

Innovative pulse and cereal-based food fermentations for human health and sustainable diets

Understanding Fermentation Behaviour and Acceptance

Outputs from a Socioanthropological
Approach and its Complementary Nature with Behavioural and
Economical Approaches.

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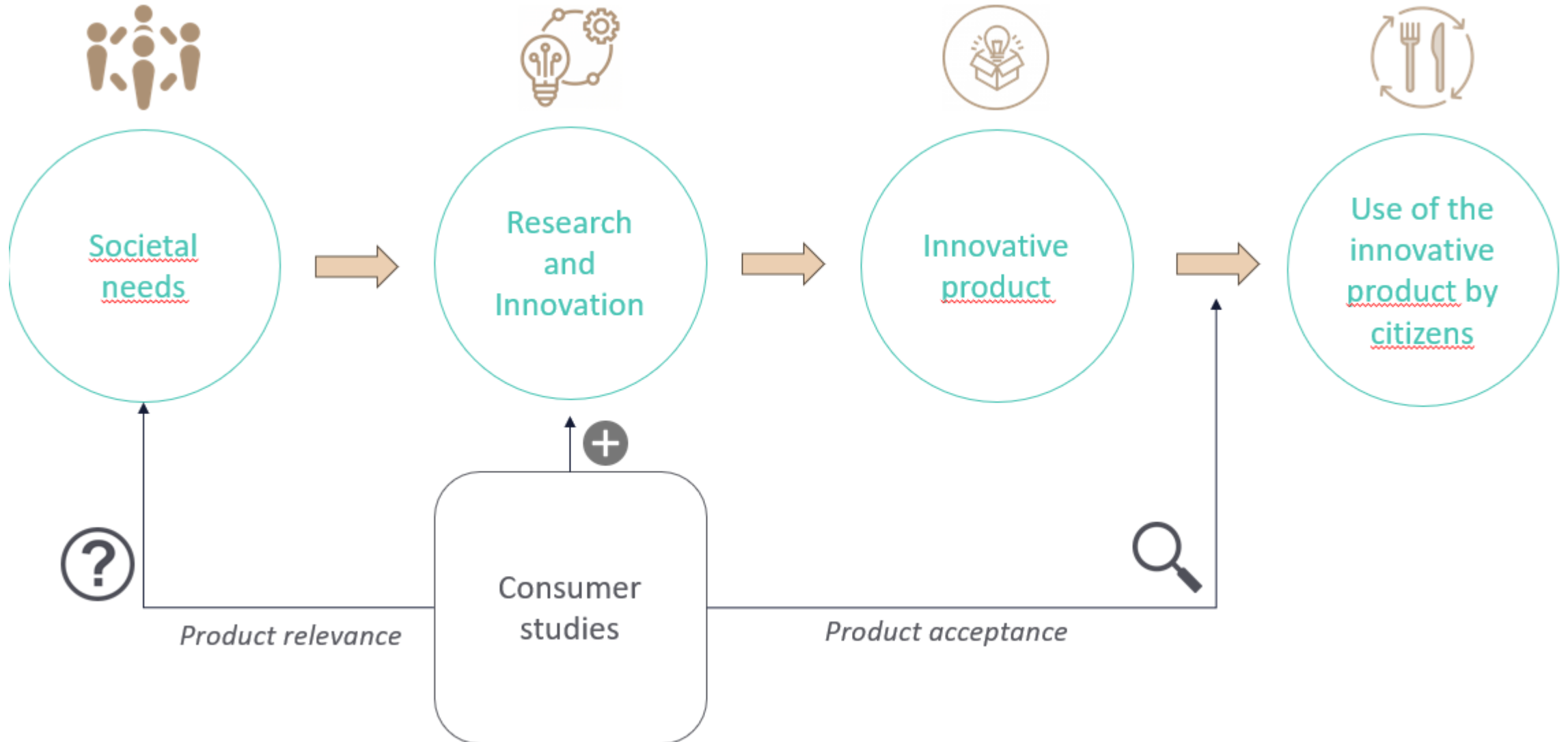
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Innovation & Consumer studies



Different approaches in consumer studies

Economics of consumer Behavior



Marketing
Management sciences
Behavioral economics

Socio-anthropology of consumption



Sociology
Anthropology
Social psychology

Consumer Behaviour

- Objectives

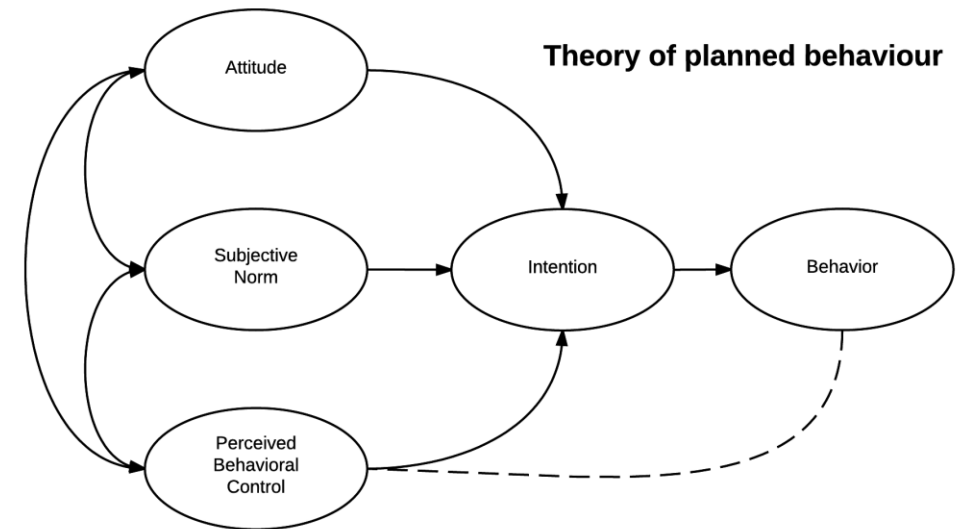
- Understanding the taste, representations and attitudes of consumers
- Segmenting the population
- Identifying key determinants of willingness to try

- Methods

- Questionnaires in general population
- Sensory lab tasting
- Living-lab tests

- Type of results

- Models
- Graphs



- Objectives

- Understanding the sociocultural dimensions in which practices are embedded (Practice Theory (Warde, 2016))
- Explaining the trajectory of early adopters
- Identifying levers of acceptance, ie. repeated consumption



- Methods

- Qualitative study with specific population (early or ancient adopters)
 - Interviews
 - Observation
 - Ethnography
- Specific questionnaires



HealthFerm WP4: combining different approaches



Work package 4: Assess, in different social contexts, **consumer acceptance** of fermented foods, their technologies and their role in the transition towards a more sustainable healthy diet.



Ethnographic Study

Inventory of types and uses
of fermented food in the EU



Validation in France, Romania
& Sweden



Consumer Acceptance

Meal design



Meal tasting in restaurant
context



Monitoring changes in consumer perceptions

Towards plant-based fermented foods

WP3 Interventions – before/after
consumer data collection
- repeated Pan EU Survey

Complementarity of the approaches: The case of the study of fermenters

Pan EU Survey



- Belgium, Denmark, Germany, Finland, France, Italy, Romania, Sweden, Switzerland.
- December 2023 and February 2024
- 7 812 respondents – 750 / country
- Repartition in age and gender
- 1565 fermenters - 20% (11% in Italy – 45% in Romania)
- Questions on: socio-demographic characteristics, anthropometrics, dietary lifestyle, food-frequency behaviours, food choice motives, attitudes, trust, perceived market opportunities, and sensory preferences

Qualitative interviews

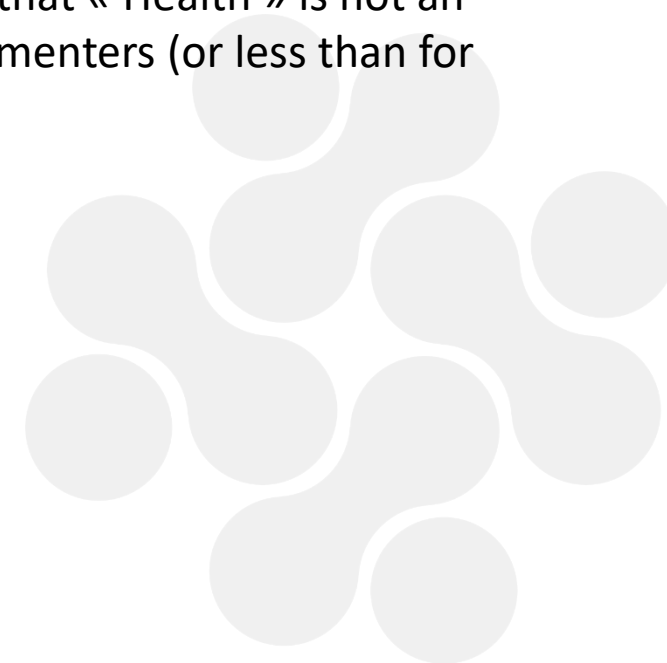


- France, Hungaria, Sweden
- June 2024 and May 2026
- 40 fermenters
- Discussions on general food habits, the cursus as a fermenter and the production-consumption of fermented foods.
- Interviews were conducted by Maxence Blanchet.

Relation to health – Survey

Pan EU fermenters		Odds ratio	95 % CI	P-value
<u>It is important that the food I eat is</u>	healthy	0.8	[0.8 , 0.9]	<0.001
	a way of monitoring my mood	1.2	[1.1 , 1.3]	<0.001
	convenient	0.8	[0.8 , 0.9]	<0.001
	providing me pleasure sensation	0.9	[0.8, 1.0]	0.003
	organic and natural	1.2	[1.1 , 1.3]	<0.001
	Affordable	1.1	[1.0 , 1.1]	0.06
	helps me control my weight	1.2	[1.1 , 1.2]	<0.001
	Familiar	1.0	[0.9 , 1.0]	0.19
	environmentally friendly	1.1	[1.0 , 1.2]	0.004
	animal friendly	0.9	[0.8 , 0.9]	<0.001
	fairly traded and locally produced	1.2	[1.1 , 1.3]	<0.001

These results suggests that « Health » is not an important value for fermenters (or less than for non-fermenters).



Relation to health – Interviews

- Some respondents first stated that health was not the most important motivation, but mentioned further in the discussion that they were careful about health benefits of their foods.
 - *“I: Do you pay attention to things like getting a certain amount of protein or fat, or avoiding too much sugar?
F13: Not really. Not really. Well, I do pay attention to fat, because as long as you're not deep-frying everything and you're not throwing in a whole stick of butter when you're cooking... I mean, it still has to taste good, you know, but I'm not someone who goes overboard either. [...] We still eat eggs, and soy protein and all that... and I do think of those foods as bringing protein. But I don't go as far as actually measuring how much protein I'm getting.
I: But for example, with the lasagna, did you add some because you thought “that'll add protein,” or was it just to have a bit of...?
13: Yeah. Yeah, a little. Yes, actually, I did. So yes, I do pay some attention to what you're getting. But... I'm not obsessed with it, you know?” F13 (man, 30)*

The qualitative study suggests that "health" is a complex issue, and that some fermenters value health in their food but are not able to consciously express it, which can explain the surprising result in the survey.

Attitudes toward plant-based foods - Survey

	Pan EU fermenters	95 % CI	P-value
	Odds ratio		
I consume more Plant-Based Fermented Foods than a year ago?	1.1	[1.1 , 1.2]	<0.001
Plant-Based Fermented Foods contribute positively to my health state	1.0	[0.9 , 1.0]	0.22
It is easy to ferment Plant-Based Foods at home (e.g., vegetables, cereal, pulses, etc).	1.7	[1.6 , 1.8]	<0.001
Eating Plant-Based Fermented Foods is good for the environment.	0.9	[0.8 , 1.0]	0.006
It is important for Plant-Based Fermented Foods to have a short ingredient list and be free from additives (i.e.: clean label products).	1.1	[1.0 , 1.2]	0.002
The organic/bio certification is important for Plant-Based Fermented Foods.	1.0	[1.0 , 1.1]	0.44
Fermented Plant-Based Foods facilitate a sustainable and healthy dietary transition	1.1	[1.0 , 1.1]	0.18
Plant-Based Fermented Foods are novel to me	0.9	[0.8, 0.9]	<0.001

- Progression in the consumption
- Perceived easiness of the process
- Rejection of additives



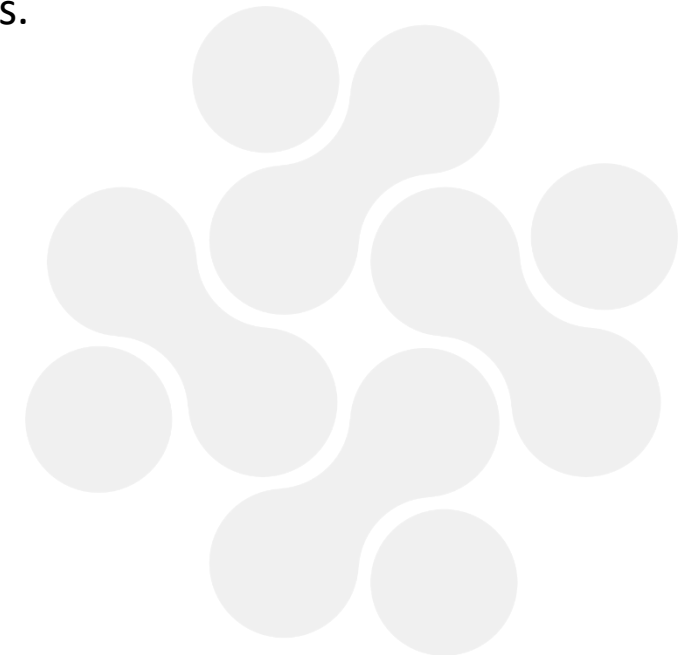
Attitudes toward plant-based foods - Interviews

- Easiness of fermentation is associated to a learning curve, and thus to a progressive increase in consumption
 - *'I really like fermentation because you don't have to do you just actually nothing special just wait' H2 (woman, 25)*
 - *'[speaking about water kefir] after a while, after doing it for several times, you see, you eyeball it, kind of. So, maybe, I am not doing anymore what should be done, but it always works. I have been told it tasted good.' F3 (woman, 33)*
- The absence of additives appears as motivation to ferment food.
 - *'I started with the topic of healthy bread, I looked into the essence of organic farming, to make it chemical-free... [...] They don't use synthetic chemicals or fertilizers, and I think it's better and healthier.' H13 (woman, 59)*

The importance of traditional fermentation - Survey

Pan EU fermenters	Odds ratio	95 % CI	P-value
I would be willing to try a product that is prepared through Precision Fermentation.	1.1	[0.97 , 1.1]	0.19
I would be willing to try a product that is prepared through Traditional Fermentation.	1.2	[1.1 , 1.3]	<0.001
I would be willing to try a product that is prepared though Biomass Fermentation	1.1	[1.0 , 1.2]	0.007

Traditional fermentation is more valued by fermenters compared to non-fermenters.



The importance of traditional fermentation – Interviews

- Participants were confident about traditional fermentation, and more suspicious towards more controlled fermentation, associated with industrial processes
 - *“S4a: I guess I worry if they really make it so controlled that they really isolate just some... I think it's okay to take a mix from someone else that you can identify some positive things in it but, it still is a mix instead of just picking, selecting out only one. Using that because I think, you know, it's kind of taking a vitamin supplement, like you don't know what the effect of the other ones are.*
 - *[...]*
 - *S4b: Yeah. Or basically kind of acknowledging that we don't really understand the full extent of it. And so there might be things that going on, that are choosing to use natural diverse fermentations instead of like, a single strand fermentation. For possible health reasons.*
 - *S4a: Yeah, that we don't know. Also I would worry, I would be concerned if there was some company, whatever that was, going to make ferment a single strain. What would determine which strain they pick? Would they be looking at, like weight loss, based on fallacious ideas that losing weight is good for you? Like, what would be the goal?” S4a (woman, 32) and S4b (man, 34)*

- **In the survey, non-omnivores were more likely to ferment at home:**
flexitarian (OR = 1,6, $p < 0,001$), pescatarians (OR = 1,9, $p < 0,001$), vegetarians (OR = 1,8, $p < 0,001$) had comparable odds to be home-fermenter, while vegans had the highest odd-ratio (OR = 4,8, $p < 0,001$).
- Some of the interviewees mentioned starting fermentation due to their dietary status, in order to have a more diverse alimentation:
 - *“As I am vegetarian, I needed some condiments ideas. And so kimchi was one of the condiments ideas, among others [...] It’s pleasurable, when it’s not always the same taste” F11 (Woman, 31)*

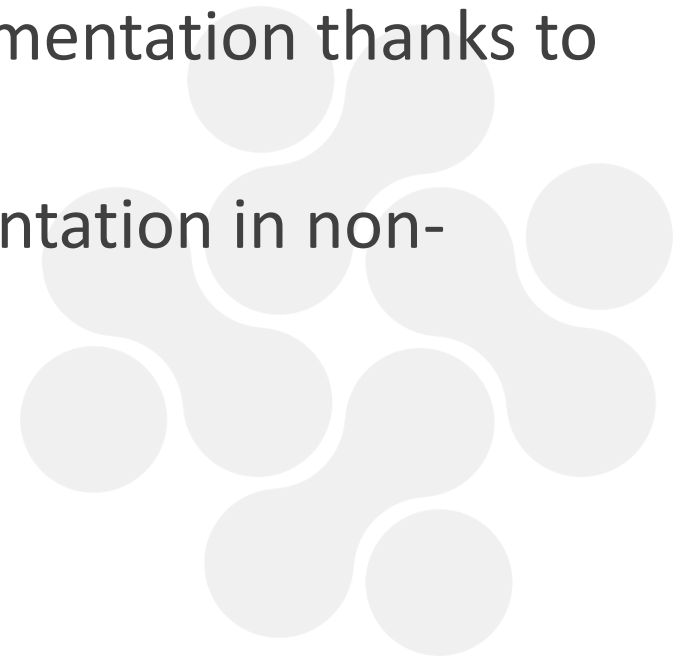
Household composition

- In the survey, **larger households tended to be positively associated with sourdough fermentation** (3: OR = 1.8, $p=0.004$, 4: OR=1.8, $p=0.01$, 5: OR =1.9, $p=0.02$) and beer fermentation (3: OR=1.9, $p=0.04$, 5: OR=3.0, $p=0.02$) compared with single-person households.
- In the interviews, some households started fermentation at home to feed their children with the best food possible:
 - “Actually, it all started from the fact that at that time there was a lot of poor-quality bread available. And then I started thinking about how to make healthier bread for the children, etc.” H12 (woman, 60)
 - *“S2: Like, then you know, then you are in control of what's in it
M: Okay, because you...
S2: Because I wanted healthy food for my children, and I think the more... the less products process and the less products that are added is best for the children.
M: So the kids were an additional motivation.
S2: Yeah, most definitely. Before the children we didn't eat so healthy.” S2 (woman, 48)*

Conclusion: the input of qualitative study

The results from the qualitative study allow:

- To confirm and illustrate some results (ex: importance of traditional fermentation)
- To put some results in perspective (ex: importance of health)
- To understand some results (ex: increasing practice of fermentation thanks to progressive learning)
- To explain some correlations (ex: higher practice of fermentation in non-omnivores and in households with children)



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