

Organic food food quality – state of the art and research needs

Mikkeli, Ruralia Institute

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organicagriculturalsciences **U N I K A S S E L**



Table of content

- Organic agriculture
- Organic food
- Organic food quality
- Research results
- Research questions

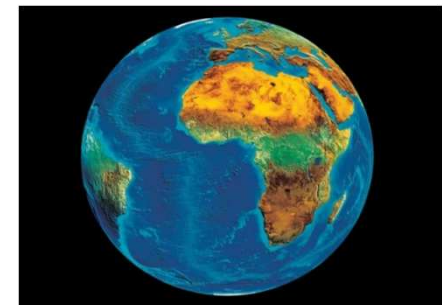


Sustainable Agriculture & Nutrition

- **United Nations definition of sustainable consumption....**

„the use of services and related products which correspond to basic needs and bring a **better quality of life while minimizing the use of natural resources** and toxic materials as well as emissions of waste and pollutants over the life cycle so as not to jeopardize the needs of future generation“

UNEP, 2005: 10



Codex Alimentarius, 2007

- Organic agriculture is a **holistic production management system which promotes and enhances agroecosystem health**, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, cultural, biological and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system.



Organic agriculture old fashion or new inspiration?

Rockström et al., described the

The Health of the Earth:

The earth is a complex system with a self-regulatory capacity that maintains a stable environment within a relatively narrow range and that can respond to changing pressures with restoring balances, within certain thresholds.

Rockström et al., Nature 461, 472-475 (24 September 2009) |doi:10.1038/461472a;



Regulations – organic food production

EU-Regulation 834/2007 and 889/2008:

Article 2: Definitions:

-The **definition of food**: Reg. EU No 178/2002



Article 3 and 6:

- Products are **healthy**
- Products are of **high quality**
- Maintain the **vital qualities** and **organic integrity** of the product
- Not mislead regarding **the true nature of product**



Promise and expectations need clear arguments

Example non-organic foodquality (TP „Food for Life“ EU)

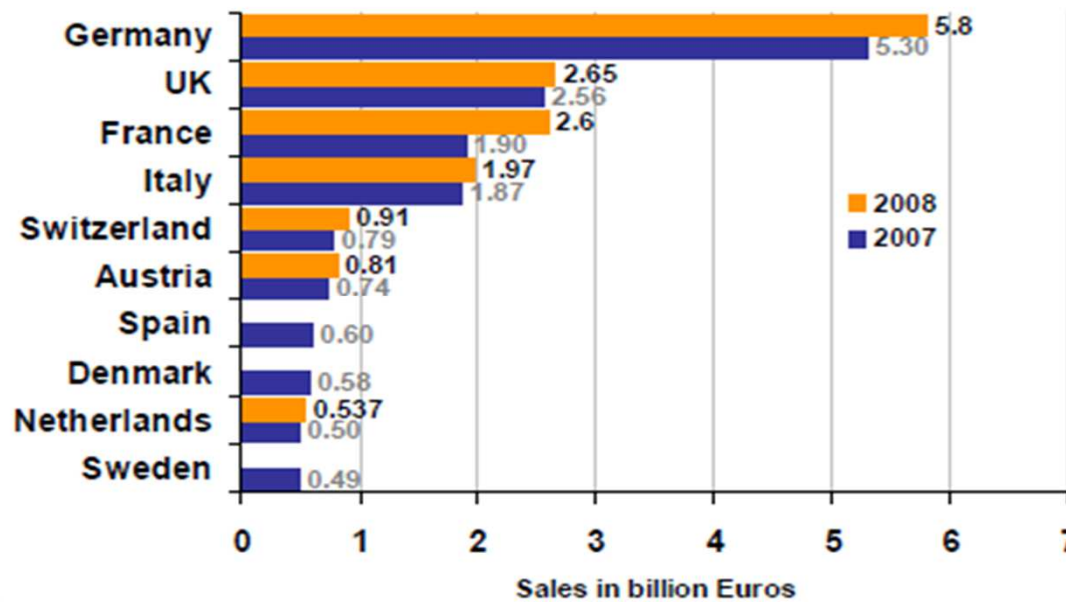
- Sustainable food production
- Quality of life
- Well-being of the people

Example organic food quality (TP „Organics“ EU)

- Sustainable food production
- Quality of life
- Well-being of the people



The European market for organic food and drink: The countries with the highest sales 2007 and 2008 (survey date June 2009)



Source: Aberystwyth University, FiBL & ZMP Survey 2009



Resume

- Organic agriculture is a natural system with certified processes
- Organic agriculture is fast growing all over the world
- Organic food market is out of the niche



Statement Organic Agriculture

Organic agriculture emphasised the world to move towards sustainable agriculture. This was one of its big innovations.

Organic agriculture is the leading system putting biodiversity, environmental protection and animal welfare together towards sustainable diets

Examples:

Reports FAO on „Organic Agriculture and Food Security“
as well as „Biodiversity in sustainable diets“



The goal: best for human and environment

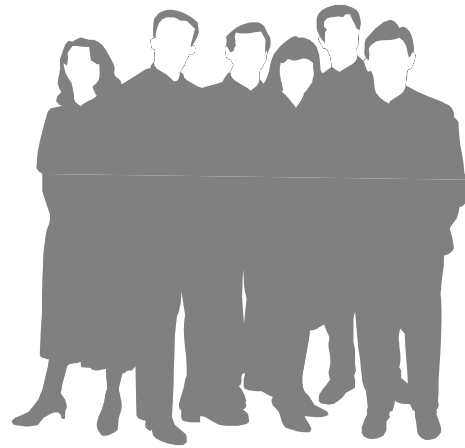


Actually discussed: market relevance

Market research results:

- 1. The quality question dominates the marketing of the products**
- 2. The quality profile needs consumer understanding and acceptance**
- 3. The quality of organic offer a „plus“ compared to non-organic**
 - product oriented aspects (natural, healthy etc.)**
 - process oriented aspects (animal welfare etc.)**





society

process
orientated
quality

**sustainability
as the underlying
principle of
food quality**



consumer

product
orientated
quality

**more selfish
demands such as
good taste,
good for ones
own health**



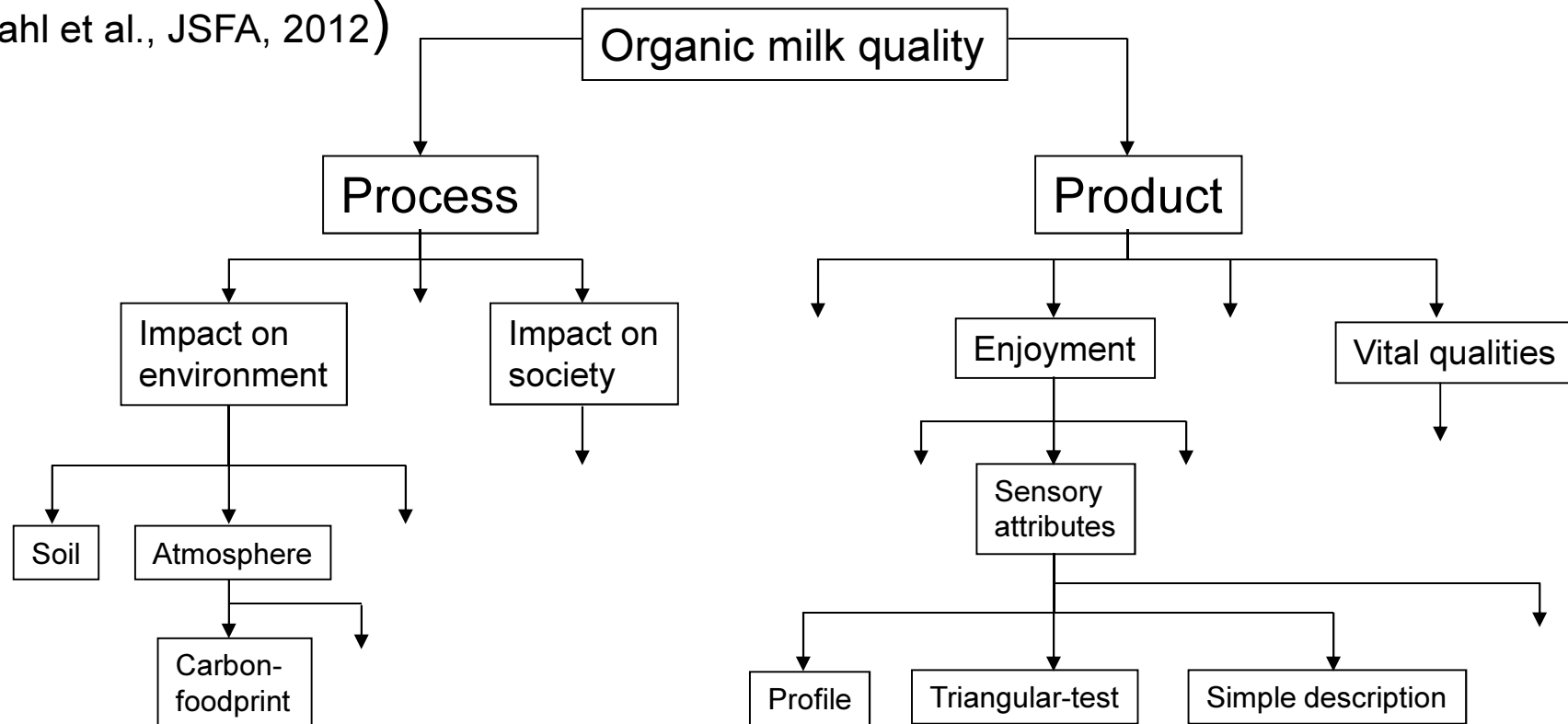
Productquality – Different criteria of food

Criteria	Example for quality attribut
Health	Content of health promoting substances
Senses	Colour, taste, smell
Technique	Ripeness, shelf-life
Psychology	Prestige



Framework for Organic food quality

(Kahl et al., JSFA, 2012)



This figure explain how quality of carrots could be divided into observable and believe dimensions and that could be measured by quality criteria in by different methods.

Quality definition of carrots in a organic baby food production chain

Quality dimensions

Observable

Believe

Nutritional value

Sensory quality

Convenience

Health

Authenticity

Quality criteria

Nutrients
Composition
Fibre
Digestibility
Wholesomeness (total of the product)

Taste
Odour
Flavour
Colour
Texture

Ability to prepare
Keep ability
Believed health promoting constituents e. g. antioxidants

Safety
Absence of harming properties
Pesticides
Mycotoxins

Contribution to healthy life (environmentally friendly)
Effects on animals
Ingredients, composition

Natural product
Organic
Safe production

How to measure

Consumer and processor studies

Quality analysis of critical control point (QACCP)

Product quality measurements

Impact on health studies

Studies of actual production lines (SME's)

Pilot plant processing studies

Chemical analyses

Sensory analyses

Animal feeding studies

Nutrients
Pesticides

Coore organic, Project no. 2006-1885, Quality analysis of critical control points within the whole food chain and their impact on food quality, safety and health (QACCP)



Resume Organic Food Quality

1. Organic food quality is defined through the principles of organic farming and food production
2. Organic food quality is defined through process and product related aspects
3. Evaluation of organic food quality is performed through criteria, indicators and parameters, these can be organic specific

Kahl et al., FT, 2010

Kahl et al., JSFA, 2012



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Factors affecting organic food quality

- No mineral N-fertilization
- Prohibition of synthetic pesticides, fungicides, herbicides
- Prohibition of GMO
- Limitation of food additives
- Certification process



Newest research results

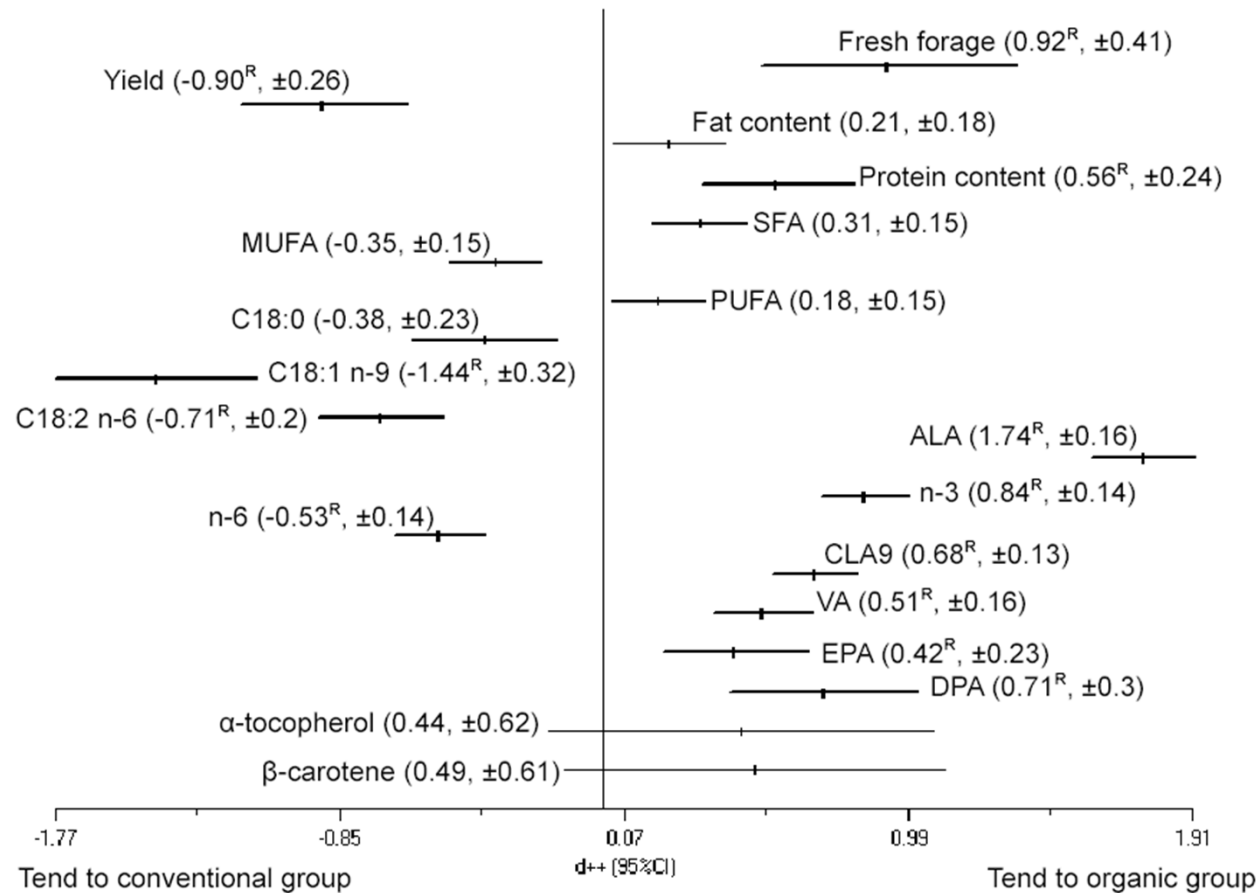
- Dangour et al. 2009 (meta-analysis)
- Lairon 2009 (qualitative analysis)
- Brandt et al. 2011 (meta-analysis)
- Palupi et al. 2012 (meta-analysis)

Results:

1. Organic food quality is different from non-organic (evidence)
2. The difference depends on the quality criteria/indicator
3. The difference can not be guaranteed (other factors)



Organic milk quality



Palupi et al.
JSFA, 2012



Organic food and health

- A few studies show a positive health effect of organic feed on animals, although sometime there was no difference in the compounds of the fodder
- A few human epidemiological studies indicate an effect, but this is strongly connected to co-factors (life style etc.)
- Organic food consists significant less amounts of undesired compounds (residues from pesticides, antibiotics etc.)
- Yet there is no scientific evidence, that organic food is healthier. We have questions how to design a human intervention study in order to give scientific evidence

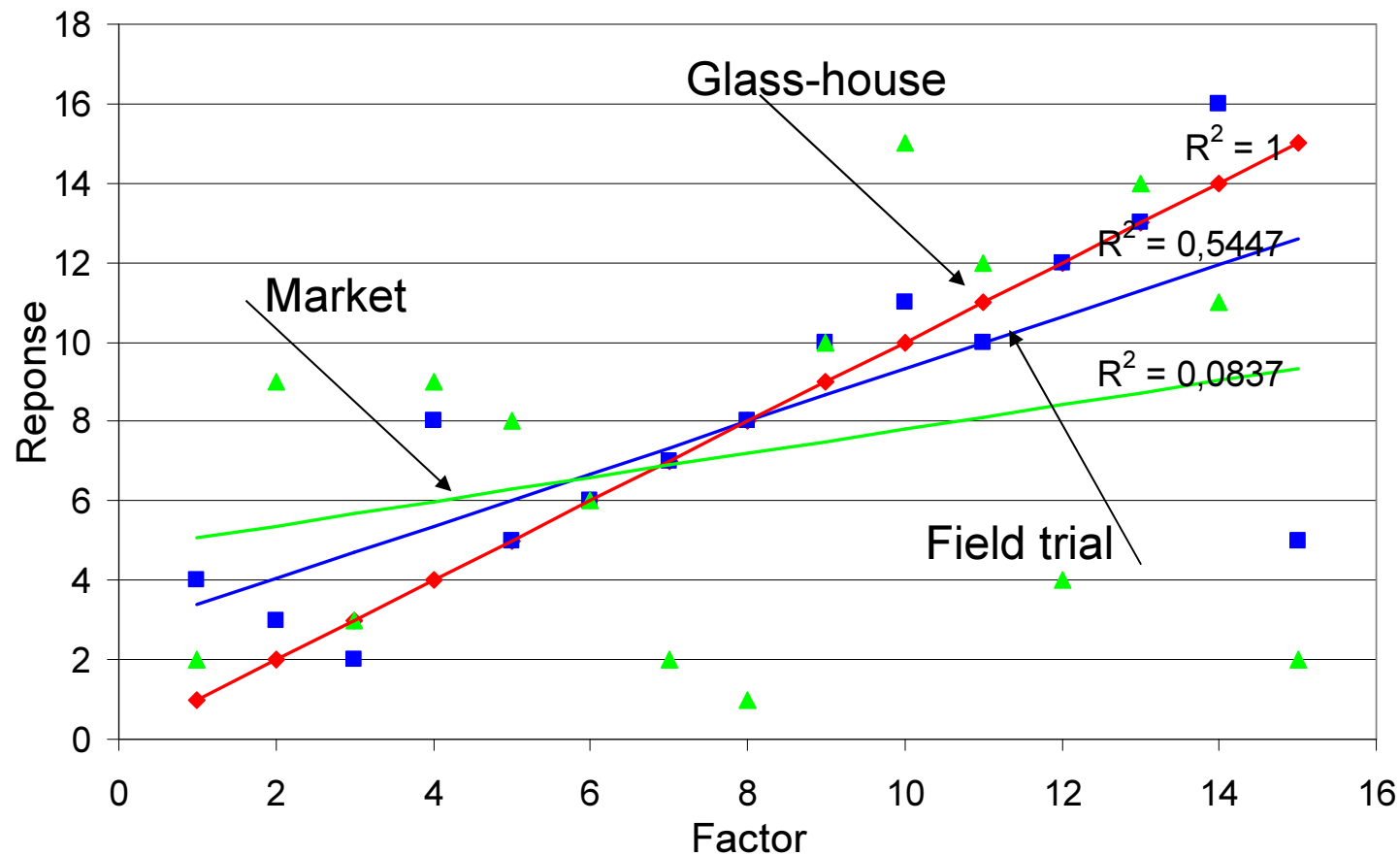


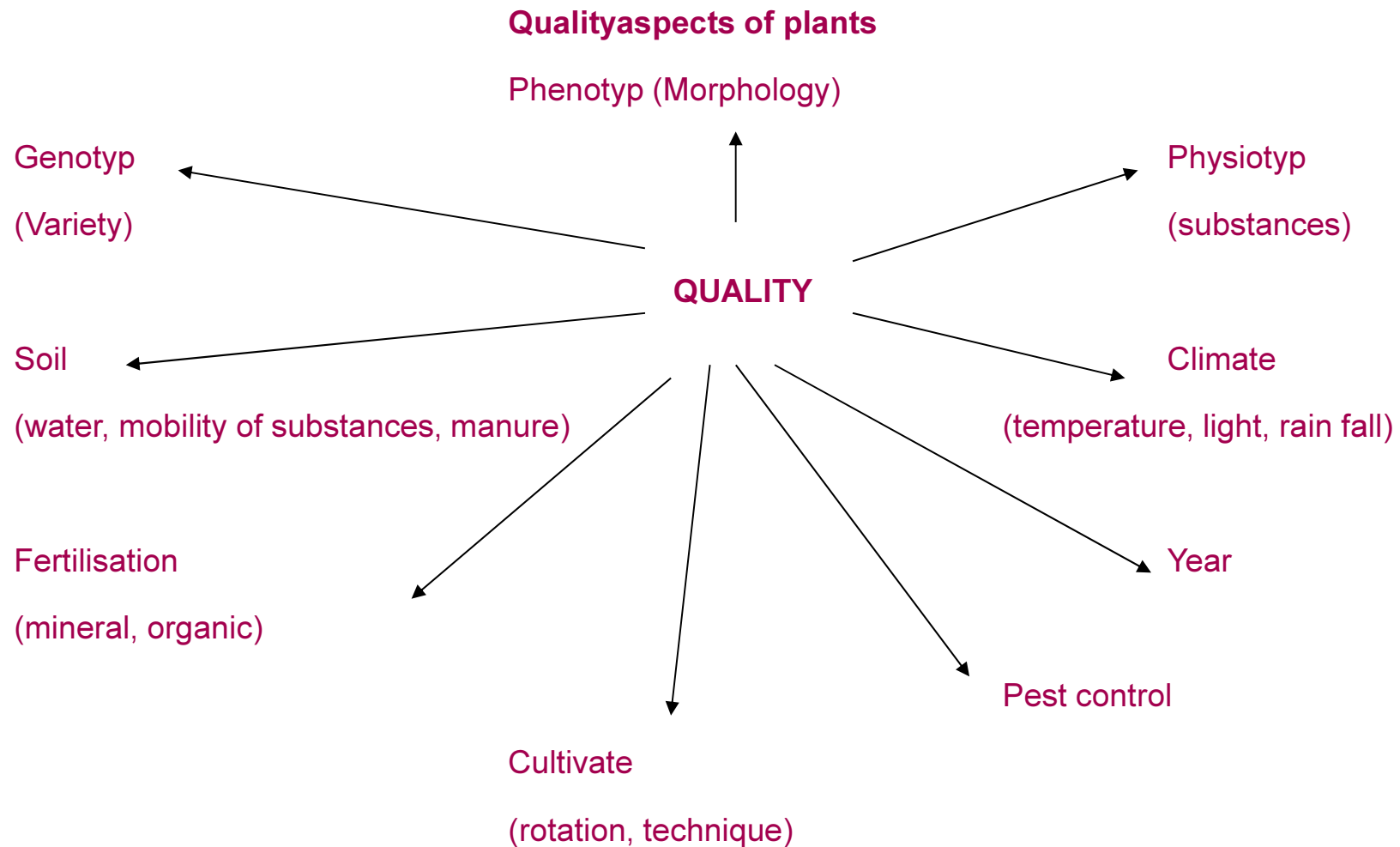
Research questions

- How to compare organic to non-organic?
- Is the single compound paradigm fitting with organic?
- Is organic sufficient to cover future expectations from consumer on high quality food?

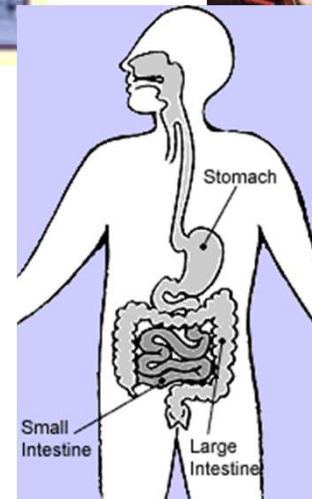
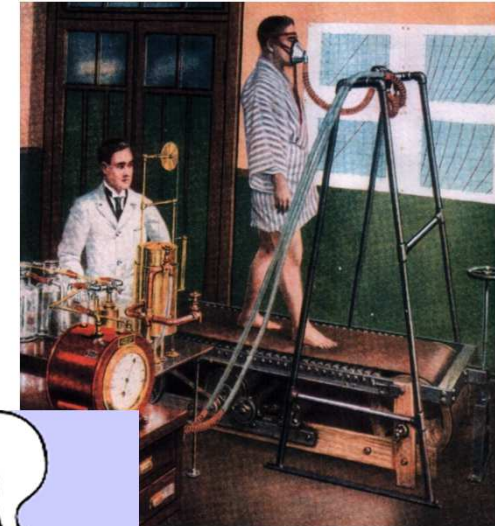


From glass-house to reality



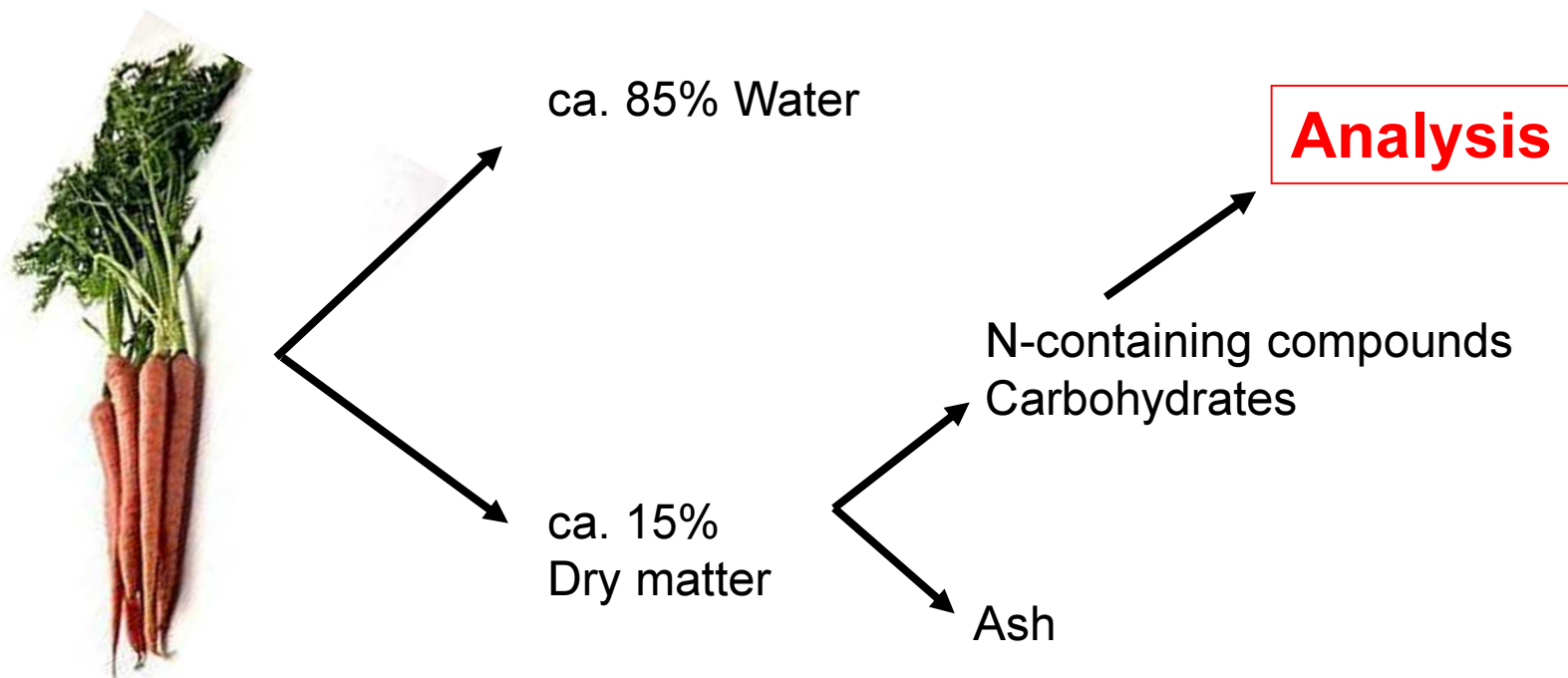


What's defining an "organic" sample and can food be determined as "organic"?



Food quality determination

Basis: LFGB, §35 Methods: Energy and single compounds



Food quality – Change of paradigms in nutrition

Phase	Quality aspect (vegetables)
I (until 1960)	Energy, Potassium
II (until 1980)	Potassium, Vitamine C
III (until 1995)	K, Vitamine C β-Carotene
IV (from 1995)	Carotinoids Flavonoids Fatty acids



Do we catch the right substance?

The lycopene story:

Rao et al. 2000

Lycopene literature review, 70 papers

Result: Lycopene against prostate cancer: model fits, some clinical studies not

Gitenay et al. 2007

Tests on rats, tomato powder with low lycopene, lycopene only

Oxidative stress

Results: **Effect with tomato powder but NOT with lycopene**

Gitenay et al. 2007

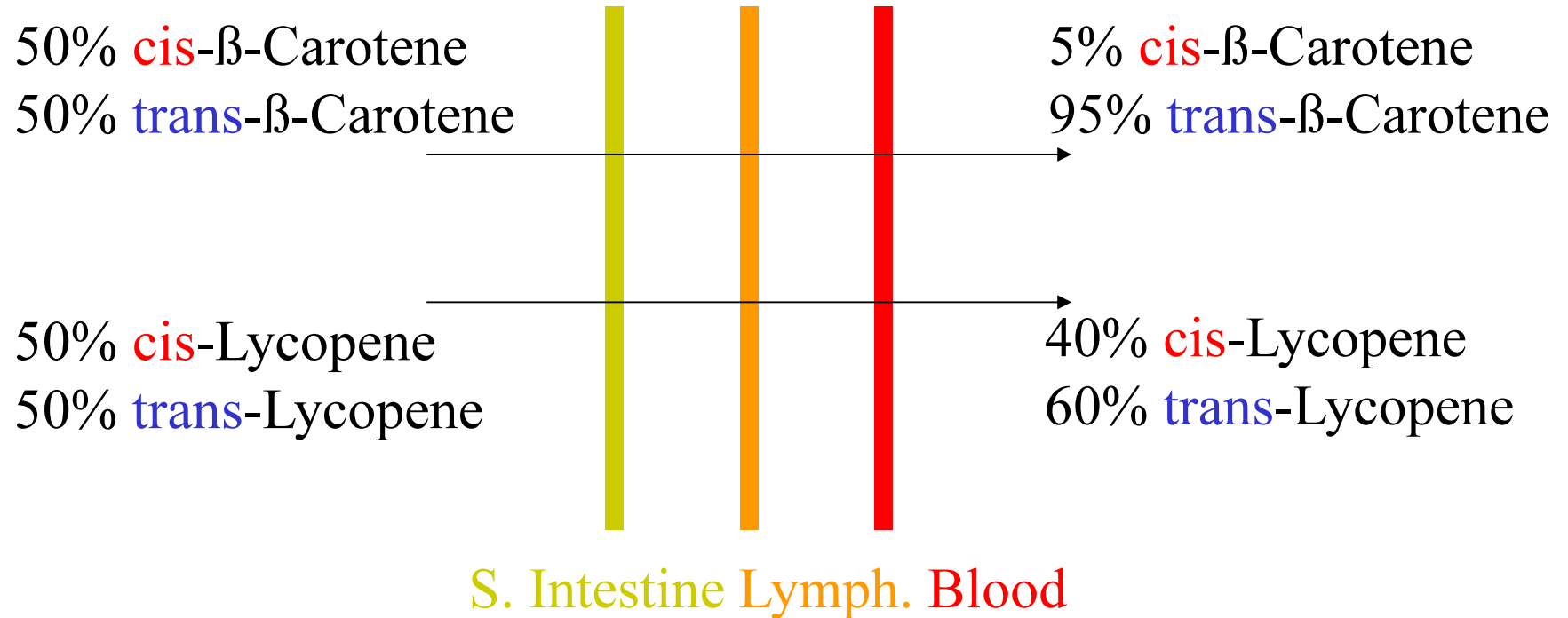
Cancer (cells)

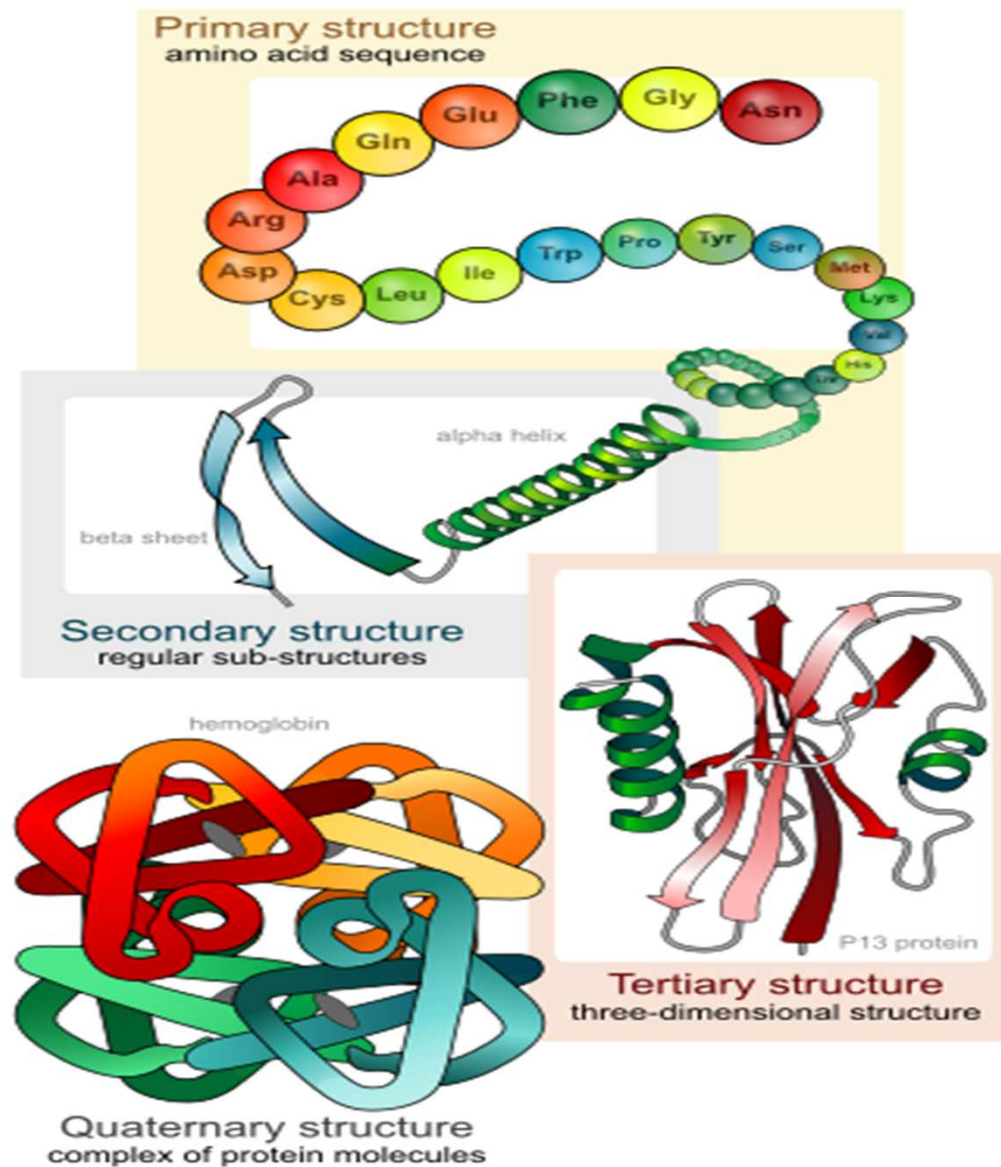
Tomato powder and lycopene

Results: **Effect with tomato powder, NOT with lycopene**

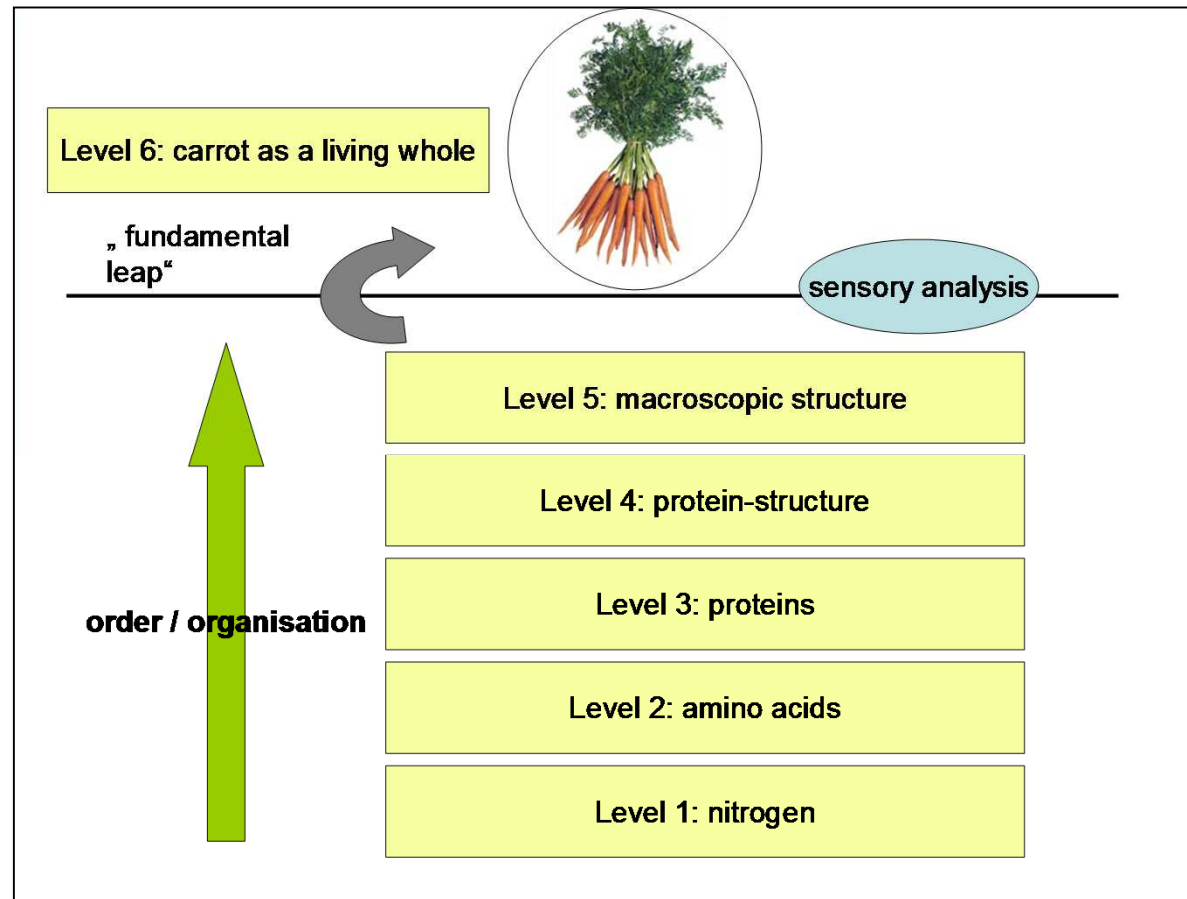


Carotinoids – Metabolism





Organic food – structural aspects – choice of methods



Kusche et al.,
BAH, 2010



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(01.12.2012)
The challenge of evaluating health effects of organic food; operationalisation of a dynamic concept of health

(17.10.2012)
Functional Food and Organic Food are Competing Rather than Supporting Concepts in Europe

(09.03.2012)
Organic food quality: a framework for concept, definition and evaluation from the European perspective

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10/13/14 to 10/15/14 in Istanbul, Turkey
Organic world congress

09/29/13 to 10/02/13 in Noordwijkerhout, The Netherlands
Conference on global food security

06/05/13 to 06/07/13 in Warsaw, Poland
FQH Conference on Food Quality and Health Research

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Results from FQH on Organic food and....

- Values-based food systems (regional, traditional)
- Careful/minimal processing
- System approach
- Best practices
- Sustainable diets



Guideline for organic food quality

„The birthright of living things is health. This law is true for soil, plant, animal and man: the health of these four is one connected chain. Any weakness or defect in the health of any earlier link is passed on to the next and succeeding links, until it reaches the last, namely, man“

Sir Albert Howard, 1947



Thank you for your attention !

