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Gruppo d'interesse analisi sensoriale

Back to the Future:

What's in the Future for the Sensory & Consumer Science ?

IFST's Professional Food Sensory Group (PFSG)
Leatherhead Food Research, UK
Monday, June 06, 2011

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Sensory Science

At the Intersection between Consumer Expectations, Food Reality and Product Development & Improvement

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Outline

- Introduction
- Food Product Development and its Sensory Implications
- Case Study: „ECROPOLIS“
  - PAN-European Approach to Product Improvement on the Organic Market
- Conclusions
- Acknowledgments

Introduction

- In Europe – as well as in the other developed countries - changes in food consumption were observed over the last decades.
- Consumers seek for quality and convenience and are more and more aware about topics such as safety and health.
- Some consumer groups show interest for the organic production of food, for environmental protection and animal welfare. These consumers are described as wealthy, well-educated and concerned about health and product quality.
- Buyers of organic products consider organic food as healthier. Food safety, taste, freshness and overall quality are often mentioned as important attributes explaining consumer preference for organic products.
- Cost is the main reason mentioned for NOT buying organic food.

Changing Structure of Global Food Consumption and Trade. (2001) Anita Regmi, editor. Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture, Agriculture and Trade Report. WRS-01-1 .

Introduction

- Key players in the organic food field claim superior tastes for their products compared to the non-organic alternatives. However there is still a controversy regarding this claim and therefore additional scientific work is necessary to clarify this statement.

- "Since repurchases are dependent on the overall liking of a product, and sensory experiences may have an important impact, knowledge about these dimensions is crucial for producers and marketers of organic food to offer products which meet consumer expectations".

Ecropolis: Sensory properties of organic food . Project homepage (2011) U. Kretzschmar-Rüger. Research Institute of Organic Agriculture (FiBL)

Food Product Development and its Sensory Implications

- The development of commercially successful products is a very difficult task.
- There is an enormous amount of research work that has been done and still is done in the field of sensory consumer science.
  - Food choice and liking are extremely complex phenomena.
  - Understanding consumers' behaviour and thus developing successful food products can only be achieved with a multidisciplinary approach.

Food Product Development and its Sensory Implications

- Factors influencing food choice and liking can be assigned to three main categories
  - **The product**
    - intrinsic characteristics (sensory characteristics and ingredients)
    - extrinsic characteristics (price, brand, label, regulatory framework, ...)
  - **The consumers**
    - individuals
    - inconsistent
    - relying on experience and beliefs
  - **The environment**
    - Location, meal context, time
    - cultural and economical factors

Food Product Development and its Sensory Implications

- Using different approaches focusing on the elements product, consumers and environment should allow for a sounder food product development.

- However, the question on how to integrate the different results remains challenging.

Food Product Development – Future approaches

ELSEVIER

Available online at www.sciencedirect.com

ScienceDirect

Food Quality and Preference 20 (2009) 70–82

Food Quality and Preference

www.elsevier.com/locate/foodqual

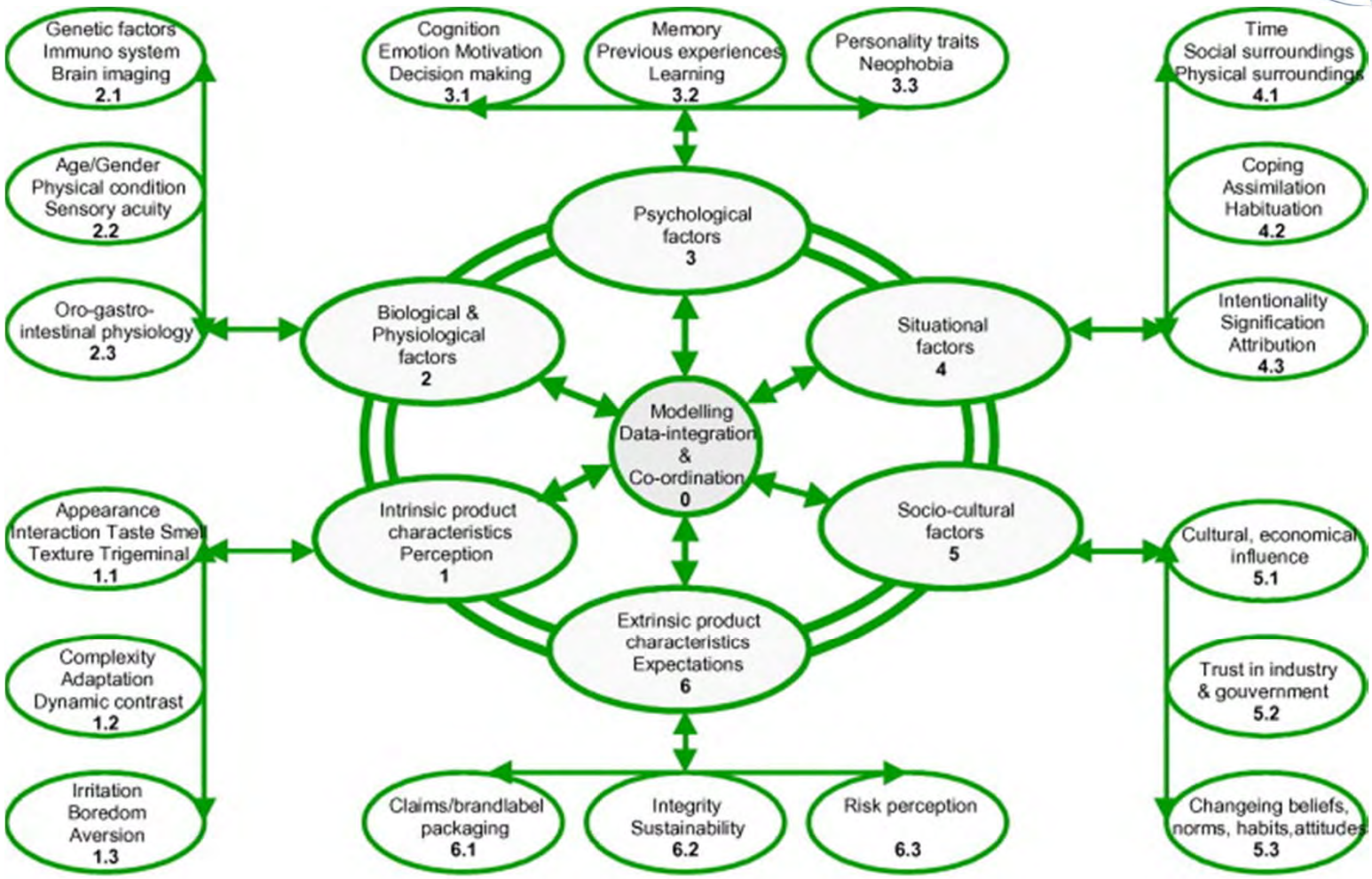
Diversity in the determinants of food choice: A psychological perspective

E.P. Köster *

Centre for Innovative Consumer Studies (CICS), Wageningen University and Research, Bornsesteeg 59, 6708 PD Wageningen, The Netherlands

Received 5 November 2006; received in revised form 8 October 2007; accepted 2 November 2007
Available online 19 November 2007

Essential factors that influence Eating and Drinking Behaviour & Food Choice (Mojet, 2007)



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Case Study „ECROPOLIS“

www.ecropolis.eu

PAN-European Approach to Product Improvement on the Organic Market

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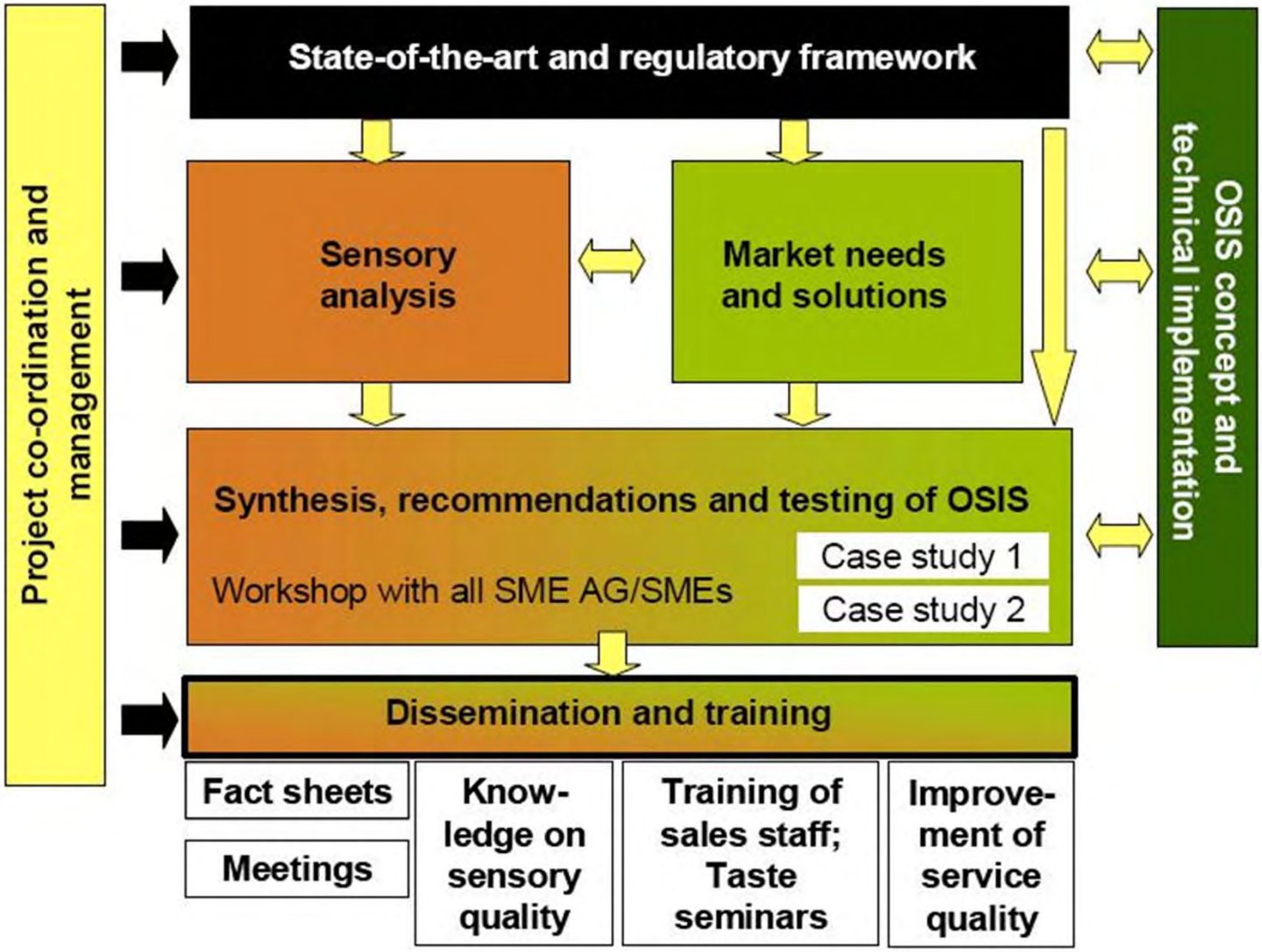
Project Structure: ECROPOLIS



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Case Study „ECROPOLIS“

› **Regulatory Framework affecting Sensory Properties**

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Regulatory Framework

Affecting Sensory Properties

Table 2.2 Selected regulations and standards in the ECROPOLIS project

Level: country/ international	Governmental rules (more detailed or even stricter than EC Reg. 834/2007 & EC Reg. 889/2007	Private Standards	Other private requirements such as Code of Practise and binding guidelines, etc.
Germany		Bioland Association (2009)* Naturland Association (2008/2009)* Demeter Germany (2008/2009)*;**	Flavour guidelines of Association Naturkost (2008)
France	Governmental rules (these are phased out in 2009)	Nature & Progrès (2005)	Synabio-Charta (draft 2009)
Italy		AIAB (2002-2006)* Italian Organic Standard (2004)	
Netherlands		SKAL	
Poland		Ekoland	
Switzerland	Governmental rules	Bio Suisse (2009)* Demeter Switzerland (2008/2009)*	

FRESHNESS, AUTHENTICITY

Use of milk-based thickeners (milk powder or milk proteins)

No use of flavour-rich extracts at all

Use of plant-based thickeners (gums, pectine, etc.)

Pasteurisation

Use of flavour rich extracts

Not homogenised milk

Use of special bacteria (e.g. Bifidus) on organic milk

STANDARDI-SATION OF QUALITY (STANDARD)

DIFFEREN-TIATION OF QUALITY (PREMIUM)

Homogenisation of milk

Use of conventional bacterias

Use of natural flavours (not from the named source)

Double pasteurisation

Use of flavours from organic ingredients (and the named source)

LONG SHELF LIFE, CONVENIENCE

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Case Study „ECROPOLIS“

- **Qualitative Approach to explore Consumer Needs and Expectations**
  - Focus Group Discussions

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Focus Group Discussions

Exploration of Consumer Needs and Expectations

Key Questions

- Which senses are important to you when eating?
- Did you perceive sensory differences to conventional food when eating organic food?
- In which occasions do you prefer organic or conventional products because of their sensory properties?
- Please take a moment to imagine the sensory experience of organic food. What kind of images comes to your mind?
- Basically, do you expect organic products to taste similarly to conventional products, or differently?
- Do you remember situations where your buying decision was influenced by sensory information and how?

Focus Group Discussions

Results: Mentioned Senses and their Relevance

Table 3: Overview on mentioned senses and their relevance in case study countries

	DE	FR	IT	NL	PL	CH
Taste	++	++	++	++	++	++
Odour	+	+/-	++	--	+	+
Appearance	+/-	+	-	+/-	+/-	+/-
Texture / mouth feeling	-	++	-	-	+/-	-
Sound	--	--	--	--		--
Others	Instinct, good feeling	Changes undergone when cooked	--	Feeling of satiety	Feeling after eating	Appetite, stomach feeling,

Quantification of relevance: ++ = very relevant; + = relevant; + / - = indifferent; - = limited relevance; -- = very limited relevance; nv = not available

Focus Group Discussions

Results: Experiences and Expectations for Organic Food

- A rather controversial discussion:
  - *"[...] sincerely, when I ate organic food, I didn't find any sensory difference in comparison to conventional one. I drank organic milk thinking that it could have better sensory attributes than conventional, but sincerely I did not meet any difference." (IT.L)*
  - *"Organic products have a more typical, authentic taste. Nowadays, conventional strawberries are tasteless." (FR.H)*

Focus Group Discussions

Results: Sensory Attributes of Organic Food should be different from Conventional Food

- *"[…] organic food should have a more intense taste. In addition, it should distinguish itself from conventional products!" (IT.L)*

- *"[organic food has to have a particular identity and taste, or] its natural taste, the old taste." (IT.L)*

- *"Organic dairy products are manufactured with whole, non pasteurised milk. This process gives the final product a more authentic, full taste. Like yogurts or cheese from the farm." (FR.L)*

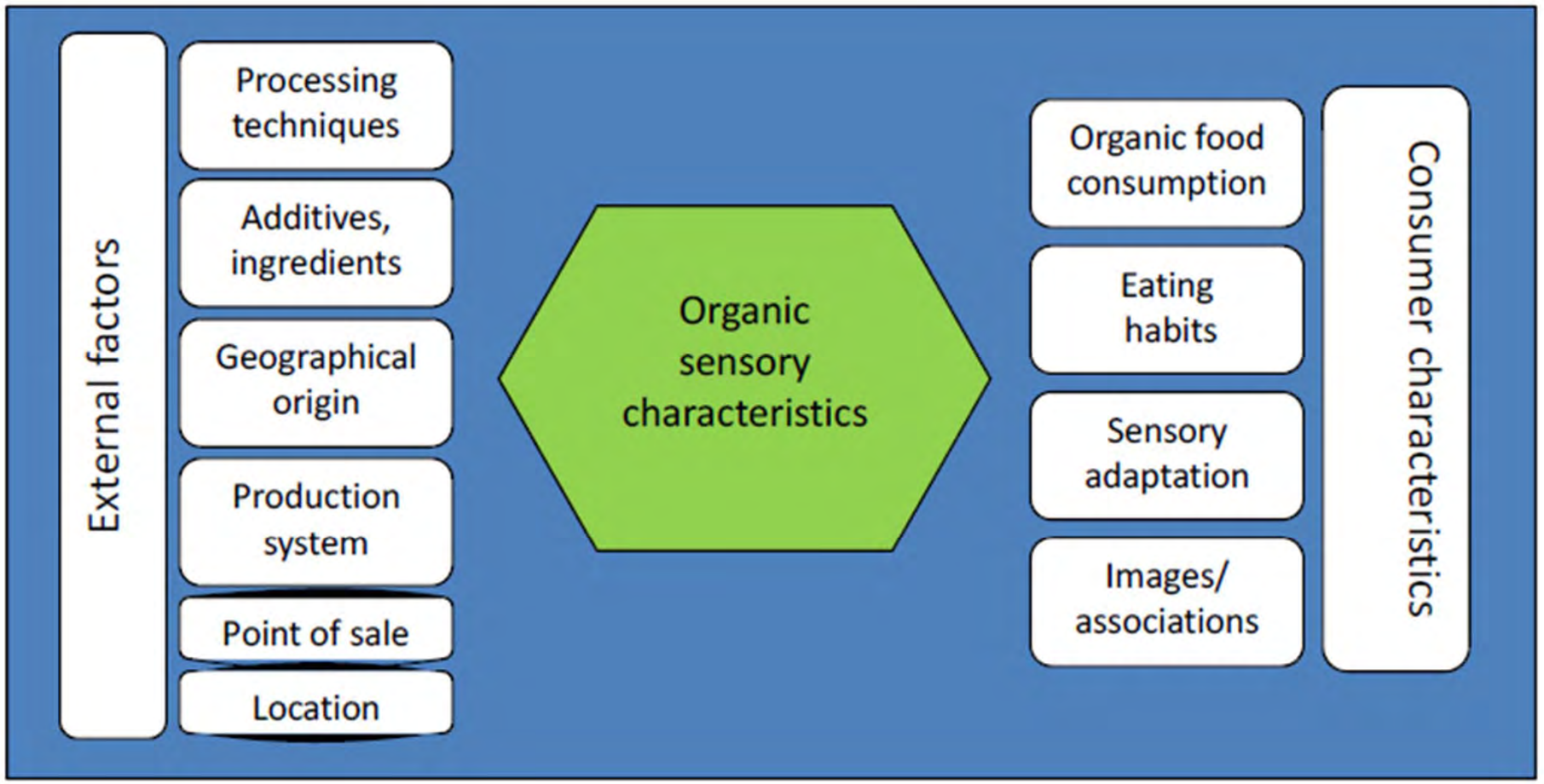
Focus Group Discussions

Results: Sensory Attributes of Organic Food should not be different from Conventional Food

- *"[…] at the beginning, a new organic product should be similar to conventional product, because the consumer has to be accustomed to the new product. So, if it will be different from conventional products, consumers may not recognize it and may refuse it." (IT.H)*

Focus Group Discussions

Conclusion: Sensory Characteristics of Organic Food



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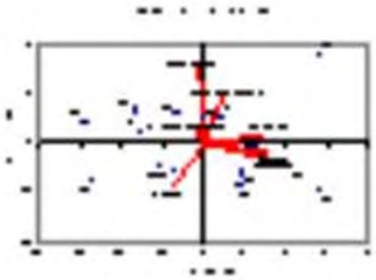
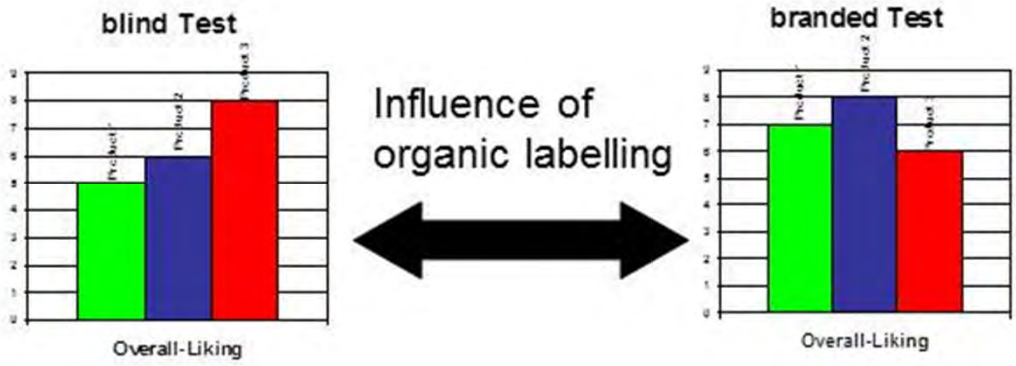
Case Study „ECROPOLIS“

- **Quantitative Approach to explore Sensory Product Properties and Consumer Acceptance**
  - Descriptive Sensory Analysis
  - Consumer Testing

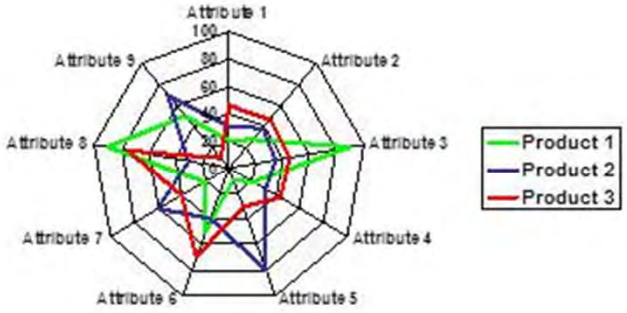
Work Plan



Preference Mapping



Consumer Test



Sensory Profiling

Descriptive Sensory Analysis

Exploration of Sensory Product Properties and Consumer Acceptance – *in Switzerland*

› **List of attributes for flavour** (example)

	TERMS	***DEFINITION***	***PROTOCOL***	***ANCHORING POINTS***
In mouth flavor	***Acid***	From the least acid to the most	Put a spoon of yogurt in the mouth, swallow it and evaluate the acid taste	none - very intensive
In mouth flavor	***Fermented***	Persisting acid taste	Put a spoon of yogurt in the mouth, swallow it and evaluate the yogurt's acid taste	none - very intensive
In mouth flavor	***Fresh***	From the least fresh to the most	Put a spoon of yogurt in the mouth, swallow it and evaluate the yogurt's freshness	none - very intensive
In mouth flavor	***Persistent taste***	From the least intense to the most	Put a spoon of yogurt in the mouth, swallow it and evaluate the taste	none - very intensive

Descriptive Sensory Analysis

Exploration of Sensory Product Properties and Consumer Acceptance – *in Switzerland*

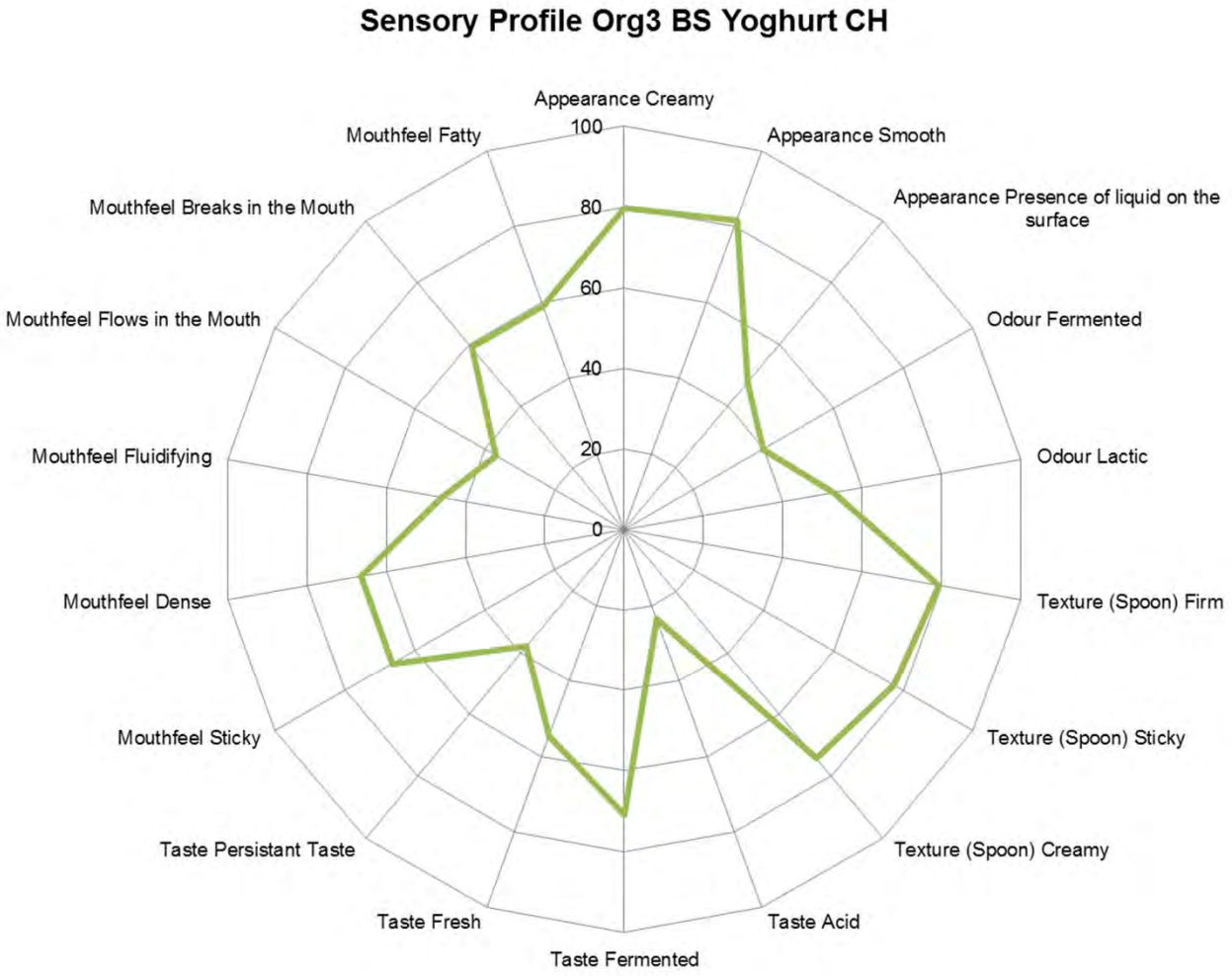
› Chosen Products

SAMPLE CODE	INGREDIENTS	MICROORGANISMS	PROCESSING METHOD
Org1 BS Yoghurt CH	milk skimmed milk powder fat content 3,5 %	no data	pasteurization
Org2 GO Yoghurt CH	milk skimmed milk powder fat content 3,5 %	Lactocacillus, B. Bifidum	homogenization pasteurization
Conv1 Yoghurt CH	whole milk, skimmed milk powder	Sc Thermophilus, Lb d. s. bulgarikus; Lb helvetikus	homogenization pasteurization
Org3 BS Yoghurt CH	whole milk homogenised, milk protein	Lactobacillus; Lb. delbrueckii subsp. bulgaricus,	homogenisation; Double Pasteurisation
Org4 MB Yoghurt CH	whole milk milk proteins fat content 4 %	no data	no data
Conv2 Yoghurt CH	milk milk protein, fat content 3,5 %	Lactobacillus Lb. delbrueckii subsp. bulgaricus,	homogenisation; Double Pasteurisation
Org5 DM Yoghurt CH	whole milk fat content 3,8%	Lactobacillus, Streptococcus	pasteurization

Descriptive Sensory Analysis

Exploration of Sensory Product Properties and Consumer Acceptance – *in Switzerland*

› **Spider Web** (example)



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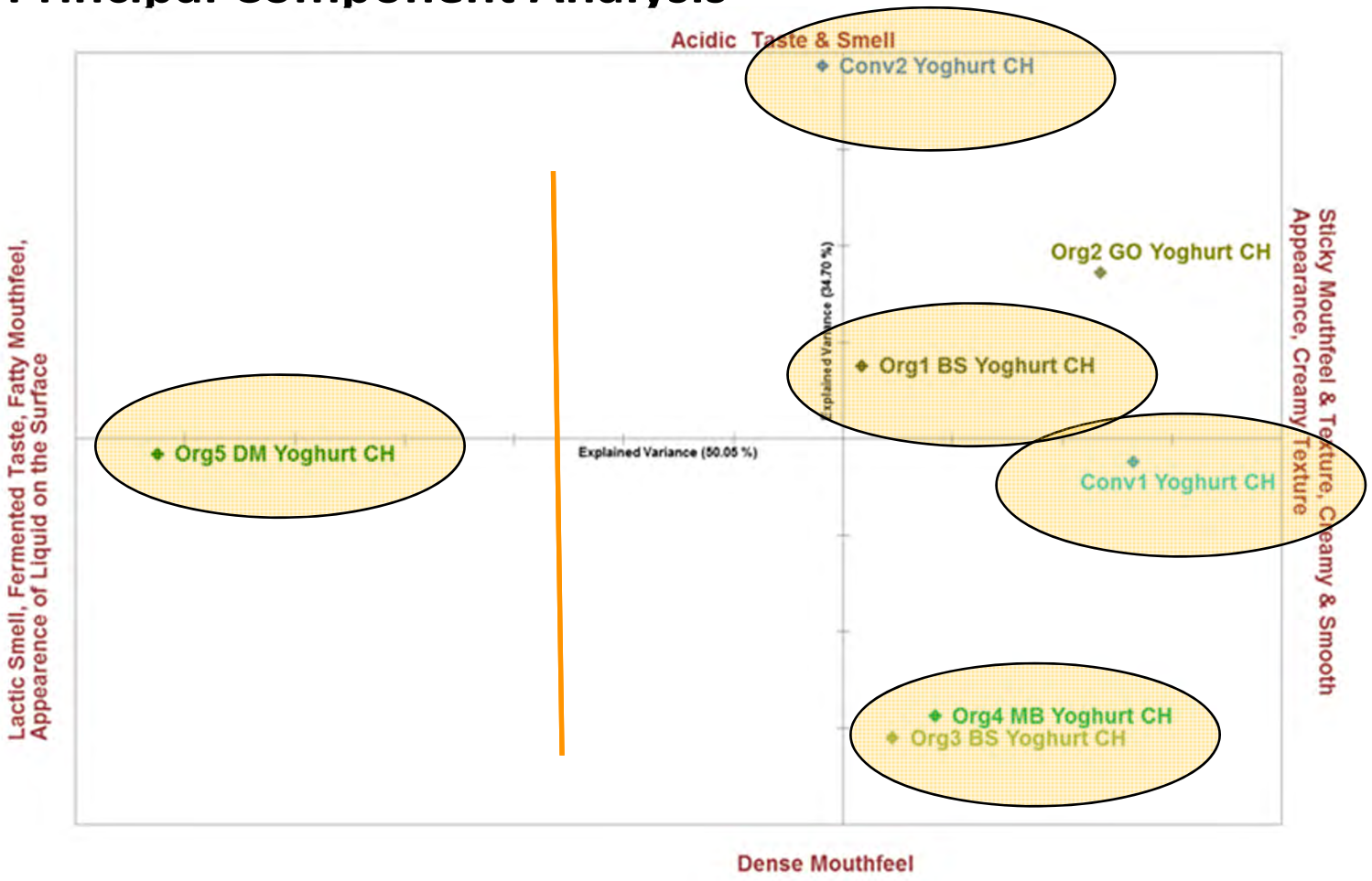
Descriptive Sensory Analysis

Exploration of Sensory Product Properties and Consumer Acceptance – *in Switzerland*

› Principal Component Analysis



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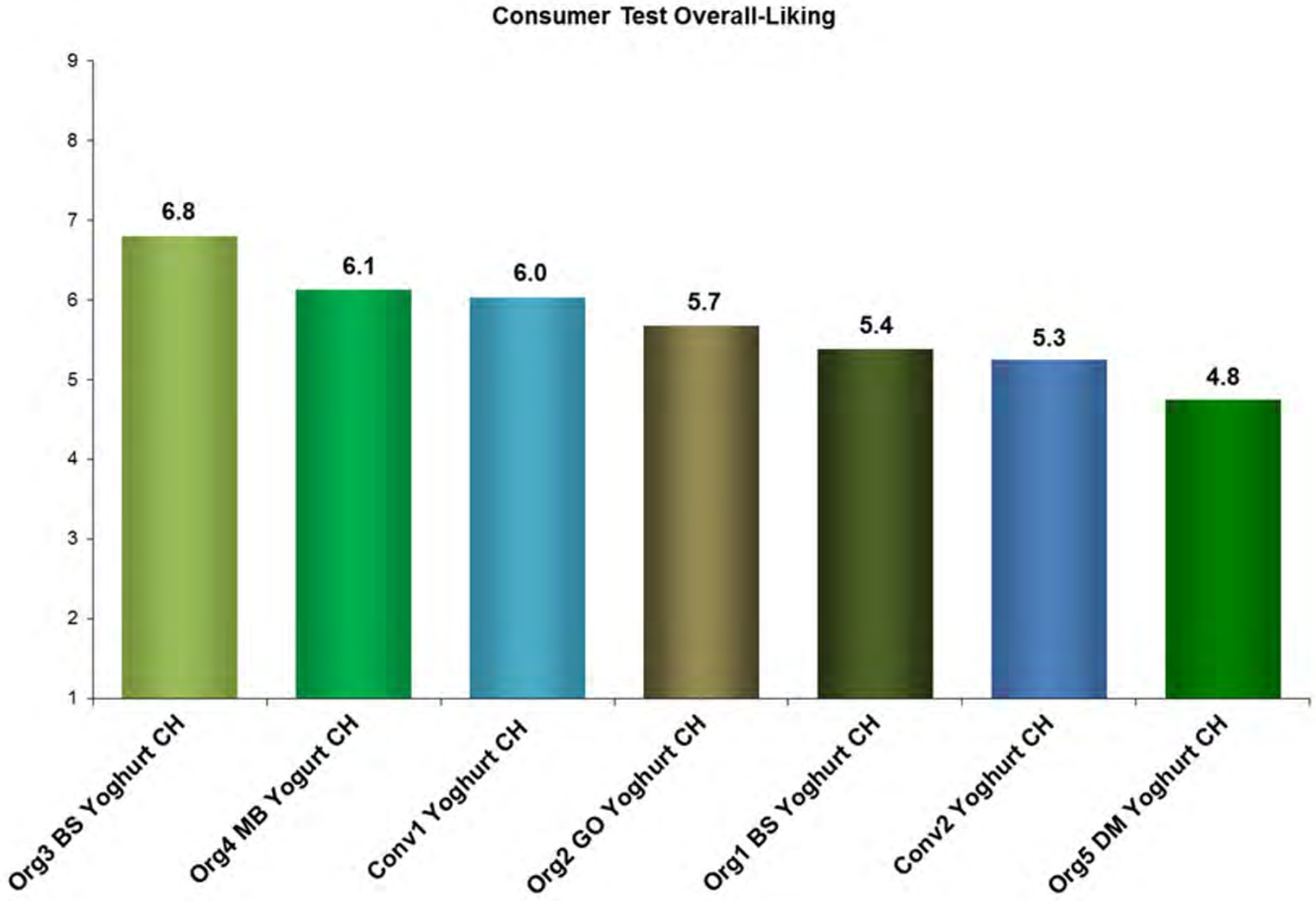
Consumer Testing

Exploration of Sensory Product Properties and Consumer Acceptance – *in Switzerland*



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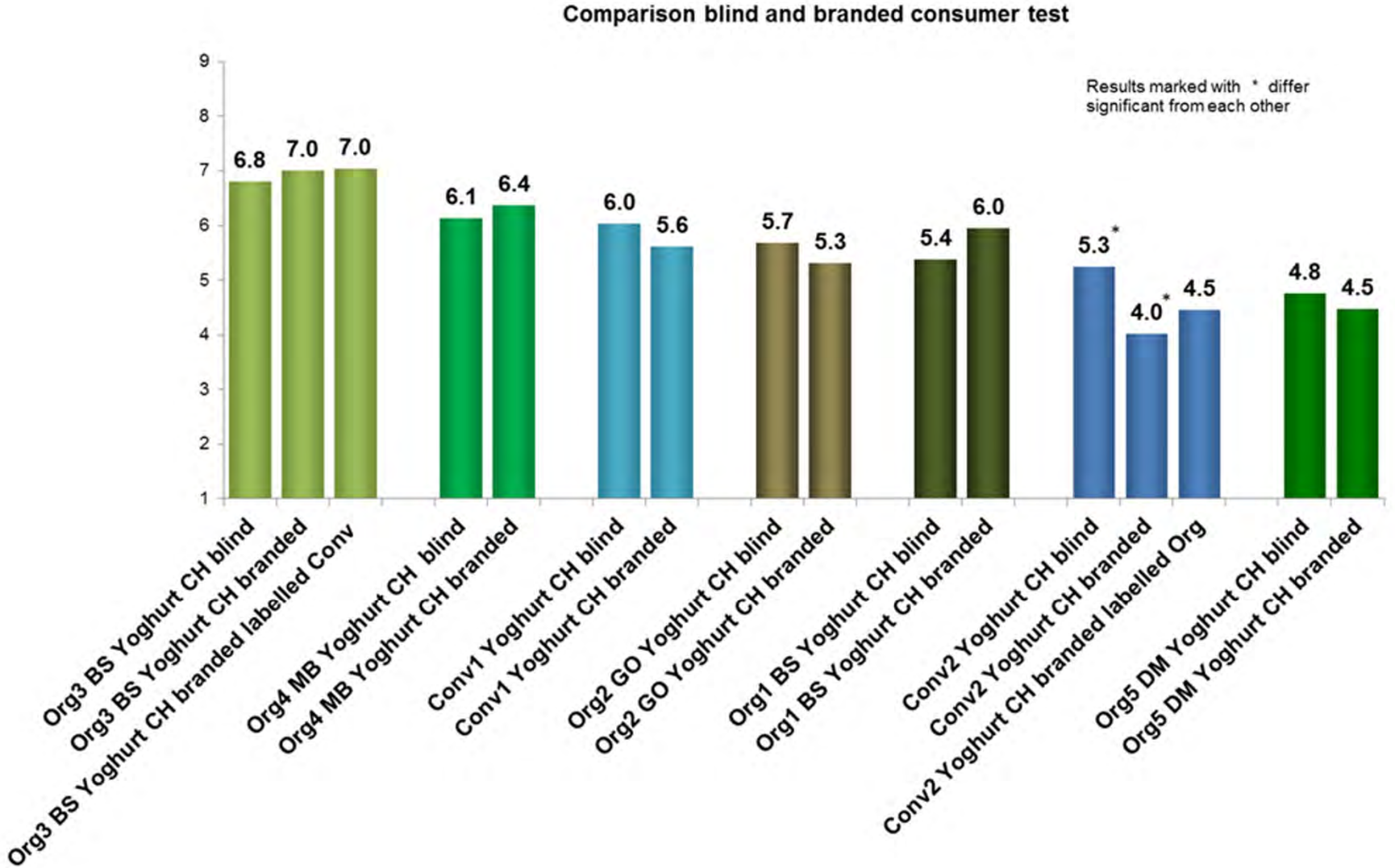
Consumer Testing

Exploration of Sensory Product Properties and Consumer Acceptance – *in Switzerland*



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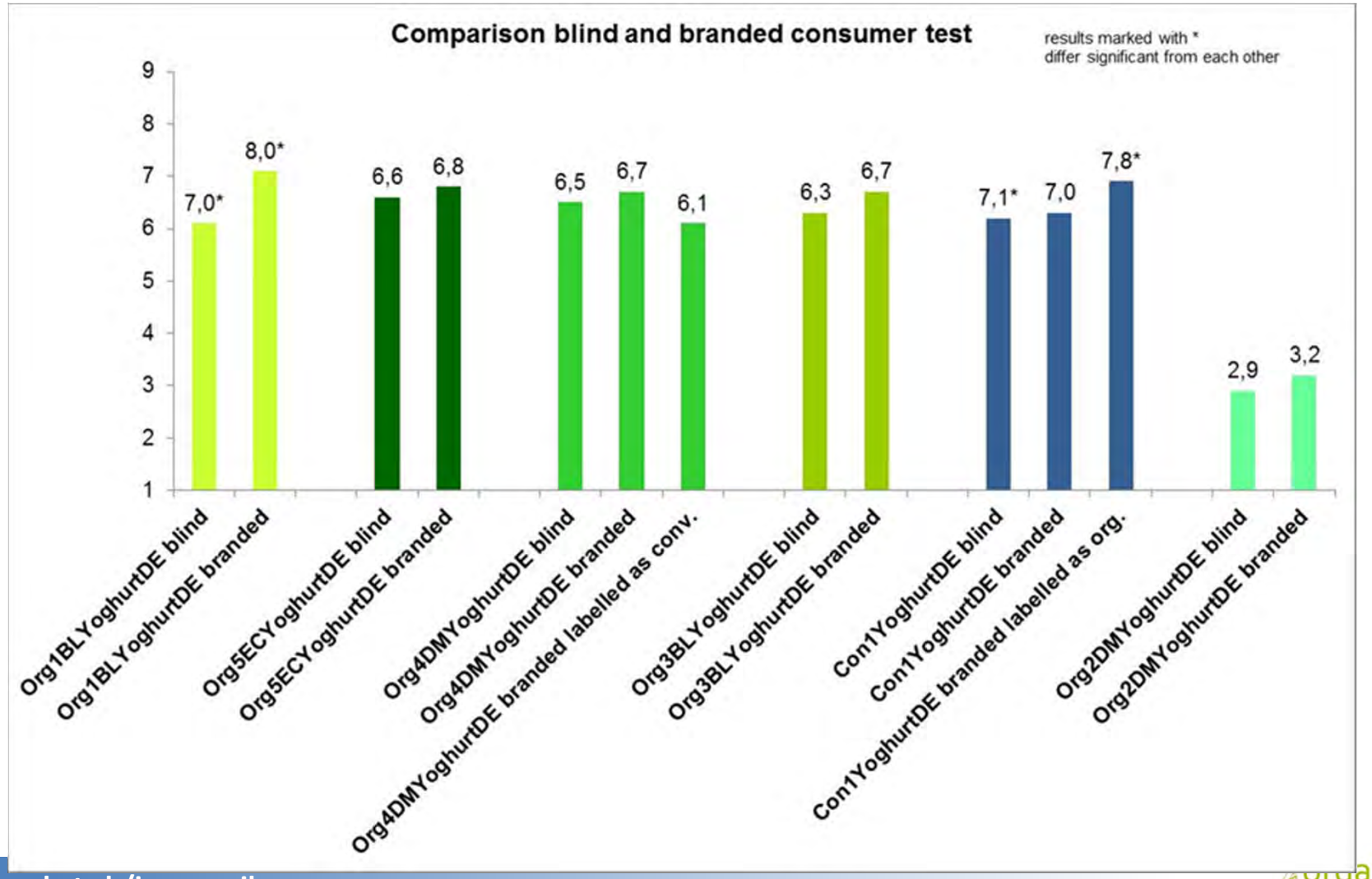
Consumer Testing

Exploration of Sensory Product Properties and Consumer Acceptance – *in Germany*



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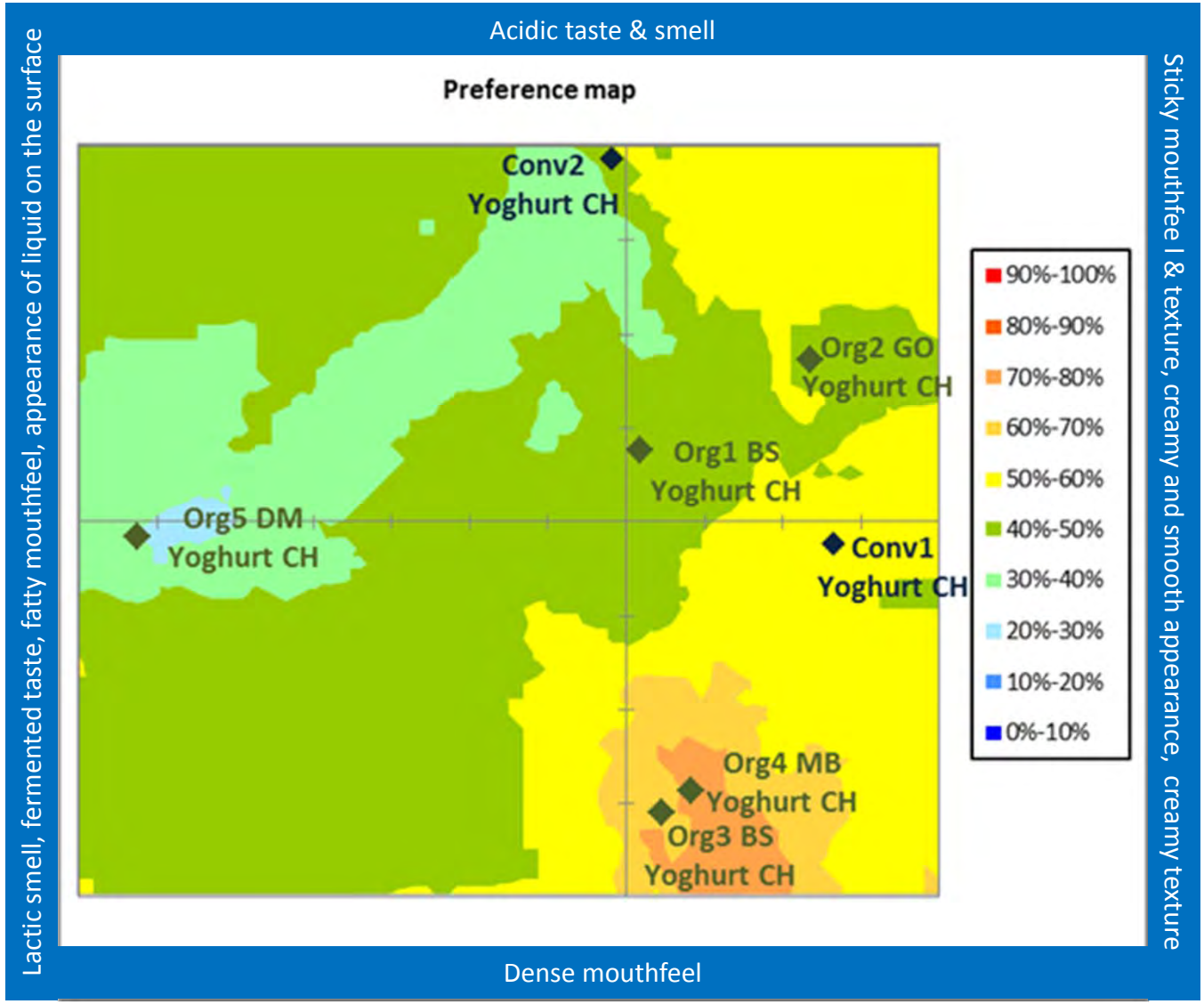
Case Study „ECROPOLIS“

- **Data Analysis / Synthesis**
  - Preference Mapping → PAN-European Mosaic
  - Product Improvement Potential

Preference Mapping



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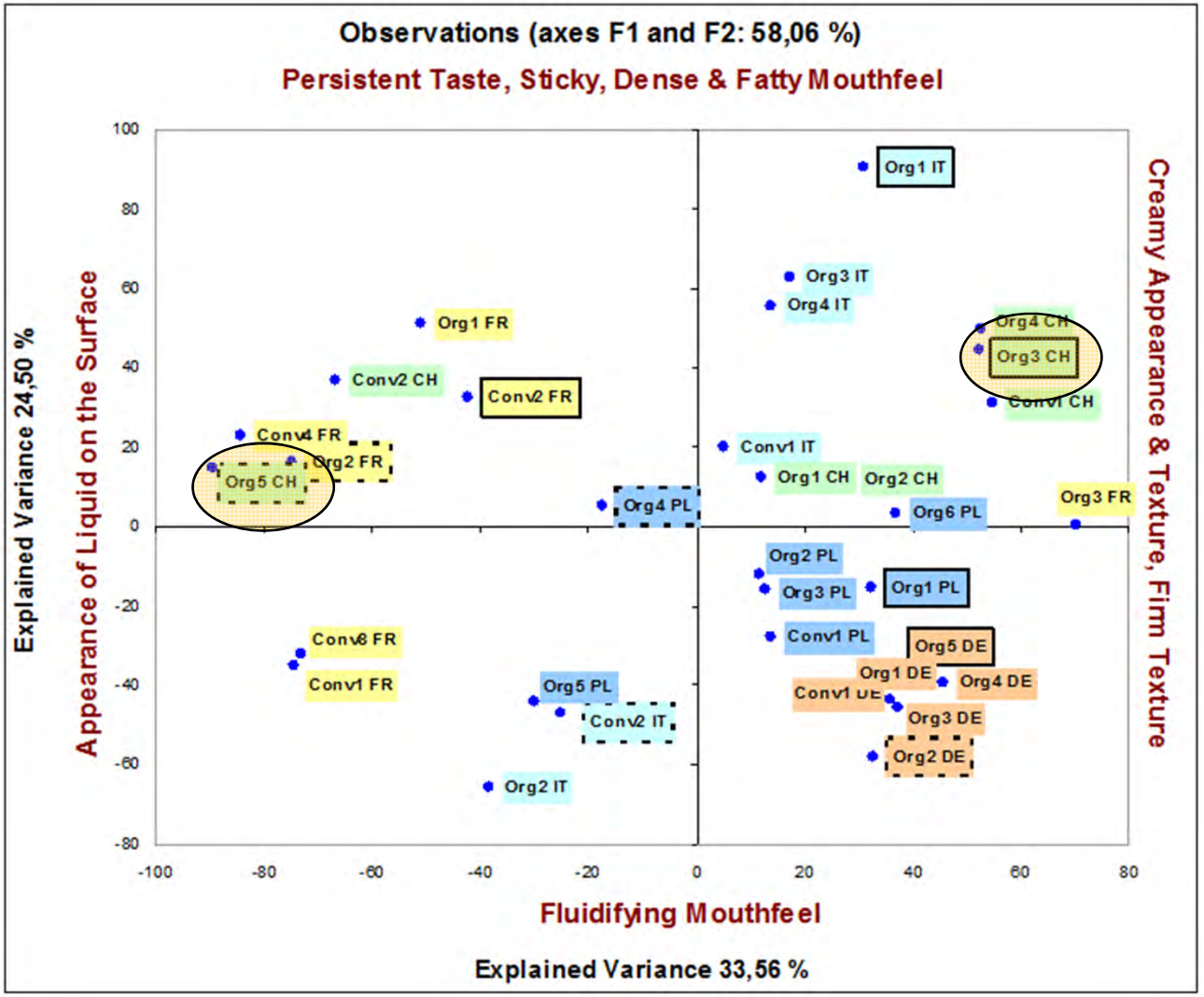
Preference Mapping

→ PAN European Mosaic



- 17 attributes
- Most liked samples marked by solid line squares
- Least liked samples marked by dotted line squares

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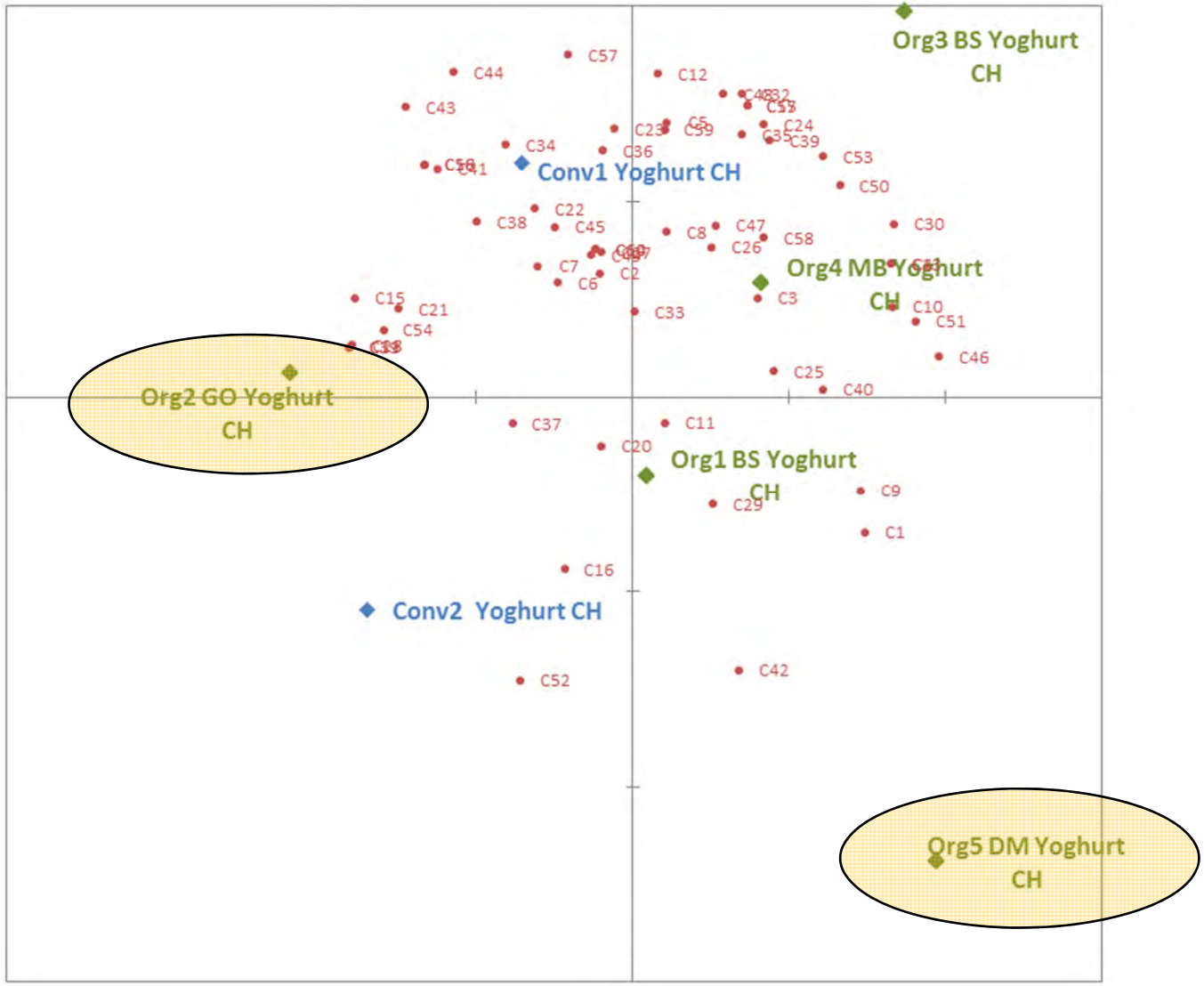
Product Improvement Potential



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Product Improvement Potential

› Drivers of Liking

Variables	Overall Liking
Appearance Creamy	**0.835**
Appearance Smooth	**0.820**
Appearance Presence of liquid on the surface	-0.582
Odour Fermented	0.031
Odour Lactic	-0.133
Texture (Spoon) Firm	0.704
Texture (Spoon) Sticky	**0.879**
Texture (Spoon) Creamy	**0.842**
Taste Acid	-0.081
Taste Fermented	-0.006
Taste Persistant Taste	-0.023
Mouthfeel Sticky	**0.901**
Mouthfeel Dense	**0.882**
Mouthfeel Flows in the Mouth	-0.427
Mouthfeel Fatty	-0.097
Overall Liking	**1**

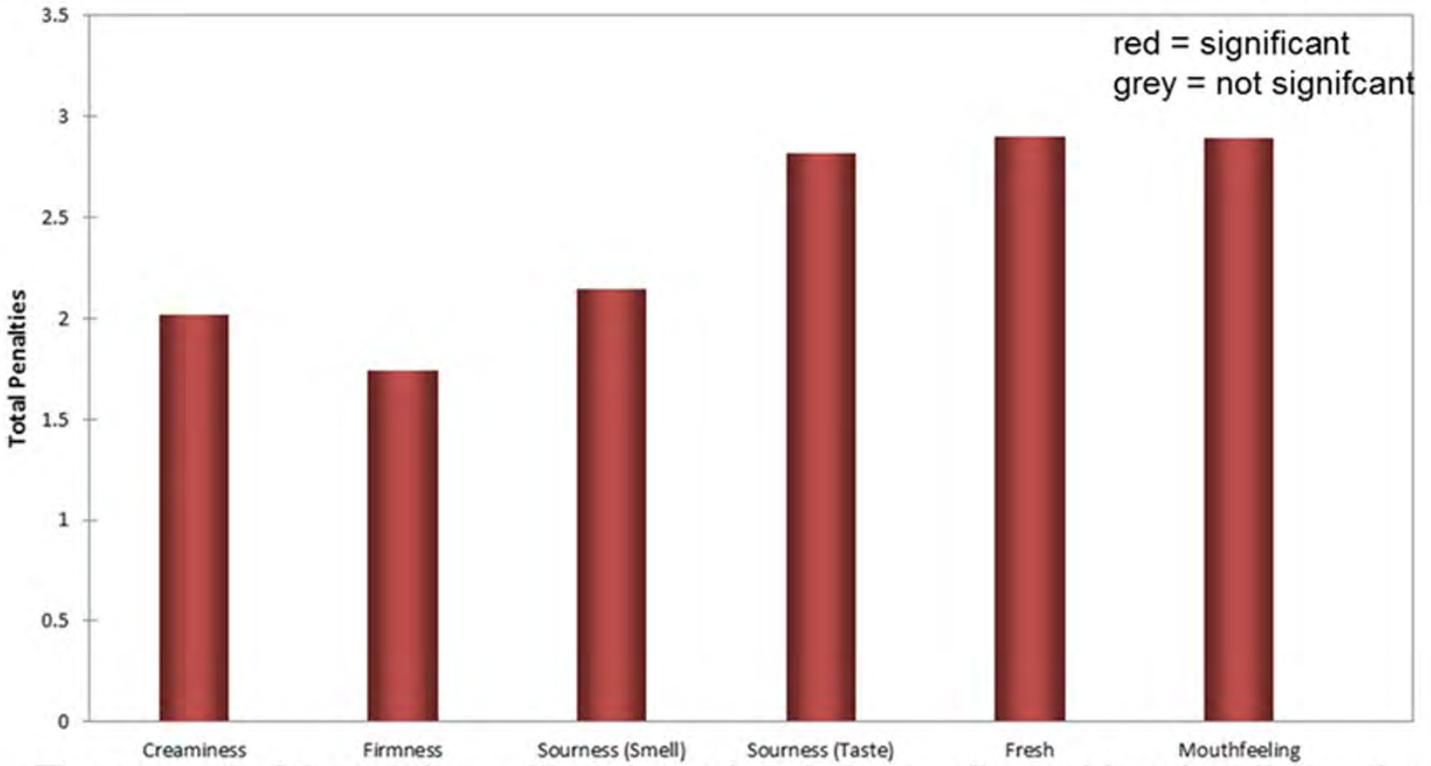
Product Improvement Potential

› Drivers of Liking

	Conv1 Yoghurt CH (Mean Value from Sensory Profiling)	Conv2 Yoghurt CH (Mean Value from Sensory Profiling)	Org1 GO Yoghurt CH (Mean Value from Sensory Profiling)	Org2 BS Yoghurt CH (Mean Value from Sensory Profiling)	Org3 BS Yoghurt CH (Mean Value from Sensory Profiling)	Org4 MB Yoghurt CH (Mean Value from Sensory Profiling)	Org5 DM Yoghurt CH (Mean Value from Sensory Profiling)	Correlation Overall-Liking with Sensory Attributes
Appearance Creamy	80.9	13.3	63.7	66.9	79.7	77.7	7.2	**0.835**
Appearance Smooth	85.9	12.7	58.5	80.3	81.6	74.6	5.7	**0.820**
Appearance Presence of liquid on the surface	34.0	86.2	34.9	32.3	47.6	43.9	85.3	-0.582
Odour Fermented	55.4	77.2	48.8	58.1	39.9	37.6	19.7	0.031
Odour Lactic	36.4	21.5	42.3	34.8	52.6	54.7	77.5	-0.133
Texture (Spoon) Firm	69.3	77.4	41.7	48.7	79.2	77.4	34.6	0.704
Texture (Spoon) Sticky	81.1	28.1	56.5	62.9	77.4	78.8	8.6	**0.879**
Texture (Spoon) Creamy	78.3	18.7	57.4	66.5	74.3	75.6	8.4	**0.842**
Taste Acid	66.2	76.0	52.9	70.6	23.4	32.3	12.2	-0.081
Taste Fermented	23.4	23.7	47.9	23.7	71.0	57.8	83.2	-0.006
Taste Persistant Taste	54.8	58.2	51.2	63.0	37.7	41.7	30.6	-0.023
Mouthfeel Sticky	62.2	37.4	49.7	55.7	66.4	69.2	16.9	**0.901**
Mouthfeel Dense	56.6	49.9	40.8	50.9	66.3	70.3	37.3	**0.882**
Mouthfeel Flows in the Mouth	43.0	46.6	57.1	63.7	36.8	36.5	43.9	-0.427
Mouthfeel Fatty	46.5	39.6	51.7	39.3	58.8	57.9	71.7	-0.097
Overall Liking	6.0	5.3	5.4	5.7	6.8	6.1	4.8	**1**

Product Improvement Potential

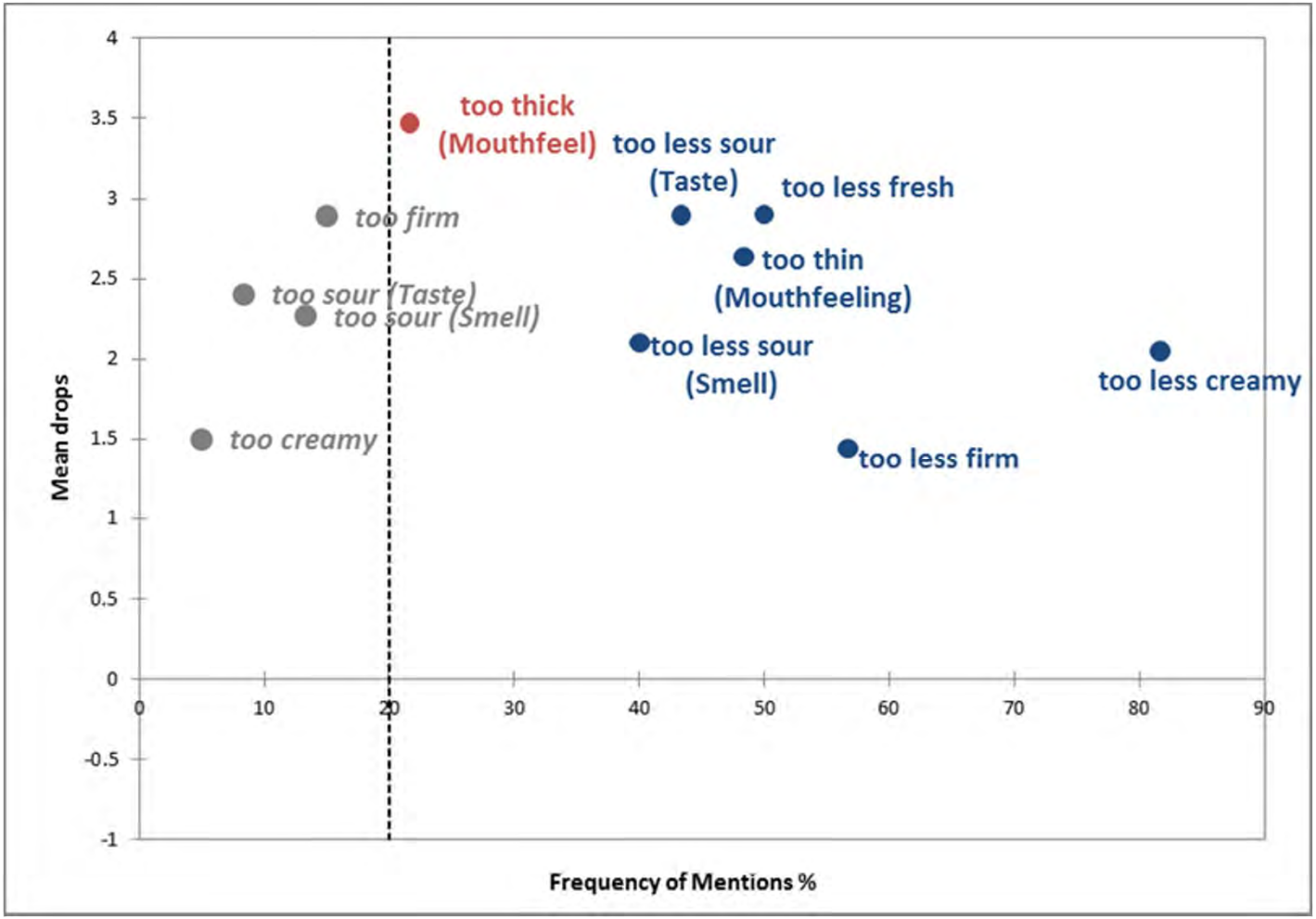
› Penalty Analysis (JAR Scales) → Org 5



The amount of the total penalties shows in relation to all considered attributes the one which shows the greatest influence on overall-liking when rated outside of the area «just about right»

Product Improvement Potential

› Penalty Analysis (JAR Scales) → Org 5



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Synthesis

Sensory Analysis ↔ Consumer Research

"A and C are a bit on the gritty side... B seems to have a bitter aftertaste... C has a good taste but a bit too mushy..."

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Conclusions

„STRESS-FIELD between …

- **Consumer Expectations**
- **Official Requirements / Standards**
- **State-of-the-art in Food Processing**
- **Food Reality / Sensory Properties of Food**
- **Overall-Liking / Consumer Acceptance**

Acknoledgments

- **Patrizia Piccinali, Co-Coordinator of IG Sensorik (SGLWT),**

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Confederazione Svizzera
Confederaziun svizra

Eidgenössisches
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- **All colleagues (SME's and RTD's) out of the EU Project**

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Thank You yery much for your Attention !!!

… any Questions ?

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