

19th Meeting of the FAO-CIHEAM Mountain Pastures sub-network
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The contribution of mountain pastures to the link to terroir in dairy and meat products

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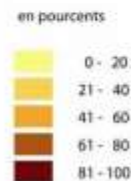


Mountain areas in the EU-27

- 18% of the farms
- permanent grasslands: 58% of the mountain AA
- Mountain products
 - cattle: 10% of the milk & 14% of the meat
 - sheep/goats: 32% of milk & 23% of the meat
- Higher production costs (about +10%)
- Richness of traditions and knowhow: an opportunity to add value to the products
- Numerous Geographical Indications
 - 45% of the total number
 - share in agricultural turnover: 23% for milk and 6% for meat sectors (< 5% in average)



Mountain areas (proportion of arable land)



Santini et al., 2014

source: PELCOM

Preserved mountain landscapes and culture

Some emblematic success stories do exist

- efficient specific public policies since 1970
- initiatives of local leaders who protected (Geographical Indications) and developed their traditional products...



Geographical Indication

PDO: Protected Designation of Origin



PGI: Protected Geographical Indication



Regulation (EC) 628/2008

Separate type of **intellectual property** based on the link to terroir

*"A PDO is a product that originates from a territory and **whose characteristics are linked** mainly to the geographical environment including **human and natural factors**"*

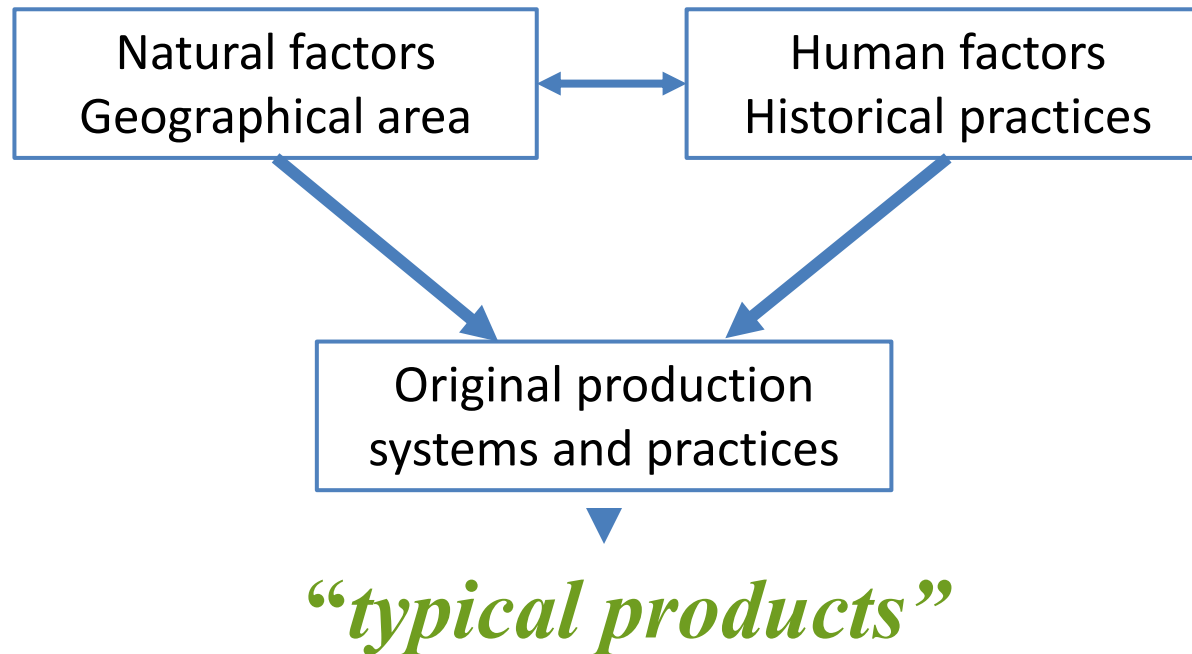
Council Regulation (EC) No 510/2006



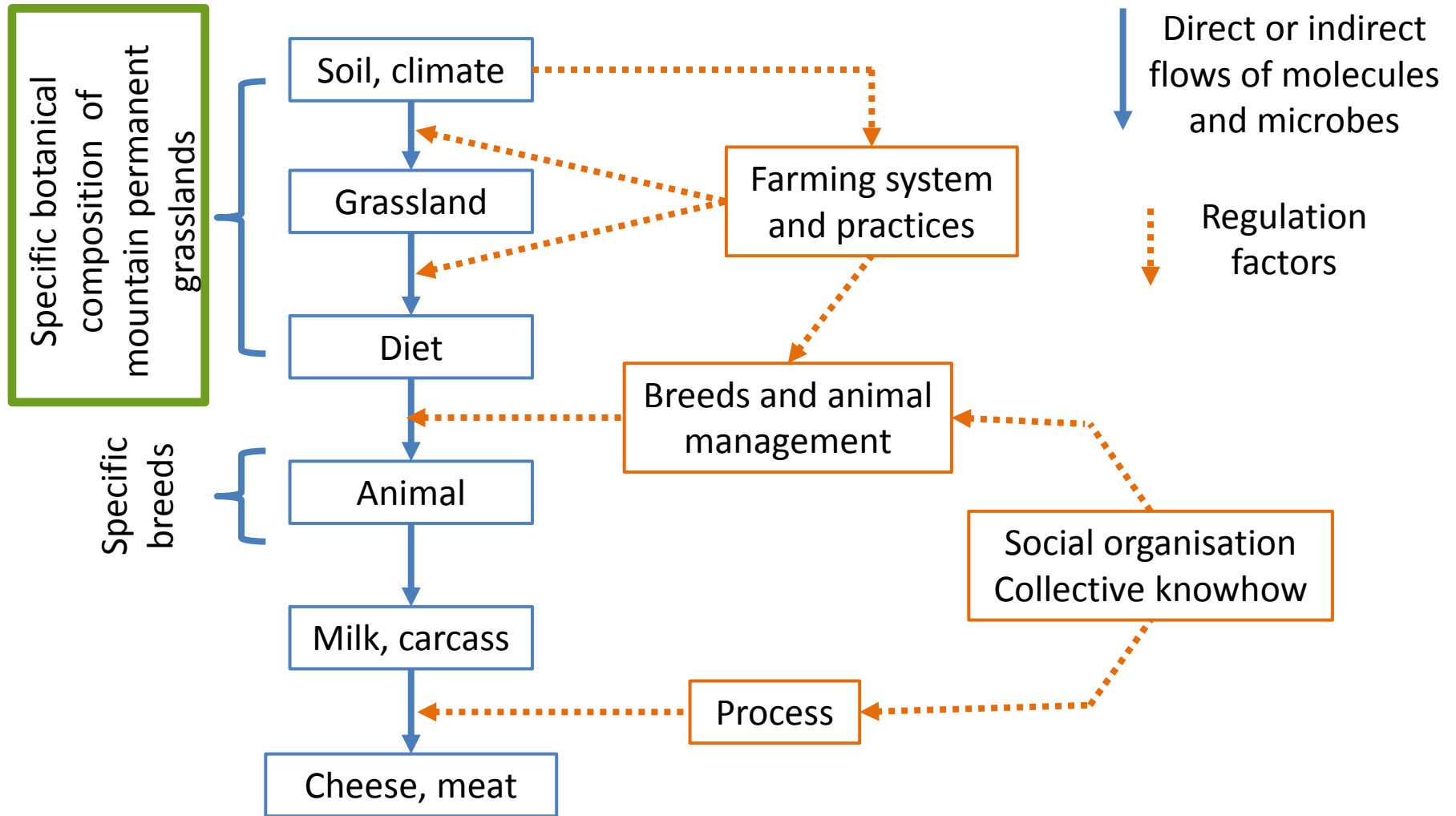
Definition of Terroir

*“A geographical limited area where a **human community** generates and accumulates along its **history** a set of cultural distinctive features, knowledge and practices based on a **system of interactions between biophysical and human factors.**”*

Casabianca et al., 2006



The link to terroir for animal products



Adapted from Dorioz et al., 2000



Dairy products

Meat products

Botanical composition of forages and cheese sensory characteristics

On-farm conditions

- ▶ Cheese sensory properties are modified when the botanical composition of the pasture changes

Grasslands from lowland rich grasses and legumes



Intense taste and cabbage or pungent flavours



Abundance cheese



associations

Buchin et al., 1999
Bugaud et al., 2001
Martin et al 2005

Grasslands rich in a wide variety of highland dicot.



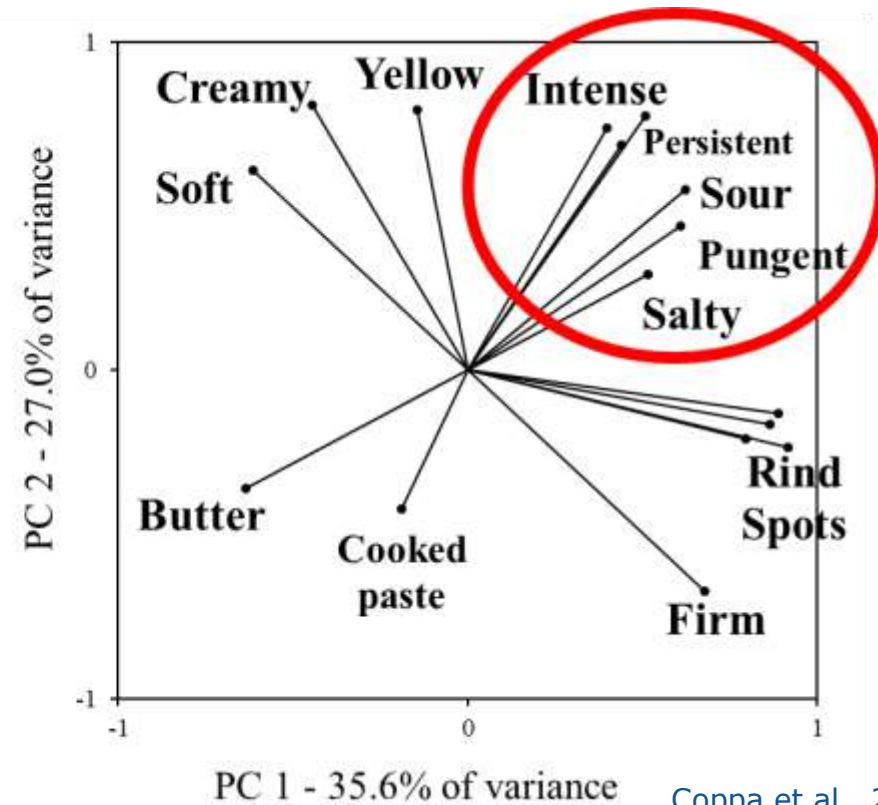
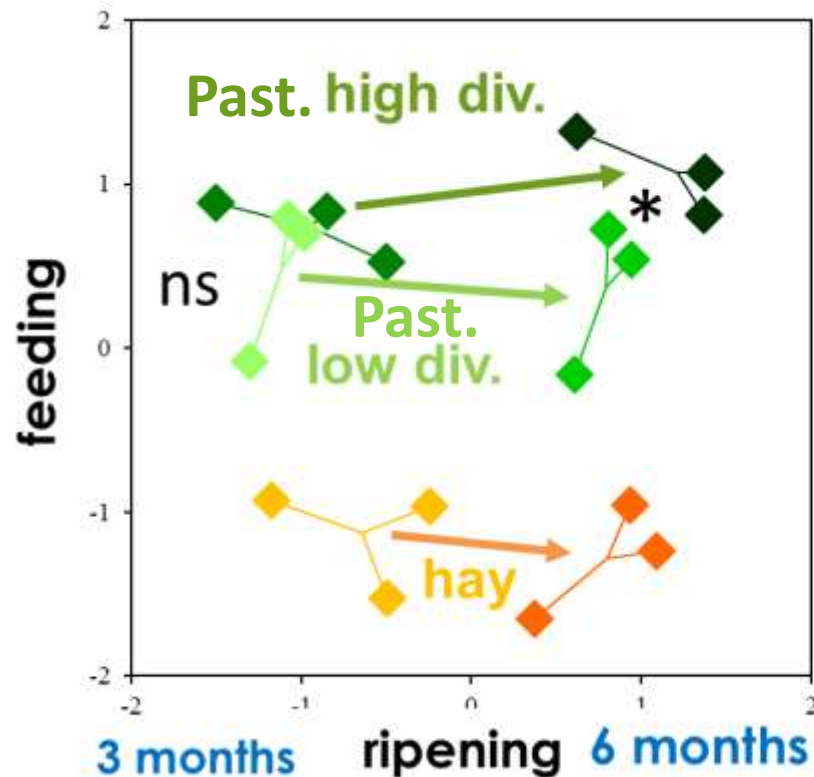
Fruit, hazelnut and cooked milk flavours



Botanical composition of forages and cheese sensory characteristics

Experimental conditions

- ▶ the effect of the biodiversity of pastures on cheese flavour is weaker; it is revealed during ripening... and varies during summer



Coppa et al., 2011

Mountain pasture and milk fatty acids

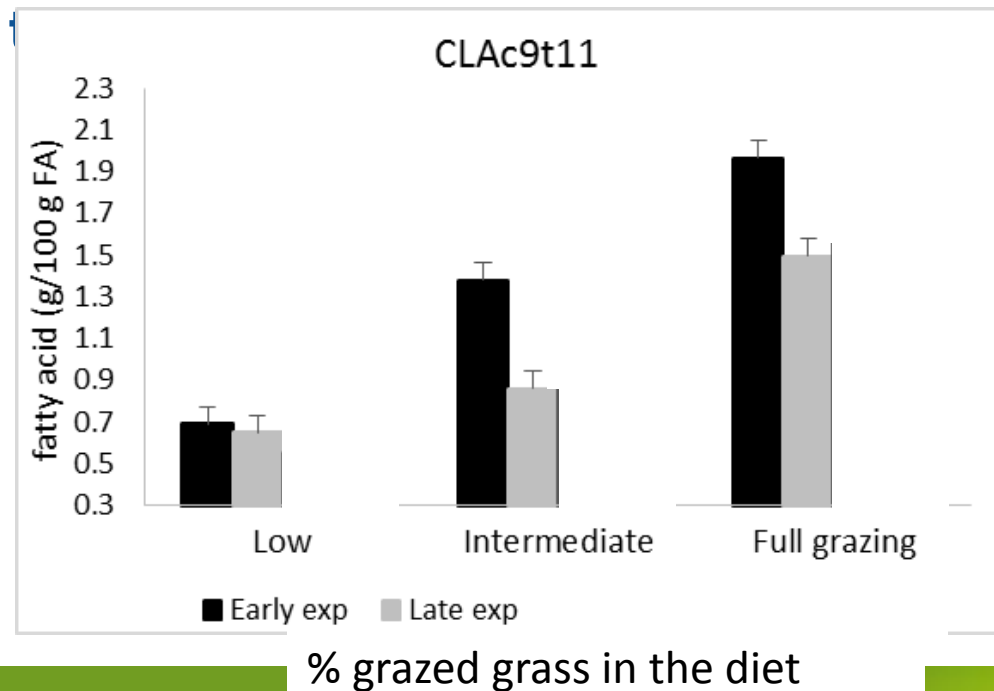
Specific composition of mountain milk fat...

- ✓ Higher milk concentration in ω -3 fatty acids...
- ✓ ...due to a limitation of rumen biohydrogenation by plant secondary metabolites

... highly variable according to

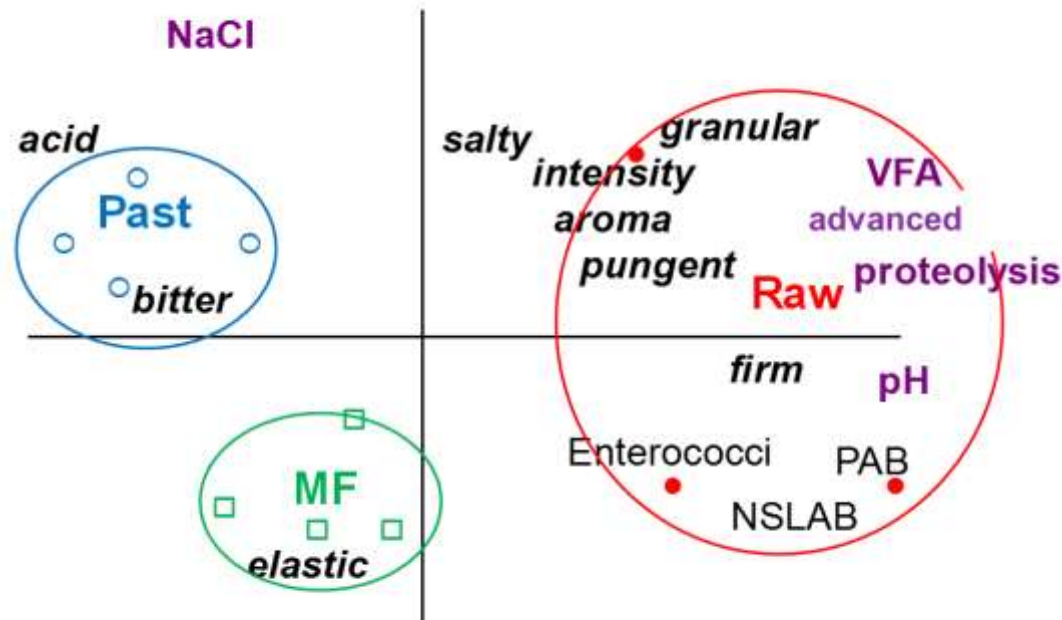
- ✓ Proportion of grazed grass in the diet
- ✓ Phenological stage of the grasslands
- ✓ ... grazing management...

Coppa et al., 2015



Microbiota of raw milk: influence on cheese

Comparison of Swiss-type cheeses made with raw (**Raw**), microfiltered (**MF**) or pasteurized (**Past**) milk :
microbiology, flavour and volatile compounds

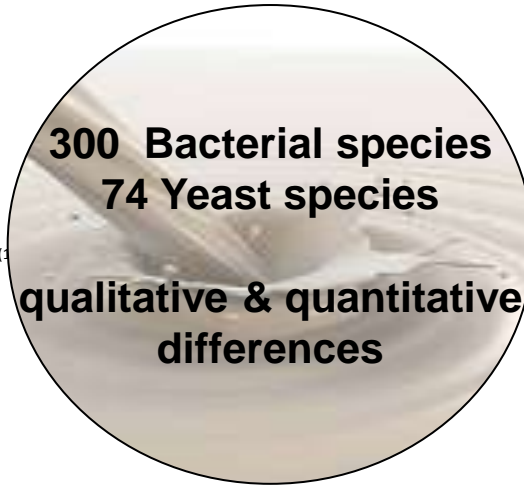


Elimination of raw milk microbiota:

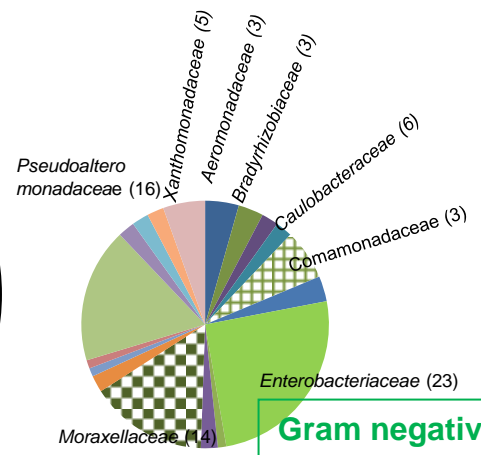
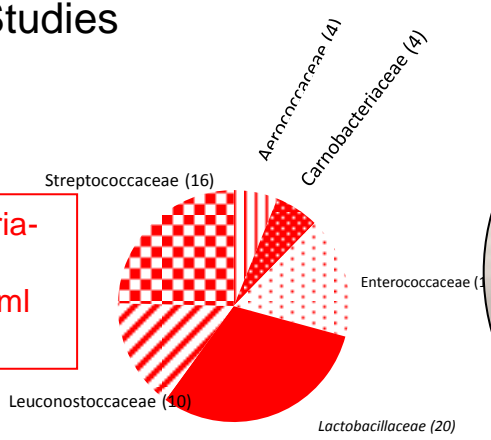
- ✓ Decrease metabolic activity during ripening (proteolysis, fermentation)
- ✓ Loss of flavour intensity and richness

Microbiota of raw milk: diversity still exists

From 50 Studies

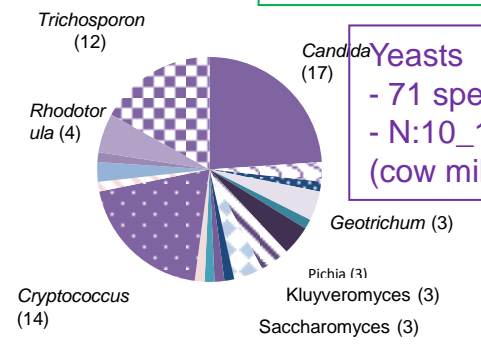
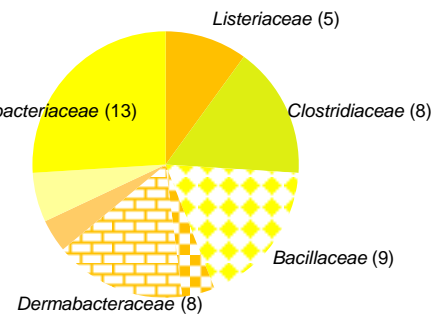
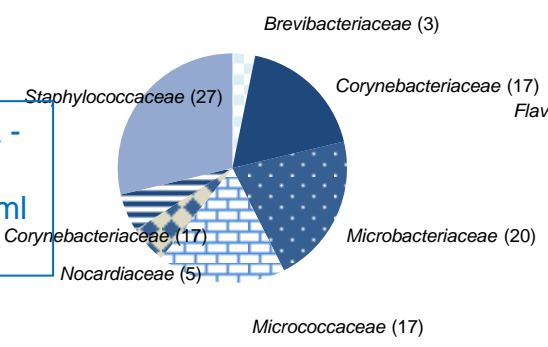


Lactic acid bacteria-
65 species
- N 10-100 CFU/ml
(cow milk)



Gram negative bacteria
-94 species
- N : 10_1000 cfu/ml
(cow milk)

Ripening bacteria -
94 species
- N100-1000 c/fuml
(cow milk)



Yeasts
- 71 species
- N:10_100 cfu/ml
(cow milk)

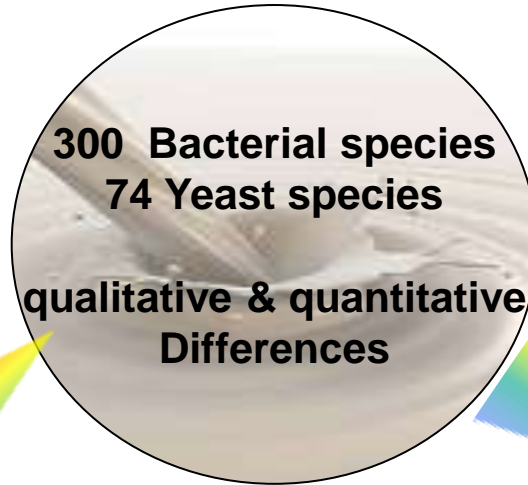
() number species /genus

One Milk microbiota = more than 30 microbial species

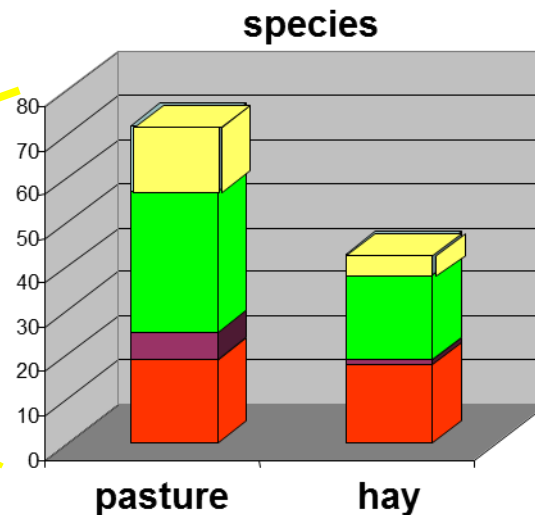
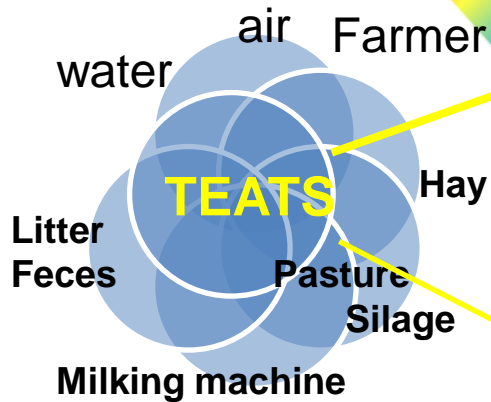
Montel et al., 2015

Microbiota of raw milk: diversity is fragile

Excessive disinfection
(teats & milking machine)



Pasteurisation



- Lactic acid bacteria
- Ripening bacteria
- Gram negative bacteria
- Other (Bacillus)





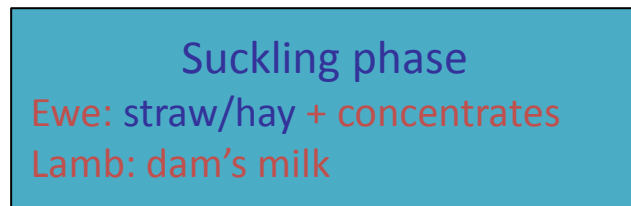
Dairy products

Meat products

Lamb and beef in Mediterranean countries

production indoors concentrate-feeding

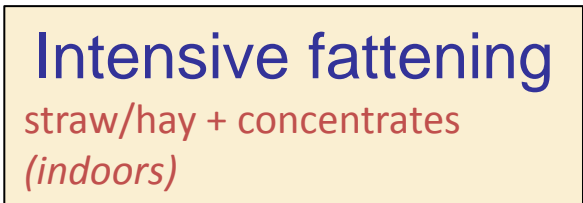
- **Light lambs**



Weaning
1.5 mo

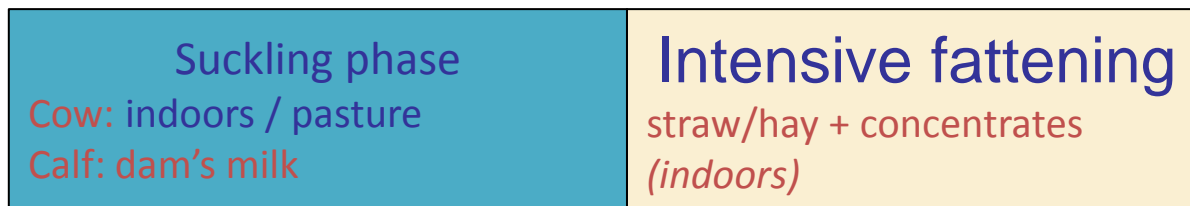


slaughter 10-12 kg



slaughter
22-24 kg LW

- **Young bulls (12-14 months)**



weaning
200 kg LW

500 kg LW

BUT... nowadays interest for grazing-based systems (image, healthy meat)

Do the carcass and meat correspond to consumers demand (white fat, pale pink meat)?



Light lambs in mountain areas:

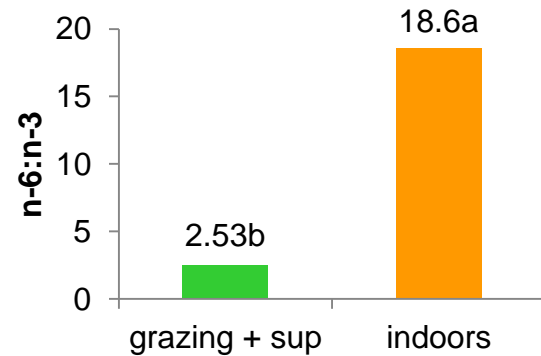
Indoors vs. grazing meadows, alfalfa, ...

- **Performance:** No or minimal effects
- **Subcutaneous fat colour:**
 - Subjctive: no effect
 - Instrumental: grazing increased yellowness

Consumers will not perceive the difference but possibility to trace grazing



- **Meat:** pasture
 - decreased intramuscular fat and
 - improved fatty acid profile

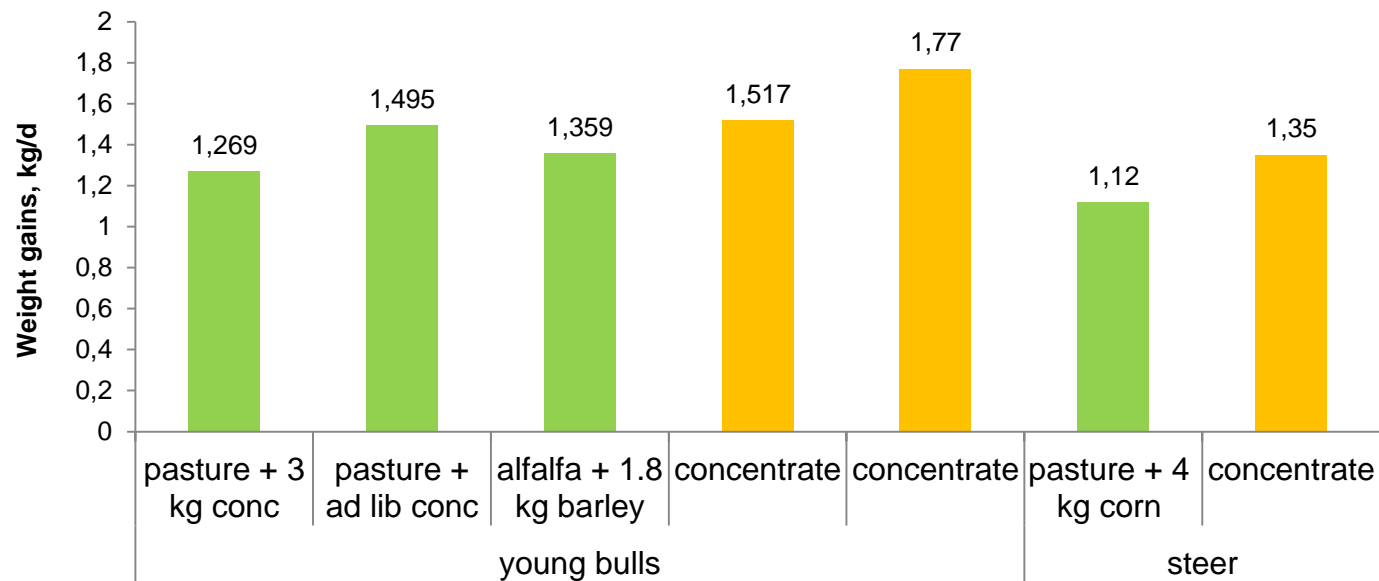


Fattening cattle in mountain areas:

Indoors concentrates vs. grazing meadows, alfalfa, ...

- **Performance:** grazing decreased growth rates but ...

depending on the **type and quantity of supplement**



Fattening cattle in mountain areas:

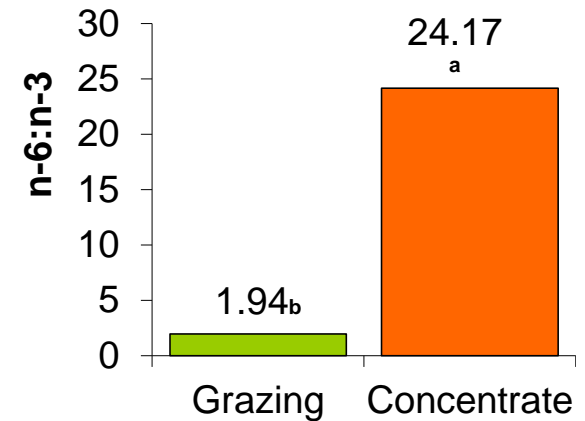
Subcutaneous fat:

- **cover:** scarce in grazing cattle
- **colour:** grazing increased yellowness



Meat quality when similar slaughter weight and fat cover:

- **Toughness & colour:** no effect
- **Fatty acid profile:** improved by grazing
affected by the finishing period depending on:
 - * the type of feed
 - * the length of the period



Conclusions

The link to terroir: key role of mountain grasslands on

- ✓ Product chemical (and microbial) composition
- ✓ Product sensory properties (sometimes poorly understood)

Link between grassland and product varies



- ✓ Grassland management
- ✓ Diet formulation
- ✓ Milk pasteurisation
- ✓ ...

Objective references for mountain food chains labelled with Geographical Indications:

- ✓ Refine the understanding of the link to terroir
- ✓ Develop appropriate specifications
so that products reflect the best the uniqueness of their terroir

and add value to the production chain!

Thank you for your attention



*on the Nutrition
of Herbivores*

SAVE THE DATE

September 2-6, 2018
Clermont-Ferrand, France

Website: <https://symposium.inra.fr/isnh2018>
Contact: isnh2018@clermont.inra.fr

