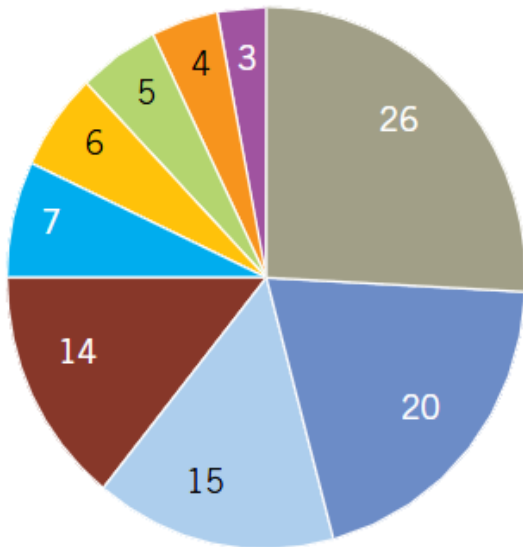


Source: Eurostat, SBS, 2007



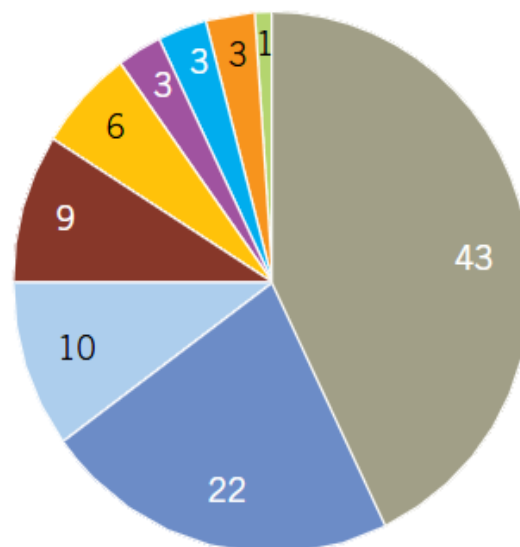
DISTRIBUTION OF TURNOVER, EMPLOYMENT AND VALUE ADDED IN SUB-SECTORS

Turnover (%)



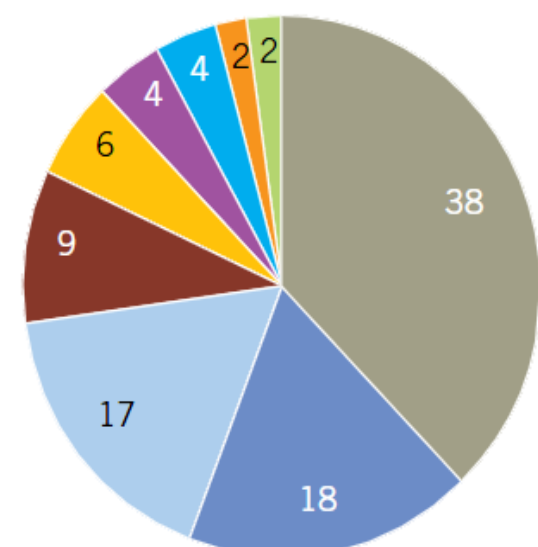
- Meat products
- Fish products
- Processed fruit and vegetables

Employment (%)



- Oils and fats
- Dairy products
- Grain mill products and starch products

Value added (%)



- Animal feed
- Beverages
- Various food products

Source: Eurostat, SBS, 2007

Source: Eurostat, SBS, 2007

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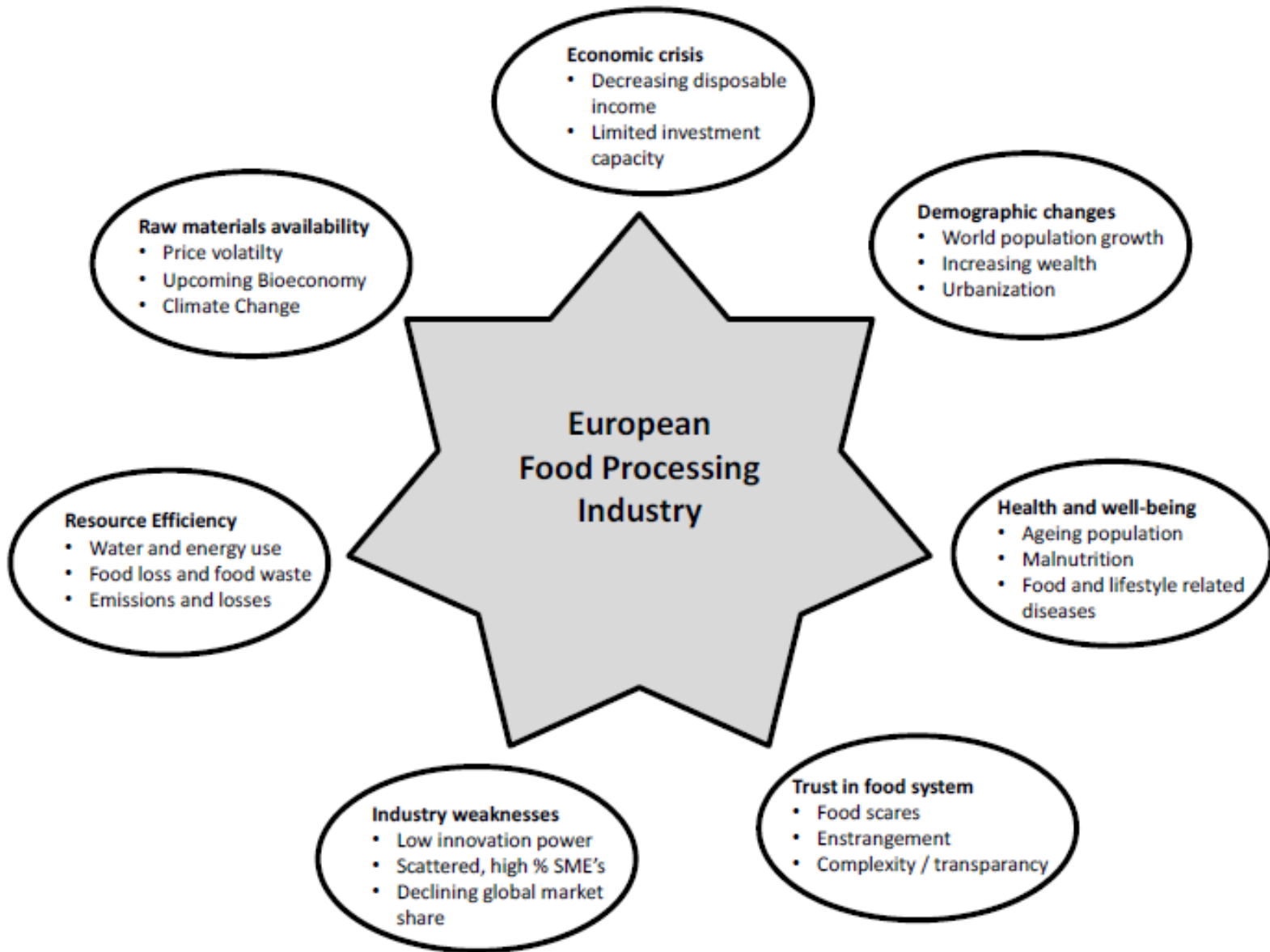
Bevölkerungswachstum und Nahrungsmittelversorgung

Nachhaltigkeit und Gesundheit

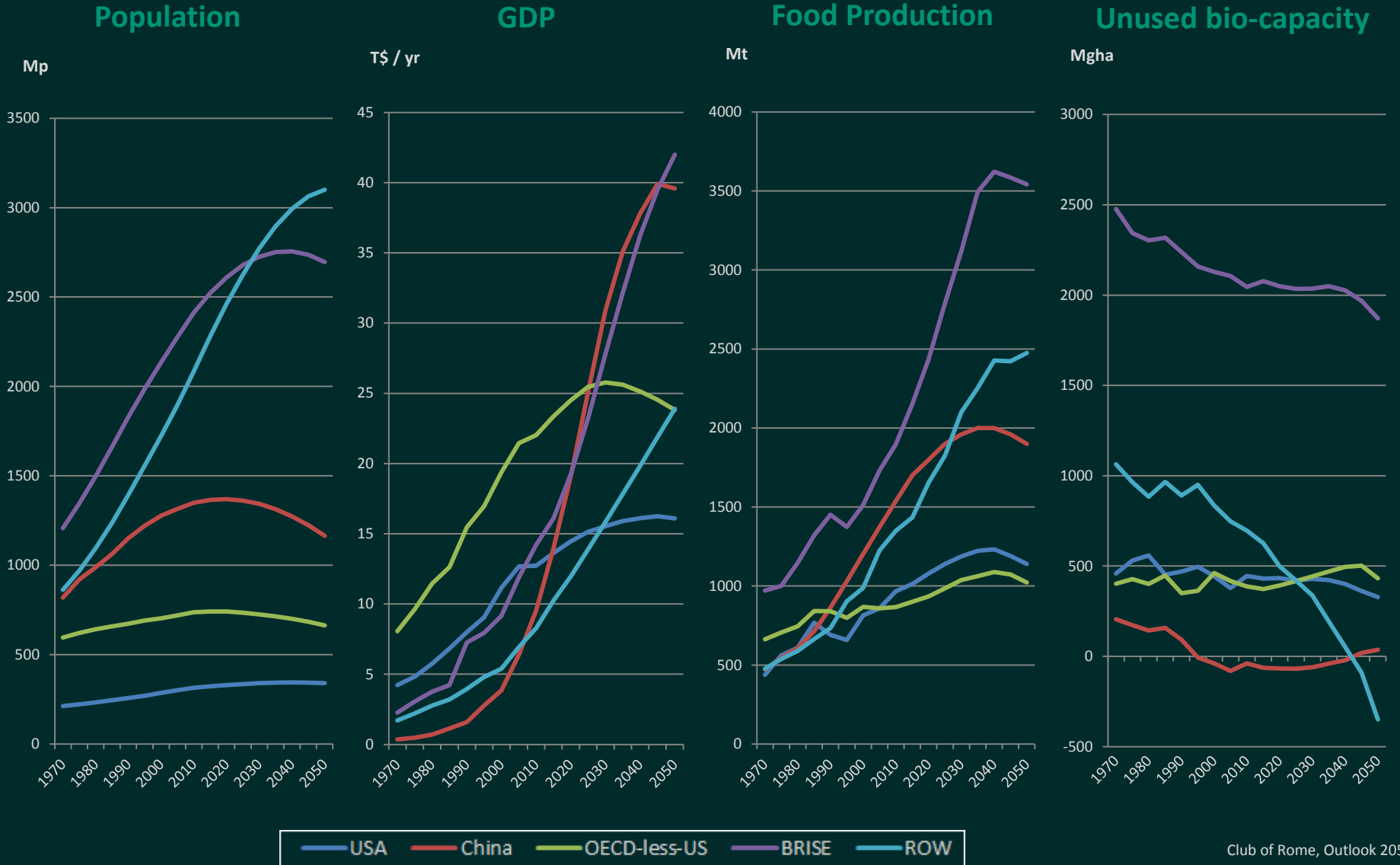
Urbanisierung

Was ist aus verfahrenstechnischer/technologischer Sicht zu erwarten?

Challenges for the European Food Industry



Food Production Perspective 2052



Changes in population



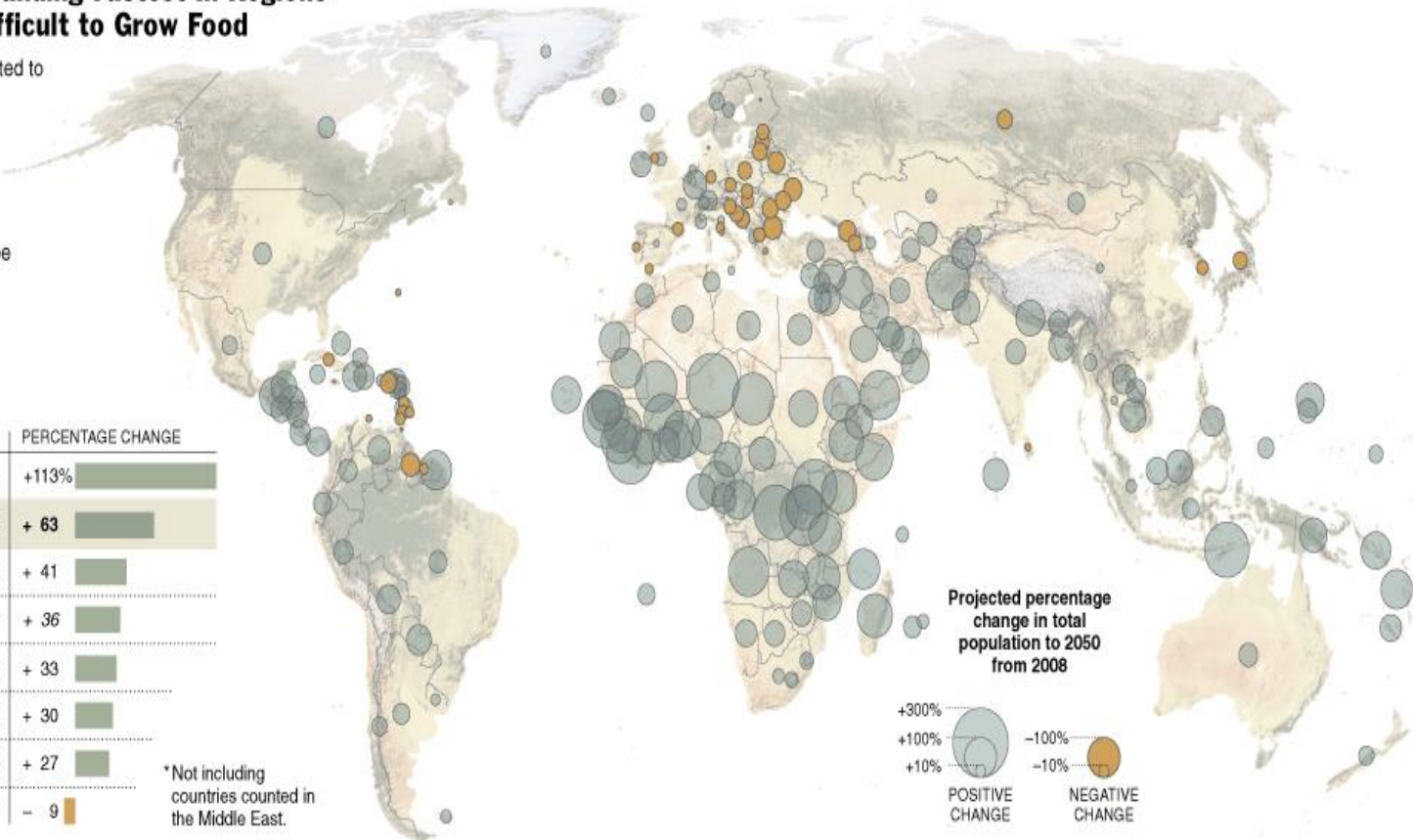
Populations Are Expanding Fastest In Regions Where it Is Most Difficult to Grow Food

The world's population is projected to grow to 9 billion before 2050. Proportionally, the countries in Northern Africa and the Middle East are among the fastest growing. But those are the world's driest regions, and by 2050, fresh water there will be twice as scarce.

Projected total population

IN MILLIONS	2008	2050	PERCENTAGE CHANGE
Sub-Saharan Africa	827	1,761	+113%
Middle East and Northern Africa	364	595	+ 63
Oceania	35	49	+ 41
<i>World</i>	<i>6,750</i>	<i>9,191</i>	<i>+ 36</i>
Latin America and the Caribbean	579	769	+ 33
Northern America	342	445	+ 30
Asia*	3,872	4,909	+ 27
Europe	731	664	- 9

*Not including countries counted in the Middle East.

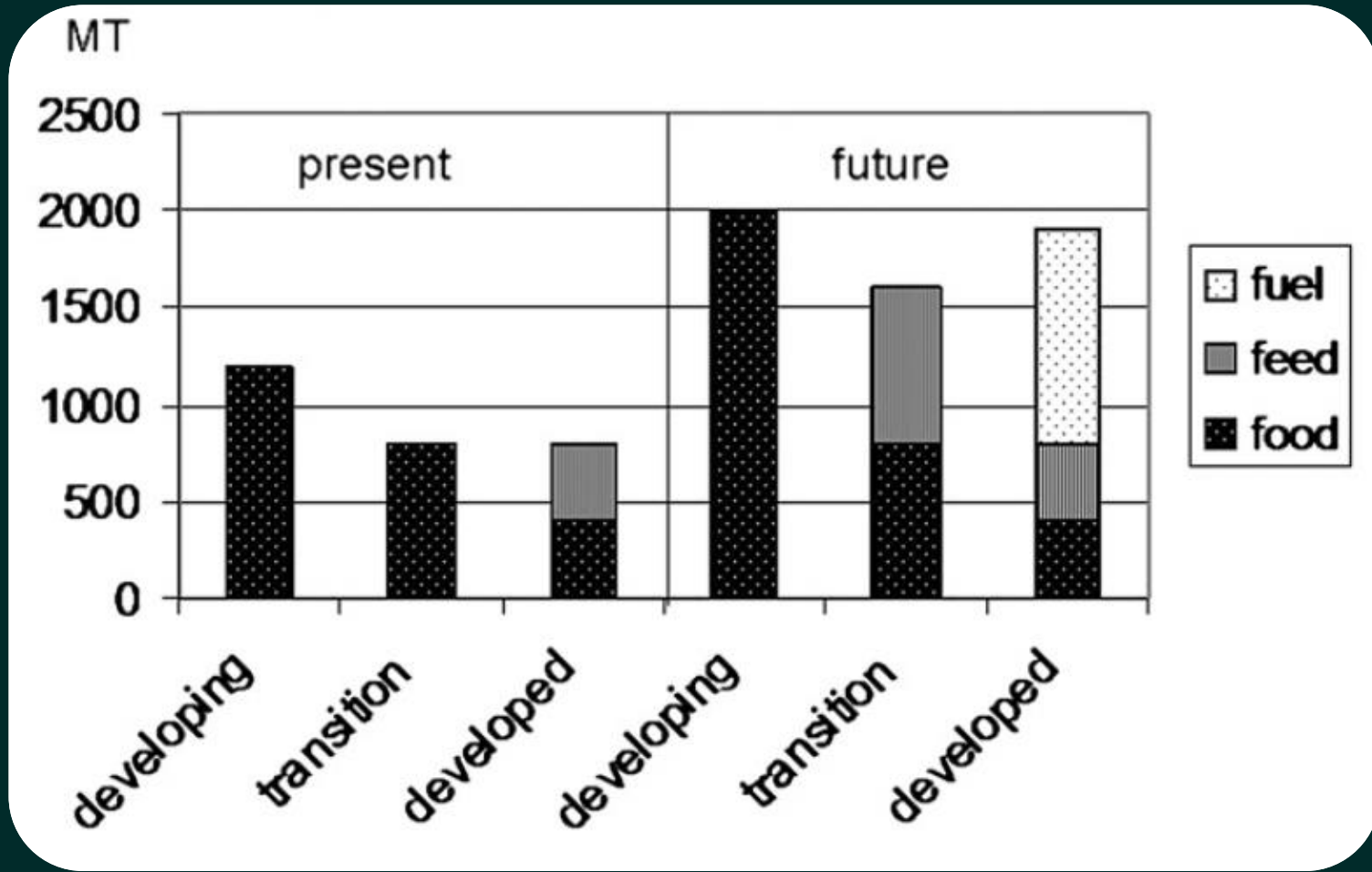


Projected percentage change in total population to 2050 from 2008



Sources: United Nations, Department of Economic and Social Affairs, Population Division "World Population Prospects: The 2006 Revision"; "Natural Earth" base map by Tom Patterson

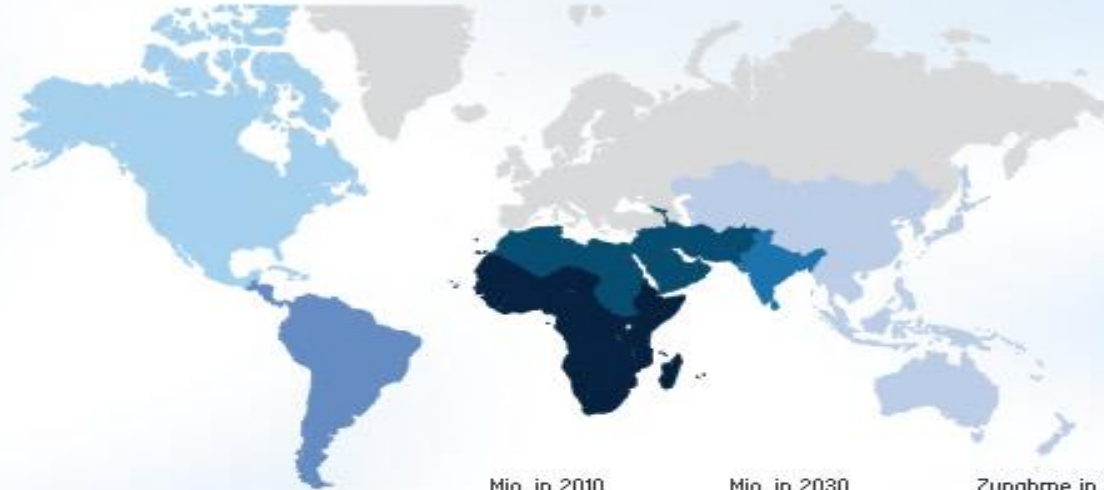
Global needs for biomass



MALNUTRITION



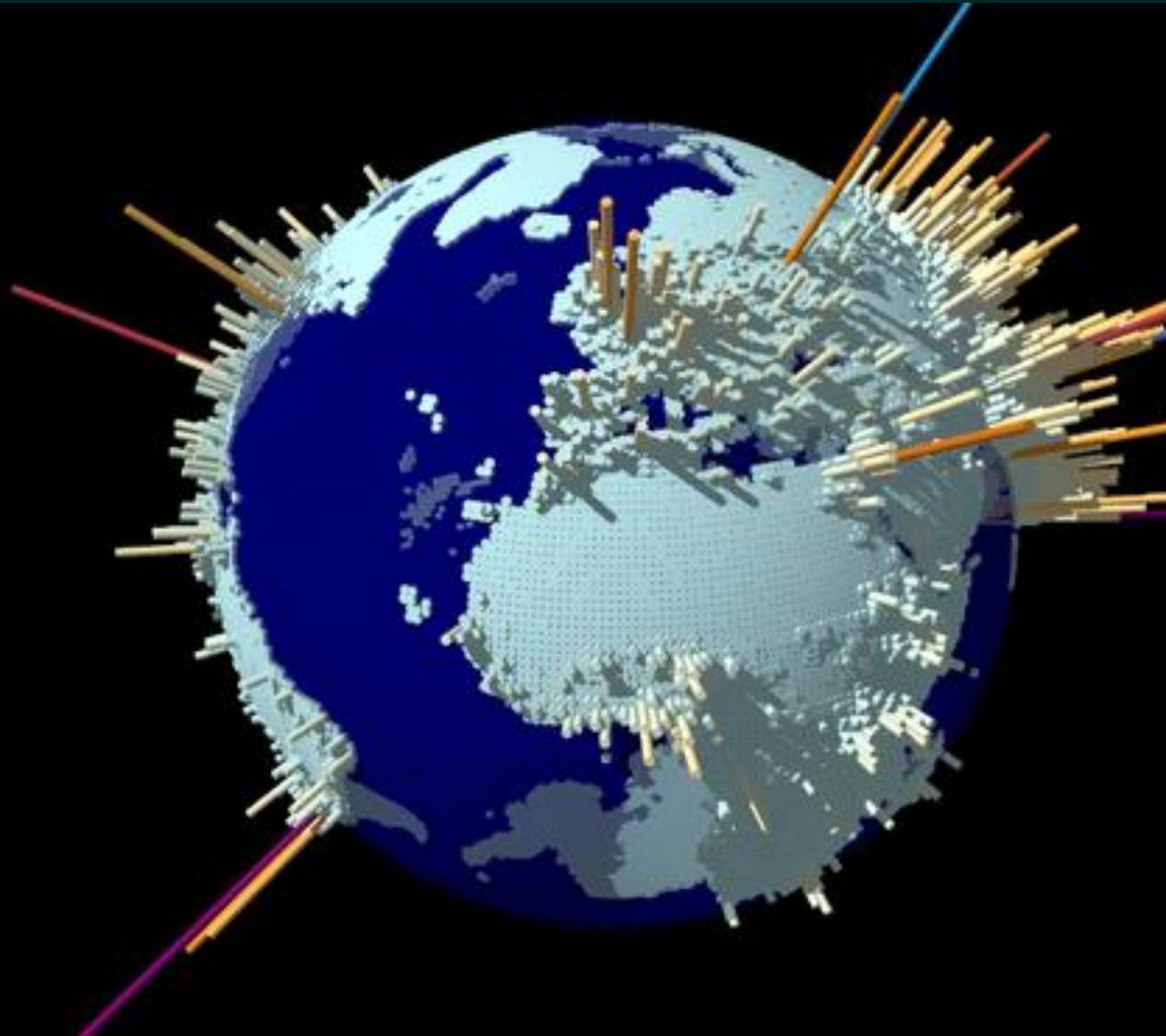
Prognostizierte Zunahme der Diabetesfälle bis 2030



	Mio. in 2010	Mio. in 2030	Zunahme in %
Afrika	12,1	23,9	98%
Naher Osten und Nordafrika	26,6	51,7	94%
Indischer Subkontinent	58,7	101,0	72%
Süd- und Zentralamerika	18,0	29,6	65%
Südostasien, Australien und Neuseeland	76,7	112,8	47%
Nordamerika und Karibik	37,4	53,2	42%
Europa und Russland	55,2	66,2	20%
Welt	284,6	438,4	54%

Quelle: IDF Diabetes Atlas, 4. Auflage 2009. Basierend auf regionalen Vorhersagen der Zahl der Erwachsenen mit Diabetes, 2010-2030.

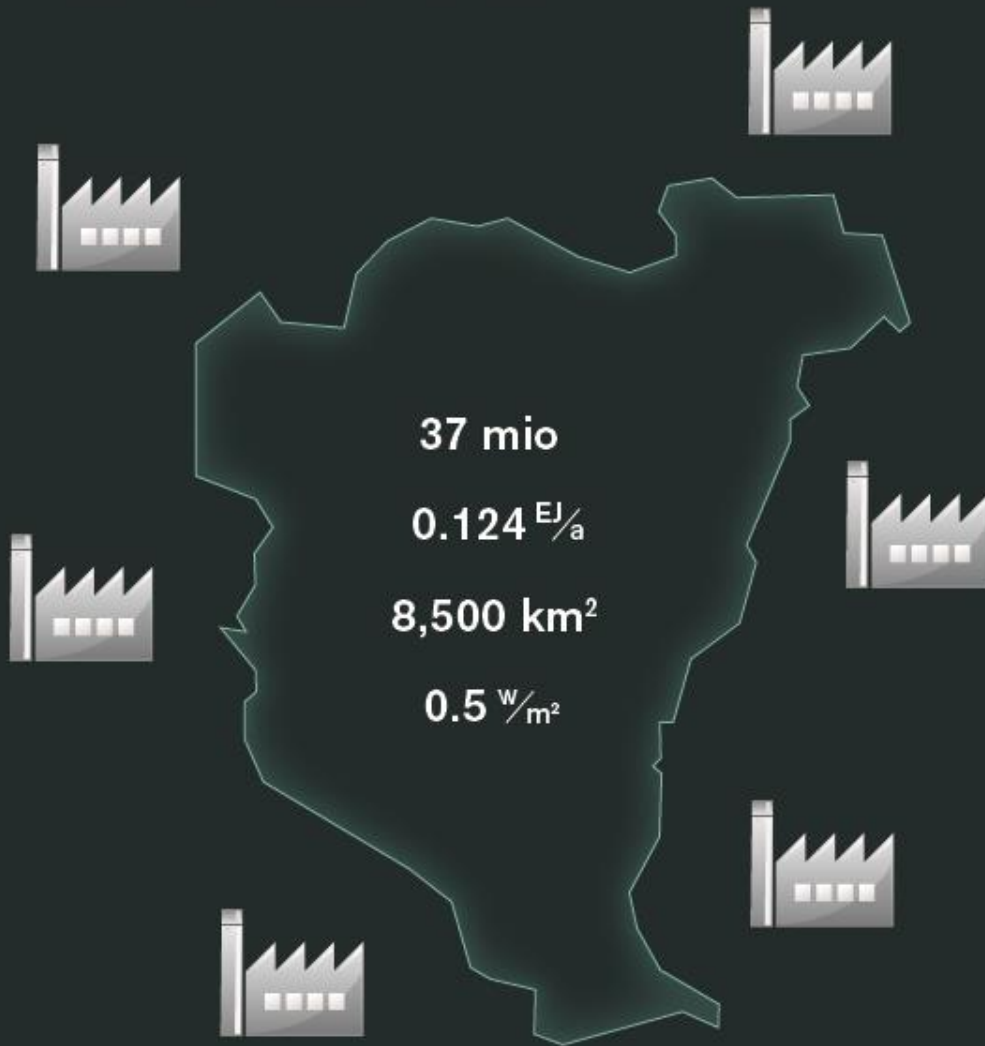
Urbanization and megacities



	Country/City/Company	GDP/Revenues
1	United States	14,204
2	China	7,903
3	Japan	4,354
4	India	3,388
5	Germany	2,925
6	Russian Federation	2,288
7	United Kingdom	2,176
8	France	2,112
9	Brazil	1,976
10	Italy	1,840
11	Mexico	1,541
12	Tokyo, Japan	1,479
13	Spain	1,456
14	New York, USA	1,406
15	Korea, Republic of	1,358
16	Canada	1,213
17	Turkey	1,028
18	Indonesia	907
19	Iran, Islamic Rep	839
20	Los Angeles, USA	792
21	Australia	762
22	Taiwan	710
23	Netherlands	671
24	Poland	671
25	Saudi Arabia	589
26	Chicago, USA	574
27	Argentina	571
28	London, UK	565
29	Paris, France	564
30	Thailand	519
31	South Africa	492
32	Royal Dutch Shell	458
33	Egypt, Arab Rep	441
34	Pakistan	439



FOOD FOR MEGA CITIES



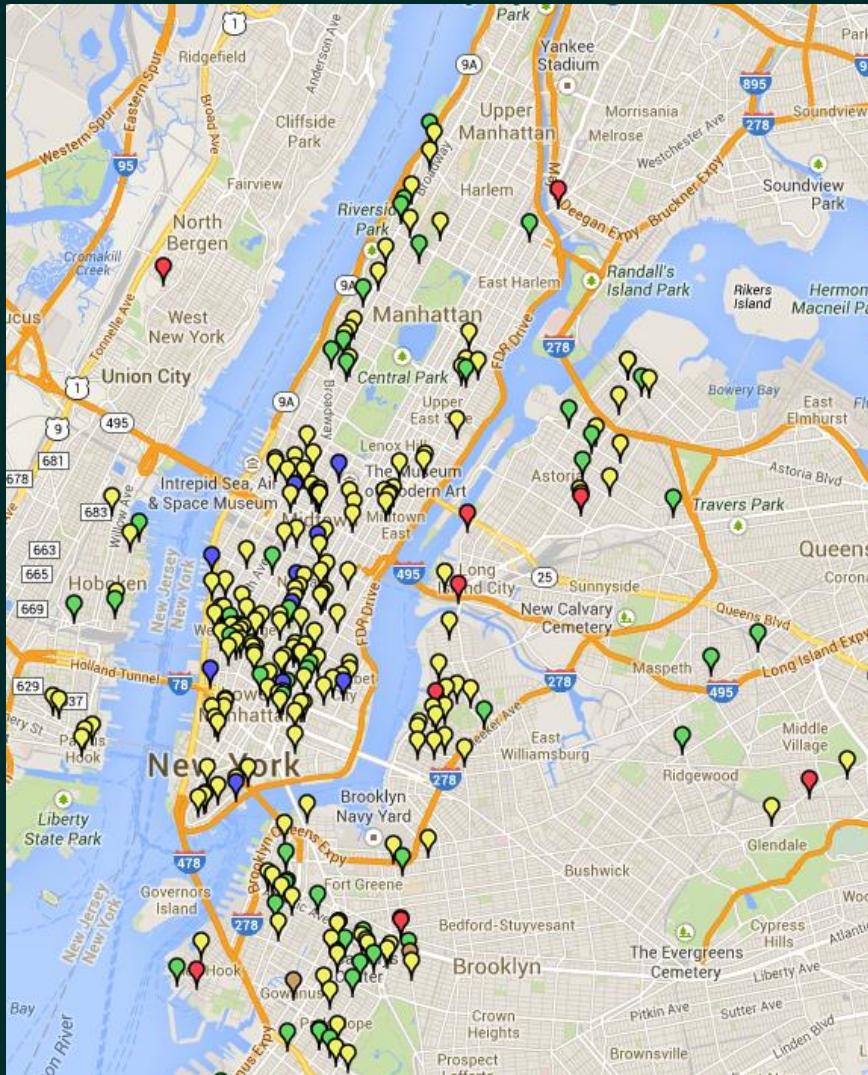
TOKIO



DHAKA

Driver for Innovation: Small-Scale Food Production Systems

Example: Micro-Breweries in New York



The Beer Trail: 8 New Microbreweries to Visit

By Mary Jane Weedman



Transmitter Brewing Photo: Miguel Rivas

Brooklyn Brewery was just the beginning. Thanks to the rise of local microbreweries with on-site taprooms, it's possible to embark on the hops-and-malt-driven equivalent of a wine-tasting weekend in Napa without ever leaving town.

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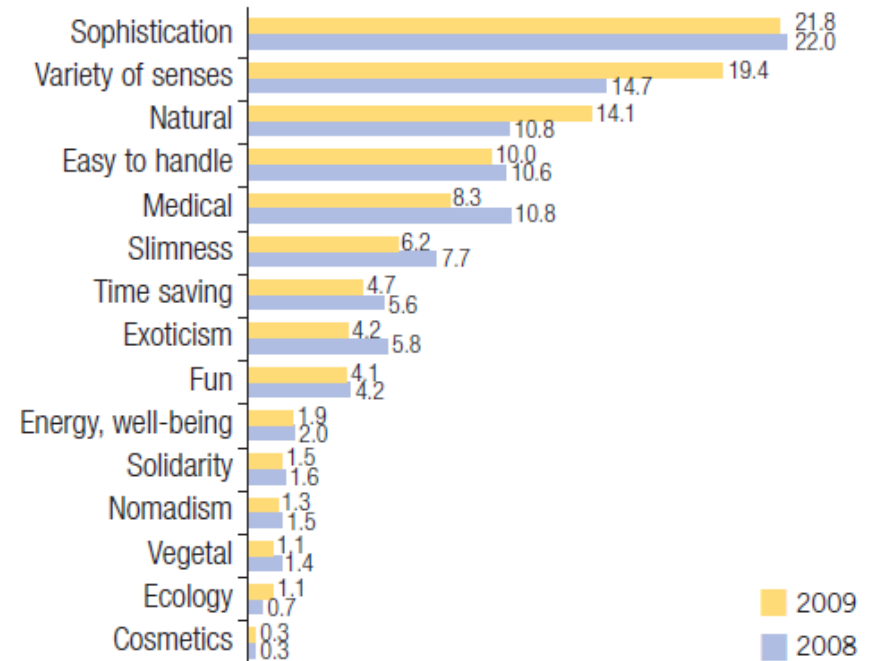
TRENDS OF FOOD INNOVATION IN EUROPE

Share of the drivers of innovation in Europe, 2008-2009 (%)

	2008	2009
Pleasure	46.7	49.6
Health	23.1	23.5
Convenience	17.8	16.0
Physical	10.0	8.4
Ethics	2.4	2.6

Source: XTC World Innovation Panorama 2010; Copyright XTC 2010 (www.worldinnovation.com)

Share of the trends in food innovation in Europe, 2008-2009 (%)



Source: XTC World Innovation Panorama 2010; Copyright XTC 2010 (www.worldinnovation.com)



Food Processing

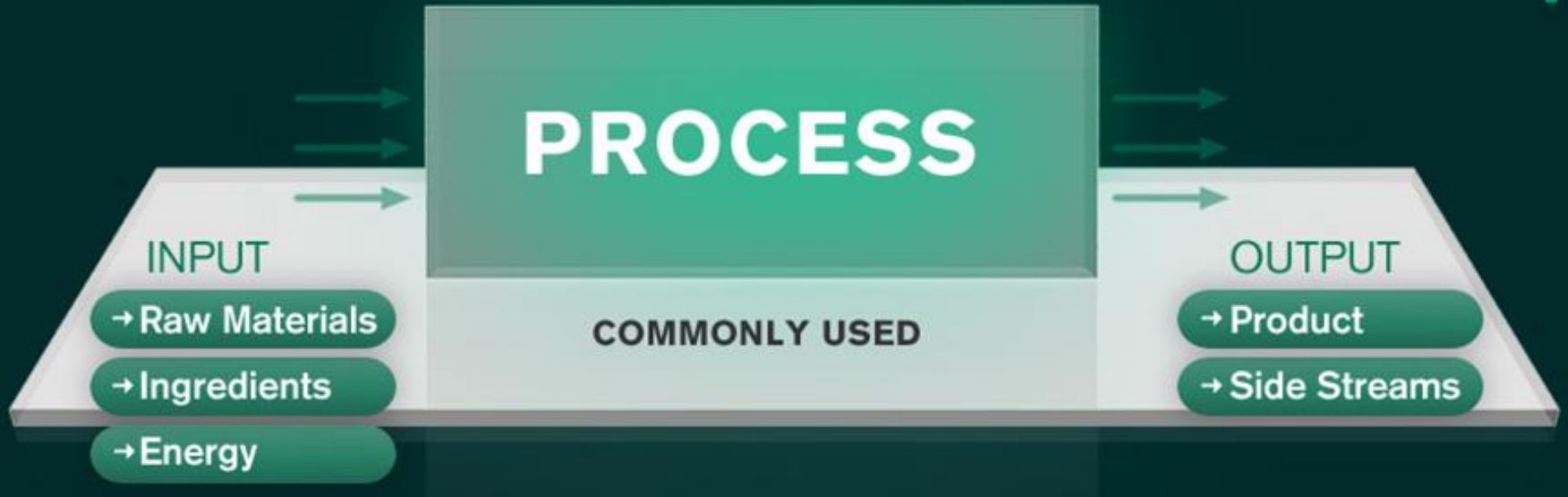
Food Processing:

“Transformation of raw ingredients and intermediates into products intended for human consumption, with the purpose to improve the digestibility, bio-availability of nutrients and energy, taste, appearance, safety, storability and distribution”

Three major aims:

- To make a sufficiently stable food product, that is safe (microbiologically and chemically) for human consumption
- To give the product the required intrinsic quality aspects, e.g. digestibility, nutrient content, flavour, colour and texture
- To add value to the product on other aspects, e.g. convenience, lifestyle and marketing

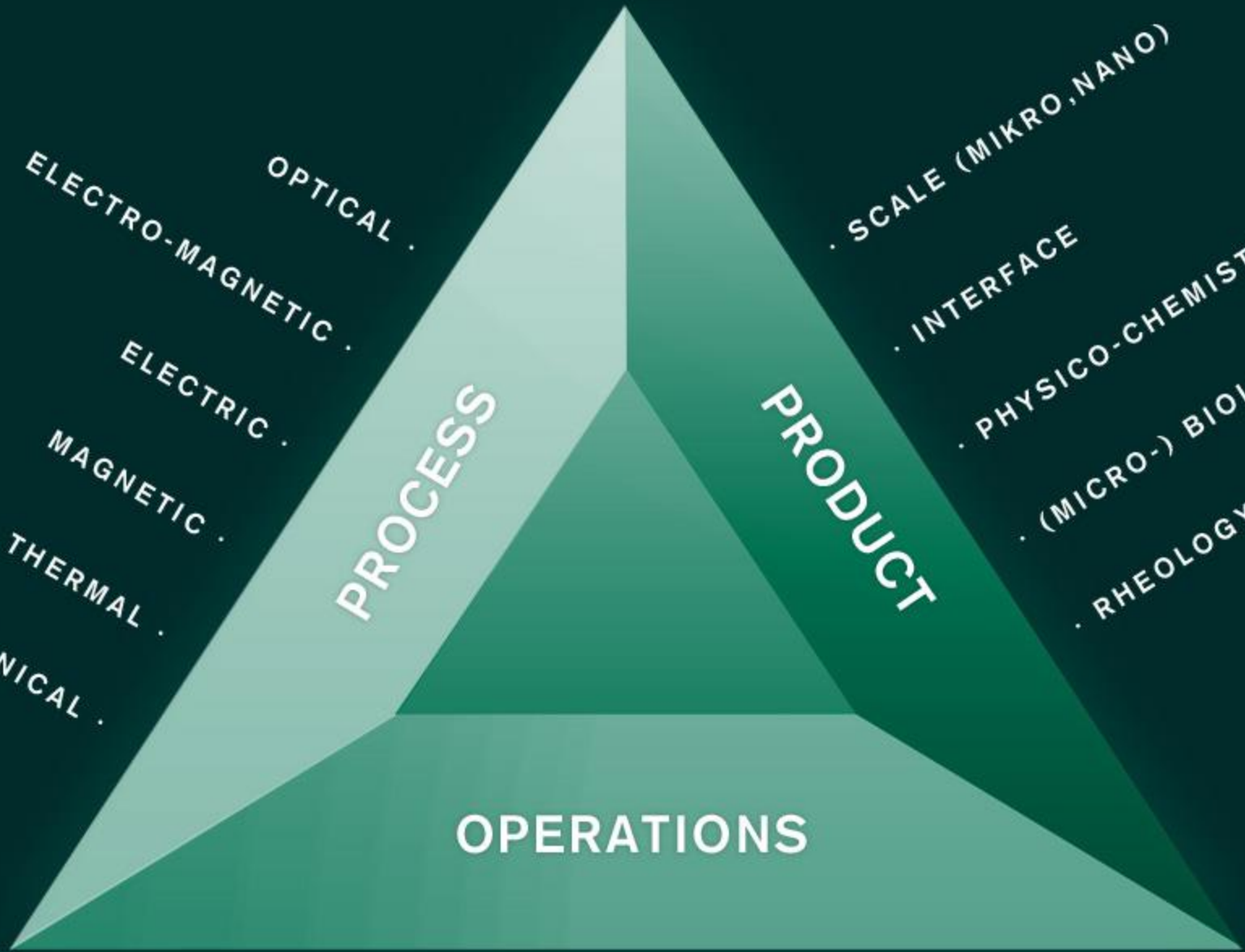
FOOD PROCESSING



FOOD PROCESSING



FOOD PROCESSING



STRUCTURE SEPARATION CONVERSION STABILIZATION PACKAGE

Novel Technologies Selection



The criteria for selecting the novel technologies are:

Retailing Trends

- Proper labelling
- Extended shelf life
- Intelligent packaging
- More local products
- Mild processing food and freshness
- An adequate margin
- Extension of assortment

Consumer Trends

- Health
- Functional foods
- Convenience
- Bundling
- Pleasure
- Sustainability
- Authenticity

Technology options and their impact on food manufacturing



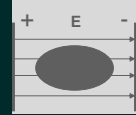
Technology option	Improvement of			Reduction of		
	Product dev.	Quality	Safety	Energy	Water	Loss
Sensor technology	+	+++	+++	++	++	++
Sustainable packaging and refrigeration climate control	++	+++	+++	+	+	+++
Non-thermal pasteurization and sterilization	++	+++	++	+	+	++
Novel processes for utilization of by-products	+++			++	++	++
Alternative processes requiring less energy and water	+	+	+	+++	+++	+
Plant-based meat alternatives	+++	++	++	+++*	+++*	++
Information and knowledge transfer	+++	++	+++	+++	+++	+++

* considering the whole chain

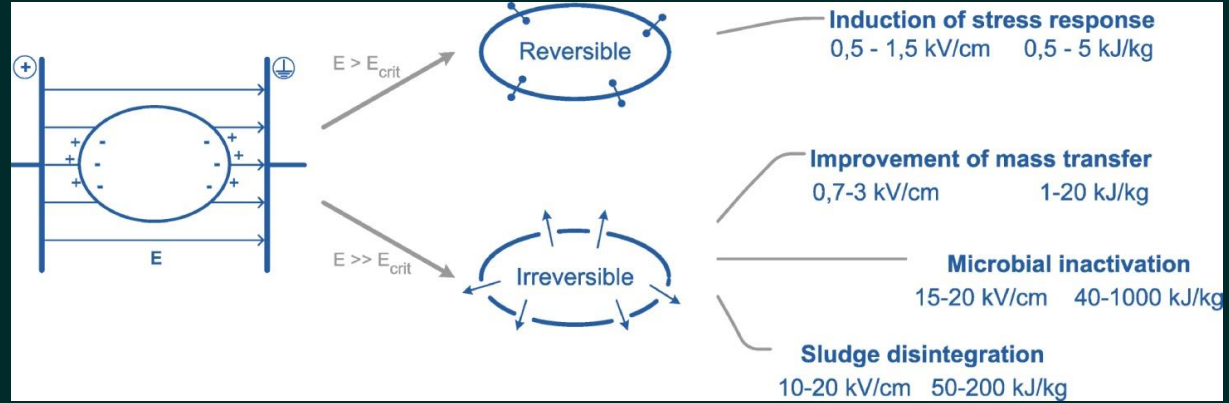


Pulsed Electric Field (PEF)

Principle Overview



PEF Principle



PEF preservation

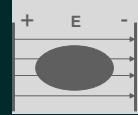


PEF extraction



Pulsed Electric Field (PEF)

Pulsed electric field PEF- industrial scale units at DIL



Ohmic Heating

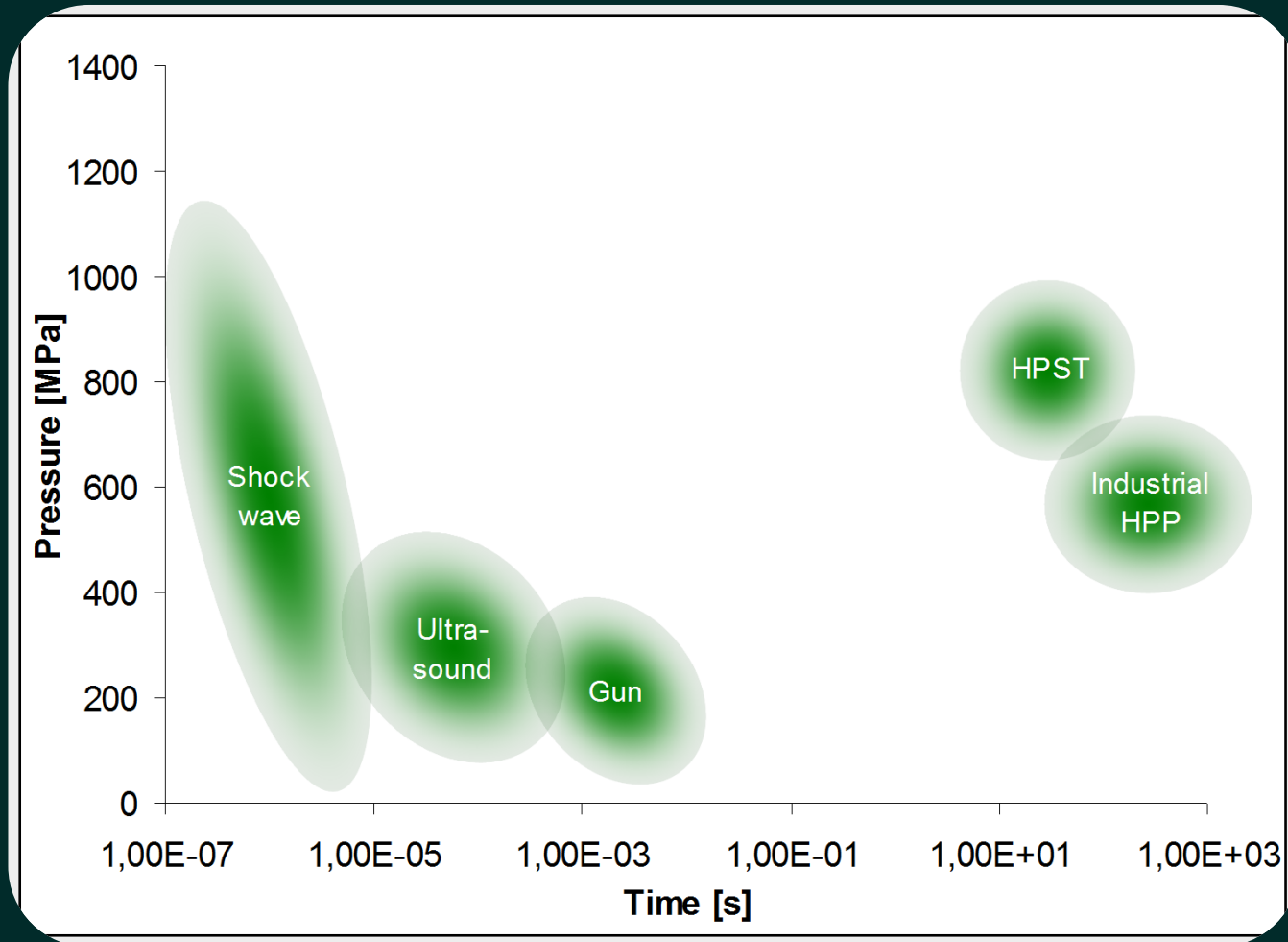
Ohmic heating instrument - pilot scale



Shockwave Processing

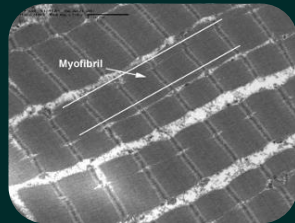
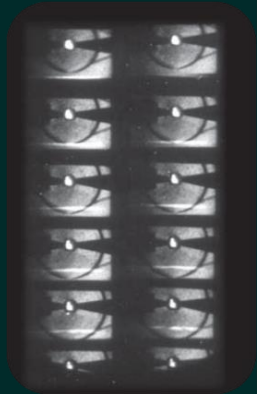


Pressure-Time-Domain

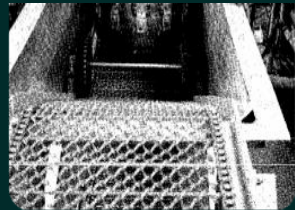
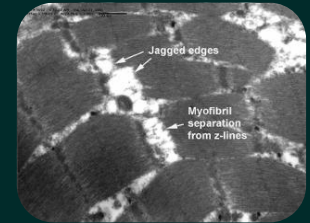


Shockwave Processing

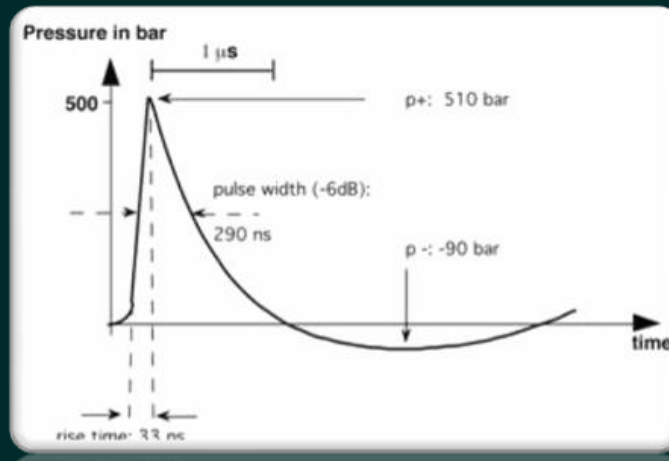
Shock Generation



Meat tenderization



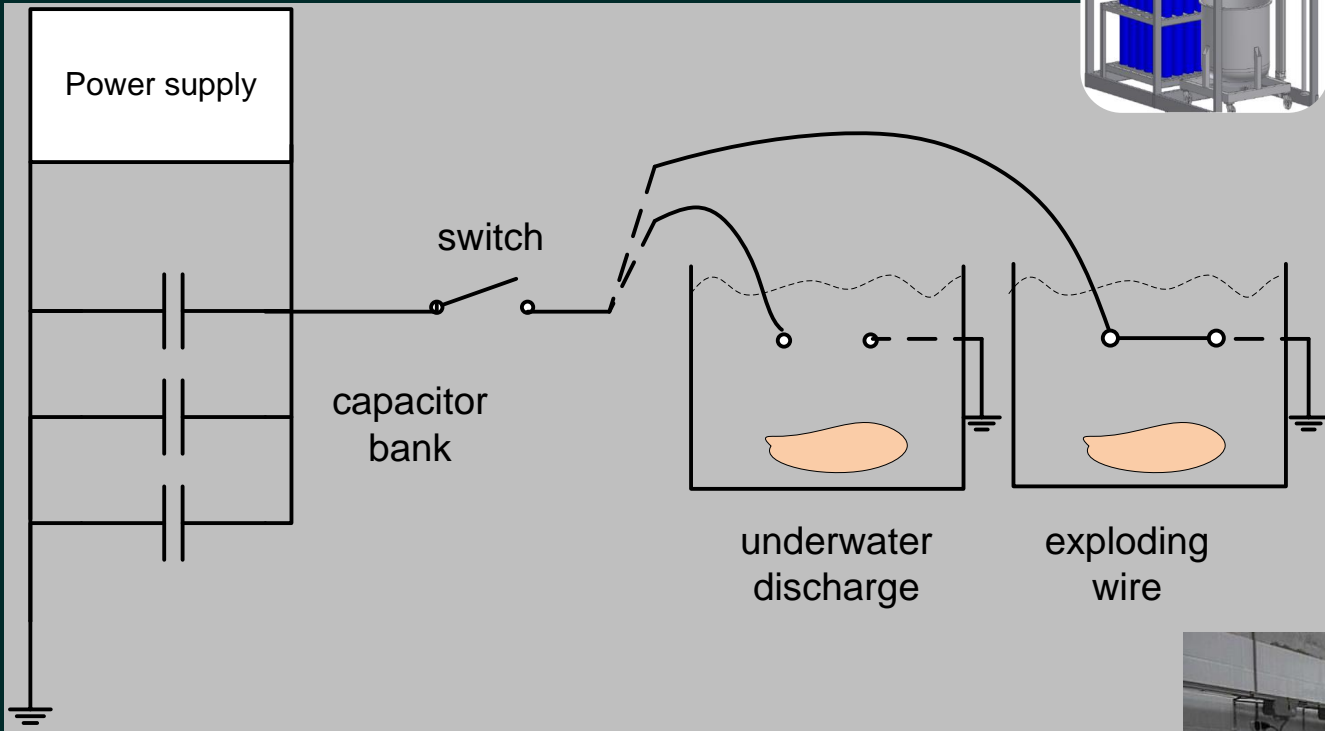
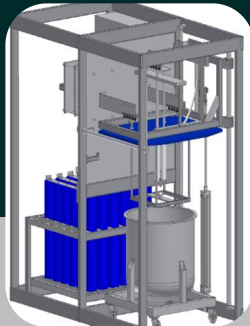
Oyster shucking



GPa
pressure,
but μ s
timescale

Shockwave Processing

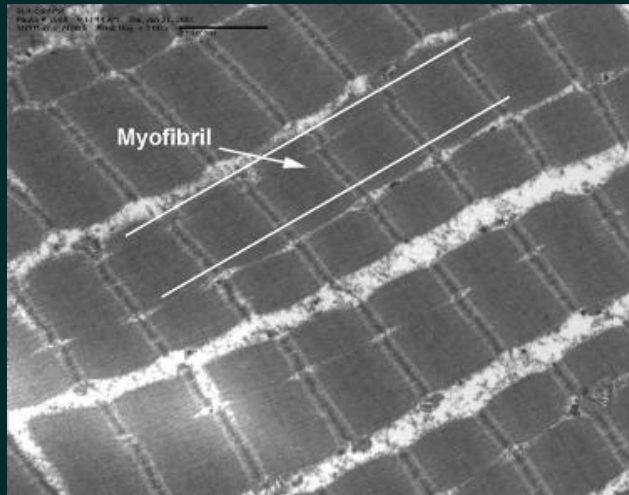
Shock generation by electrical energy



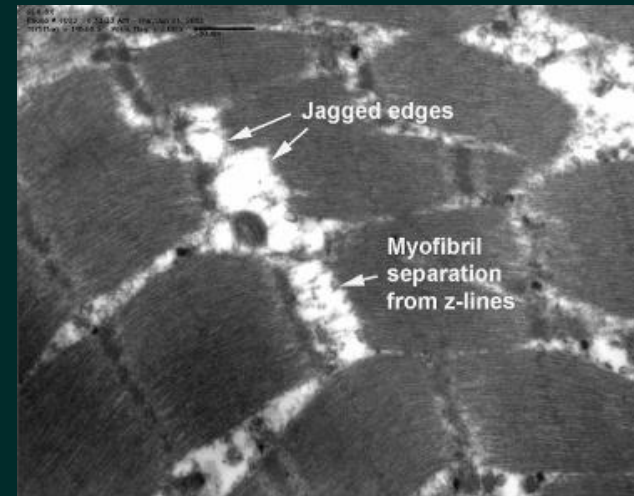
Shockwave Processing



Meat tenderization



Control: Magnification 7100X.
Early deboned Holstein beef
before processing. Intact
myofibrils.



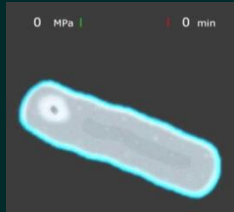
Shockwave processed:
Magnification 19500X.
Early deboned Holstein beef
after processing.

High Pressure Processing (HPP)

High pressure effects on biomaterials



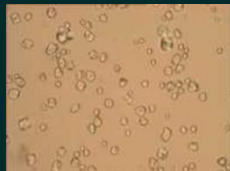
microbes



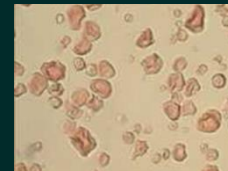
→
Inactivation



starch



→
Swelling



tissue



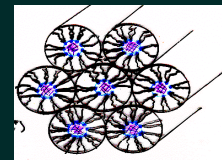
→
Disintegration



lipids



→
Transition



proteins




→
Unfolding





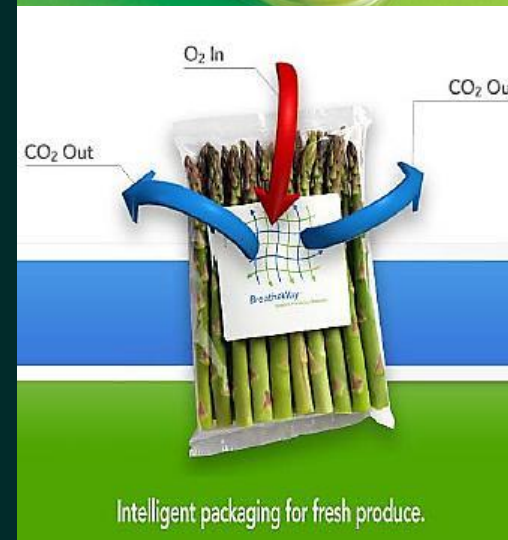

Intelligent Packaging

Freshness Indicators



crisp
 firm
 juicy

To find your perfect pear, just look for the ripeSense™ sensor.

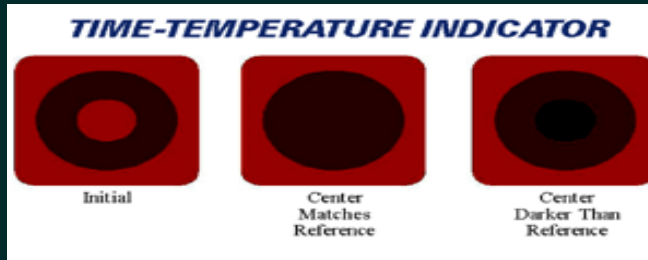


Packaged golden drop with food spoilage indicator label.
Green = fresh; orange = warning





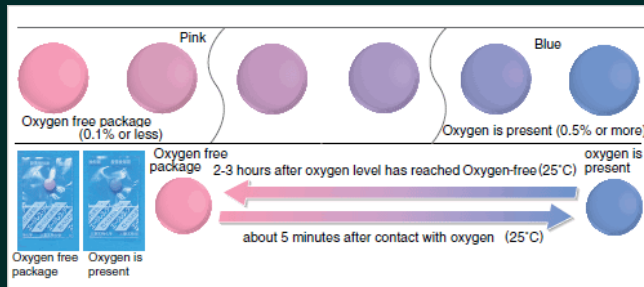
Intelligent Packaging



There are two parts to the TTI - an outer dark circle and an inner light circle. As long as the inner circle is still lighter than the outside circle, the MREs are supposed to be good



Humidity Sensitive Polymer Hologram



Oxygen Indicator



Oxygen indicator in Taro cake in Taiwan



Challenges of food processing

- Innovative Food Structures
- New Taste and Flavors for Global Consumers
- Increased Long-Term Stability (Better Quality - Less Waste)
- Short-Term Stability in Urban Production Schemes
- Adjusted Energy & Nutrient Density of Foods
- High Quality Foods with Reduced Impact on Resources



iFood Conference 2015



3rd INNOVATION FOOD CONFERENCE 2015 12-13 October Anuga | Cologne

We, the German Institute of Food Technology, cordially invite you to attend the 3rd Innovation Food Conference.



New Food



Consumer Trends



Converging Industries



Industry 4.0