



Koji Fermentation for Plant-based Cheese Alternatives?

The Power of Fermentation: Japan's Tradition and Science in
Switzerland, Embassy of Japan in Switzerland, 21.09.2025

Verena Looser, Agroscope

Swiss cheese tradition & new challenges



Image source: Agroscope

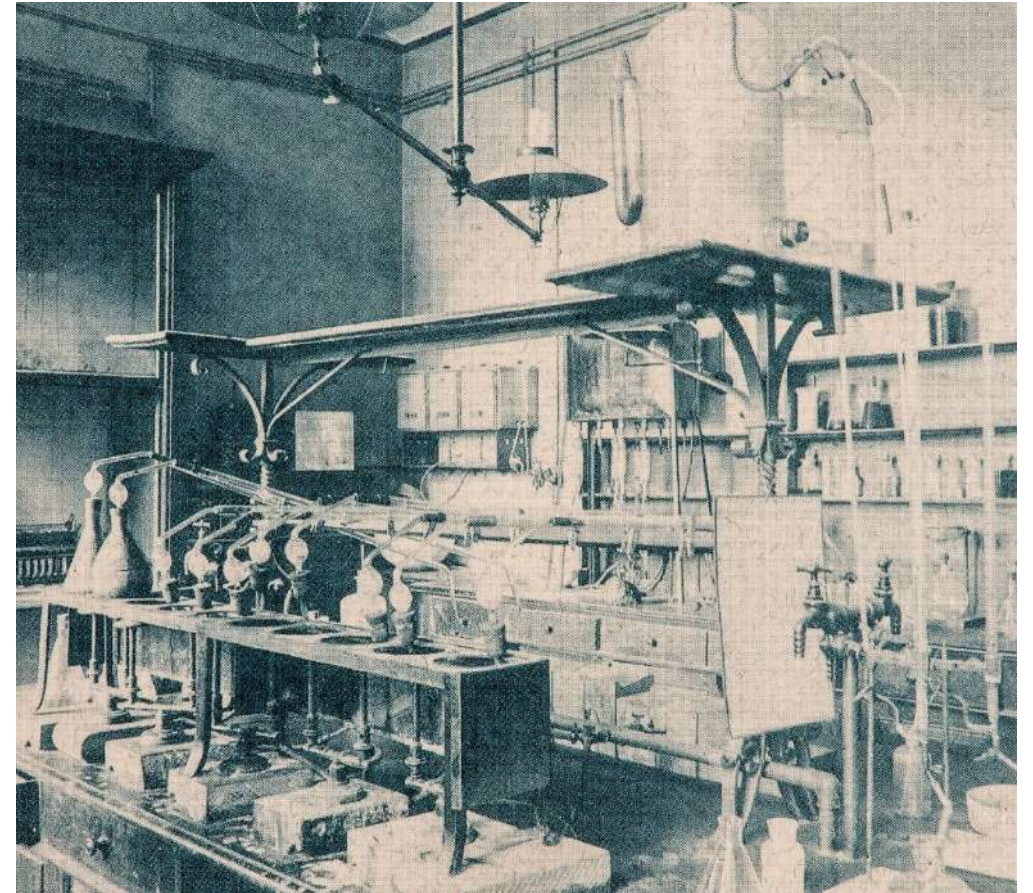


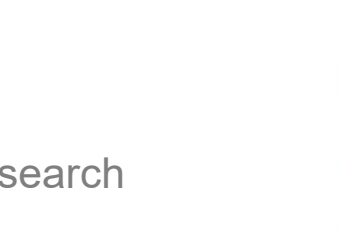
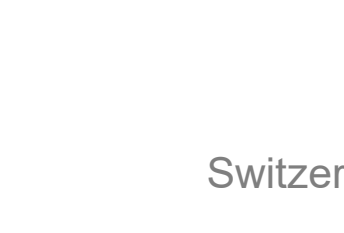
Swiss cheese tradition & new challenges

Agroscope's beginnings in the 19th century



Can we apply our traditional knowledge of cheese-making also to plant-based raw materials?





Agroscope

Switzerland's federal center for agricultural research

**PRACTICE-ORIENTED APPLIED RESEARCH FOR
THE AGRICULTURE AND FOOD SECTOR**

Agroscope's microbial strain collection

conserved fermented food microbiome of Switzerland



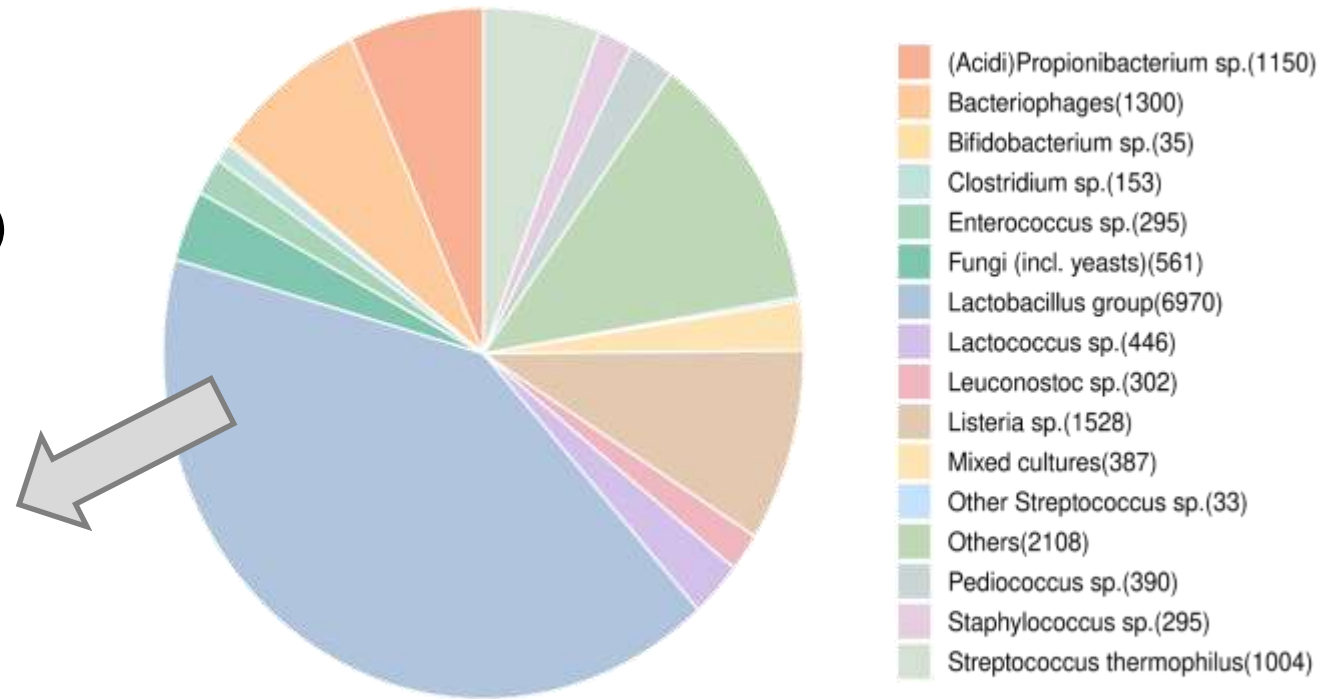
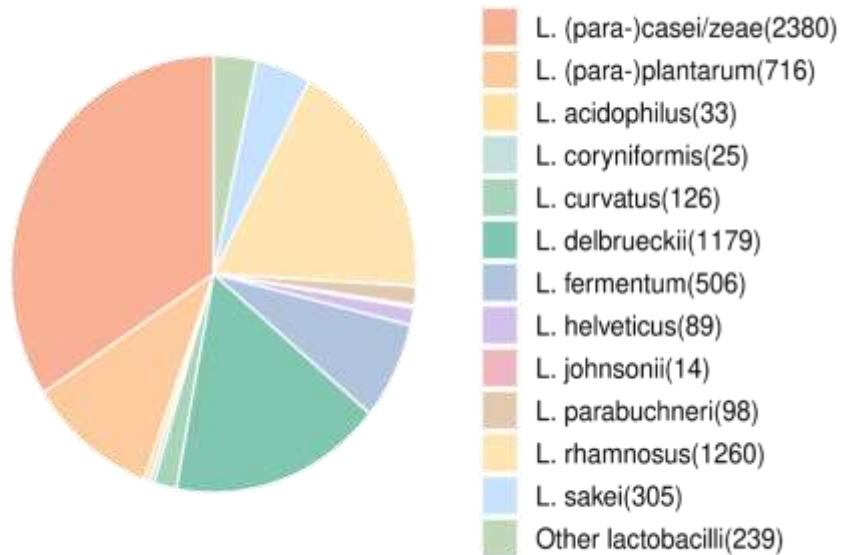
Image source: Agroscope



Agroscope's microbial strain collection

~17'000 strains

mainly *Lactobacillus* group (6970)



~10% sequenced
(OpenGenomeBrowser)

1 *Aspergillus oryzae* (koji) strain, isolated 1960



Agroscope's bacterial cultures

for fermentation and ripening of Swiss cheese





Schematic of fermentation and ripening of cheese

Fermentation

25 – 45°C, 6 – 24h



No residual sugar,
pH > 5,
1 – 2% salt after brining

Ripening

10 – 15°C, 1 – 24 month



Sugar → Acids
Lactose Lactic acid
 & others

Fat **Lipolysis** → Complex aroma
Protein **Proteolysis** & Umami



Plant-based alternative to Raclette made from fermented sunflower oilseed cake

Innovation project
supported by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Innosuisse – Swiss Innovation Agency



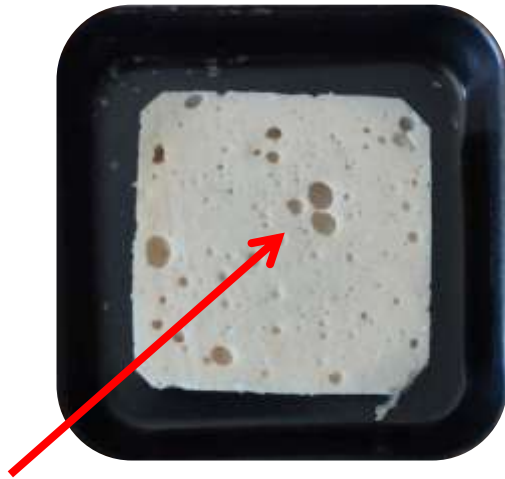
↓
sunflower seed oil

Raclette experience (melting)
unique flavour (not an imitation)

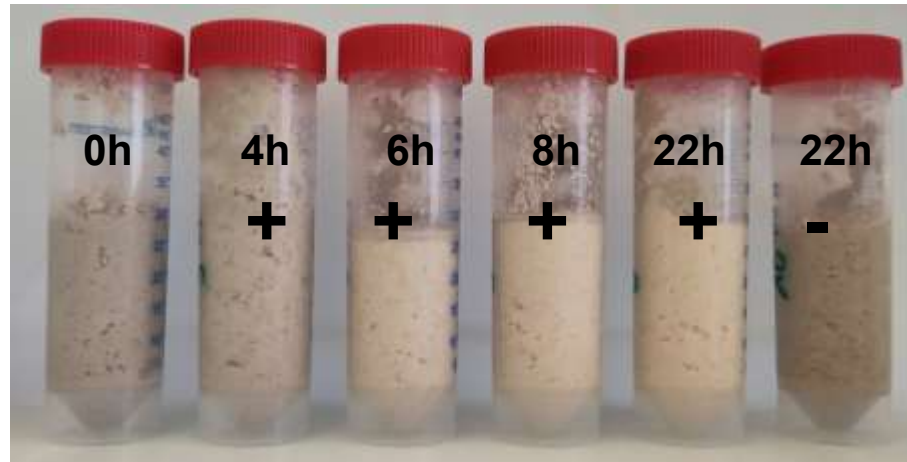


Fermentation of plant-based cheese alternative

using cheese starter culture



- Unable to degrade available sugar sucrose
- Addition of glucose necessary → enables adjustment of desired pH value
- During fermentation, equal or more buttery aroma (diacetyl) is produced as in cheese
- Fermentation inhibited growth of spore-forming *Bacillus cereus*
- Improved colour by fermentation





Ripening of plant-based cheese alternatives

is at its beginning



Source: ajour.ch



Source: Agroscope

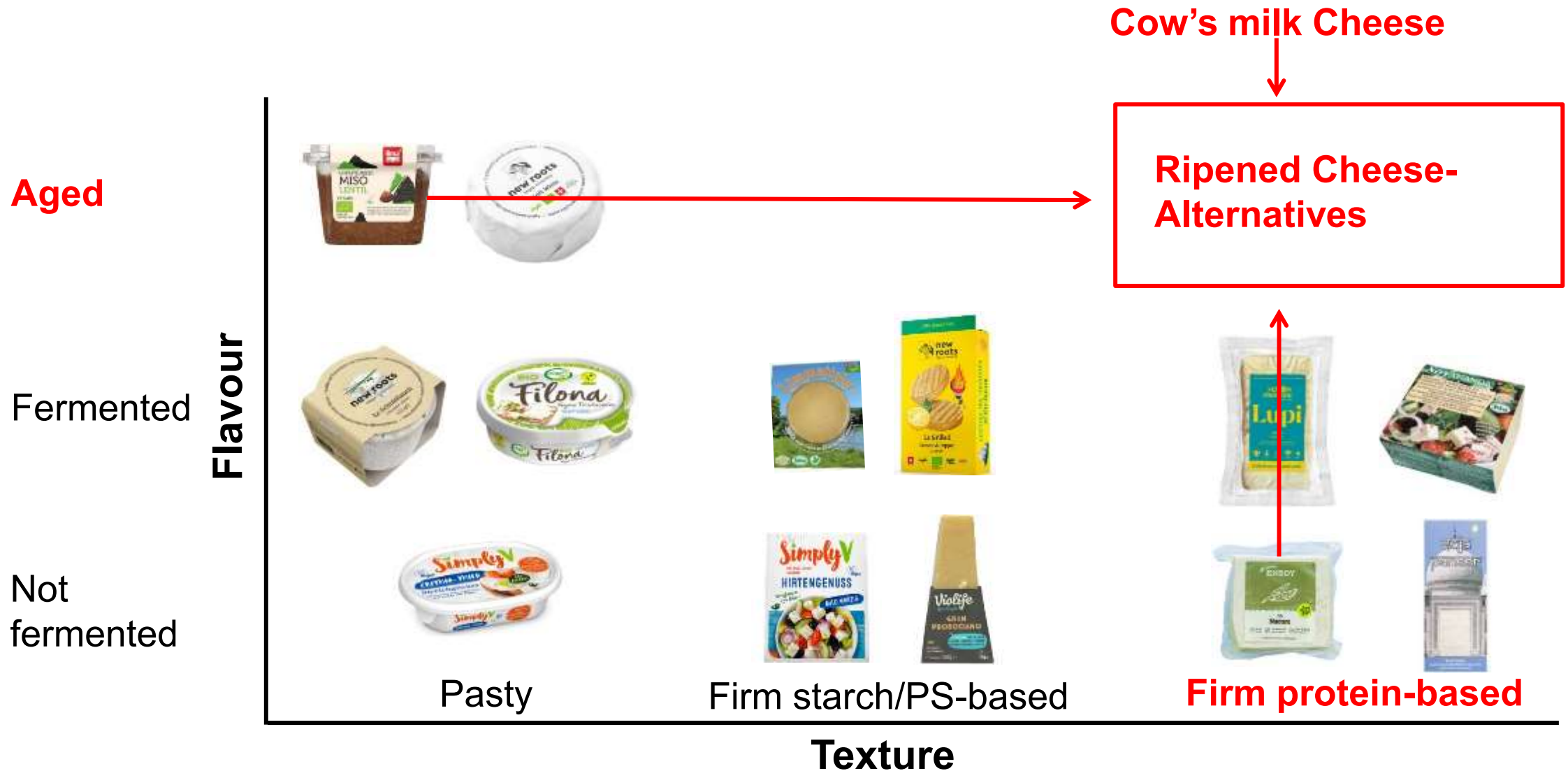


Some plant-based products on the Swiss market





Bringing together Traditions and Science





Platform for ripening plant-based cheese alternatives

Planned Agroscope research project: 2026 – end 2029

Swiss ingredients



Starch-free pulses
(e.g., soy)



Fermented protein curd



Using cheese dairy
infrastructure



Ripening



Umami and
ripening flavours



Open for collaboration

Bringing together Traditions and Science

Application of Koji-fermentation?

Specific Koji-strains?

Swiss ingredients



Starch-free pulses
(e.g., soy)

Soy milk
preparation



Fermented protein curd



Using cheese dairy
infrastructre

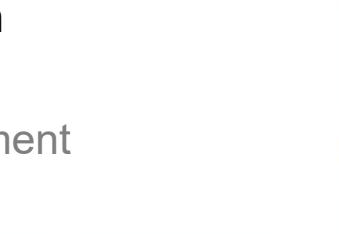
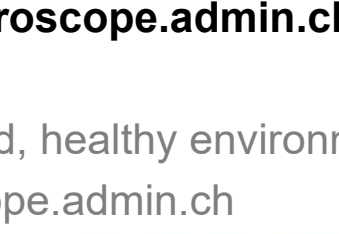
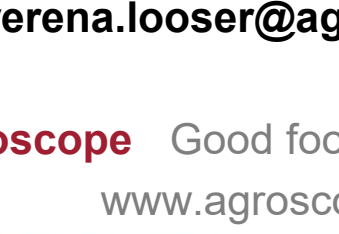
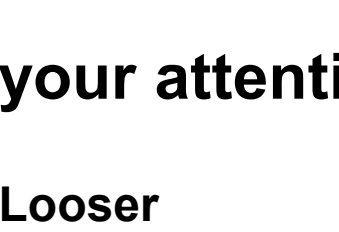
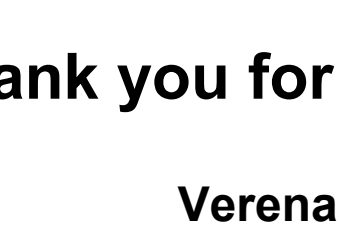


Ripening



Umami and
ripening flavours

Open for research collaboration and implementation by interested Swiss companies



Thank you for your attention

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Agroscope Good food, healthy environment
www.agroscope.admin.ch

