Milk quality assessment for intensive and extensive goat farming of the Skopelos breed in Greece

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Current state

Intensive livestock production systems

- *growing fast to satisfy the increasing demand*

Public skepticism about intensification in livestock production is driven primarily

- *by adverse links to **environmental aspects, and***
- *sustainable utilization of **natural resources***

Extensive livestock production systems are low-input

- *and are critical for supporting rural communities*

Economic sustainability of such systems is often

- *challenged by **natural resource limitations and** adverse climatic conditions, while*
- *products from extensive systems are considered of **superior quality**, but within their resource-limited environment **quality repeatability might often be questionable***

The evaluation of the structure, organization, and operation of breeding systems in animal production, as well as the production of livestock products of high quality and acceptance from the consumer, is considered essential for the sustainability of breeding in the future

Objective

Evaluate the quality of goat milk produced in an intensive and an extensive farming system throughout the lactation period in the Greek Skopelos dairy goats

2 Farms

Intensive

- Permanently housed - zero-grazing system
- High-input system: increased investment on labour and infrastructures) with extensive supplementary feeding of concentrates
- Machine-milking
- Automated milk yield recording and herd management systems
- Evidence-based herd health & welfare management plan
- No processing of milk

Extensive

- Year-round, extensive grazing in grasslands, woodlands and shrublands
- Low-input system: minimum investment on infrastructures and labour, with limited supplementary feeding during winter and autumn
- Hand-milking
- No animal recording equipment and inadequate herd management
- No herd health & welfare management plan
- On-farm milk processing

Materials & methods

Animal phenotyping

- 938 individual milk samples
- 235 goats
  - ✓ 105 animals (Intensive) 135 animals (extensive)
- 4 different lactation stages starting immediately after weaning
- Sampling every 45 days

Milk analysis

- Chemical composition (*Milkoscan FT6000 Analyzer*)
- Physicochemical characteristics (*pH-meter/ CondMeter Rrefractometer*
- Somatic cells count (SCC) and total bacterial count (TBC)
  Fossomatic 5000 and a BactoScan FC150 analyzers)
- Fatty acid composition *(Agilent Technologies 6890N GC)*

Model

$$Y_{ijk} = \mu + FS_i + S_j + (FS \times S)_{ij} + A_k + e_{ijk}$$

FS_i the fixed effect of farming system (i = 1–2);

S_j the fixed effect of the sampling (j = 1–4);

$(FS \times S)_{ij}$ interaction effects of farming system and sampling day;

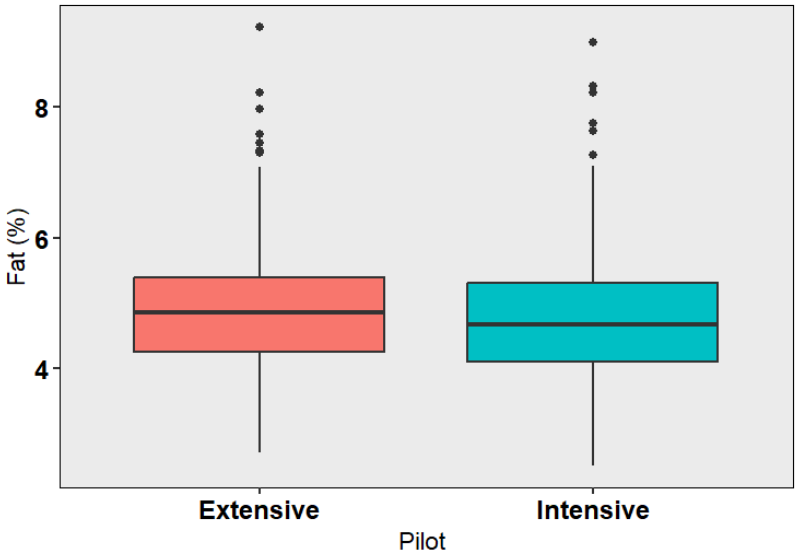
A_k the random effects of the animal within farming system;

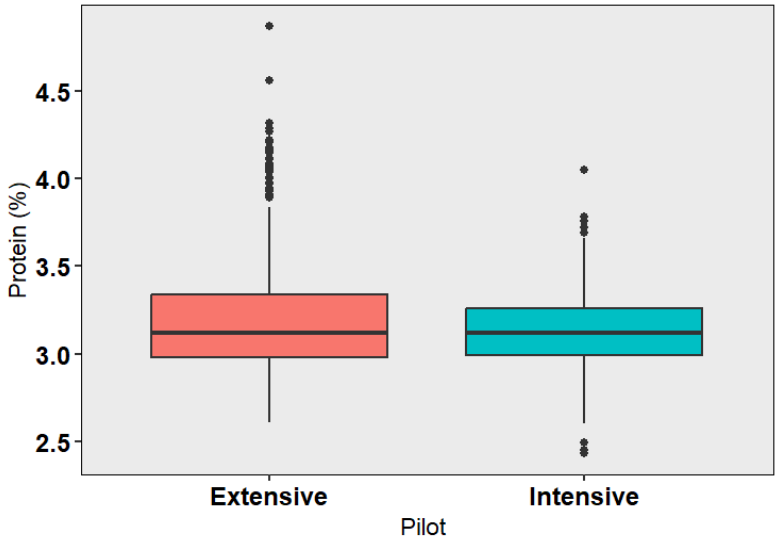
e_{ijk} the residual error associated with observation ijk.

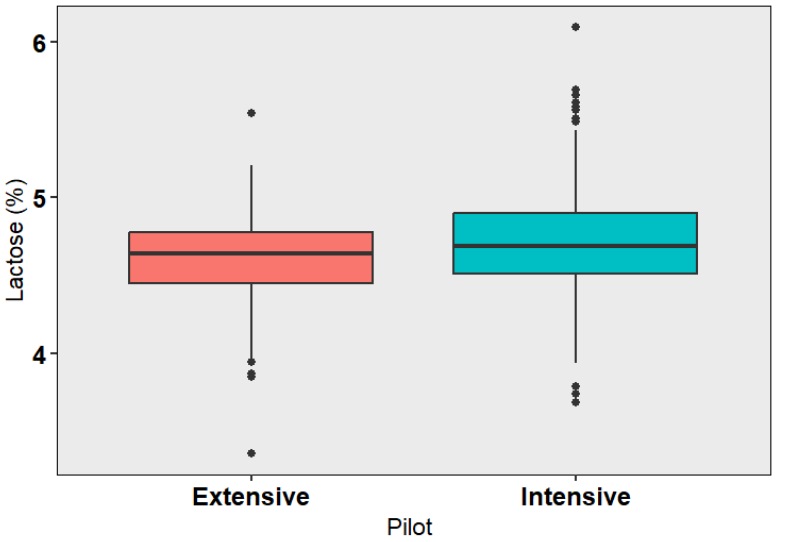
R software

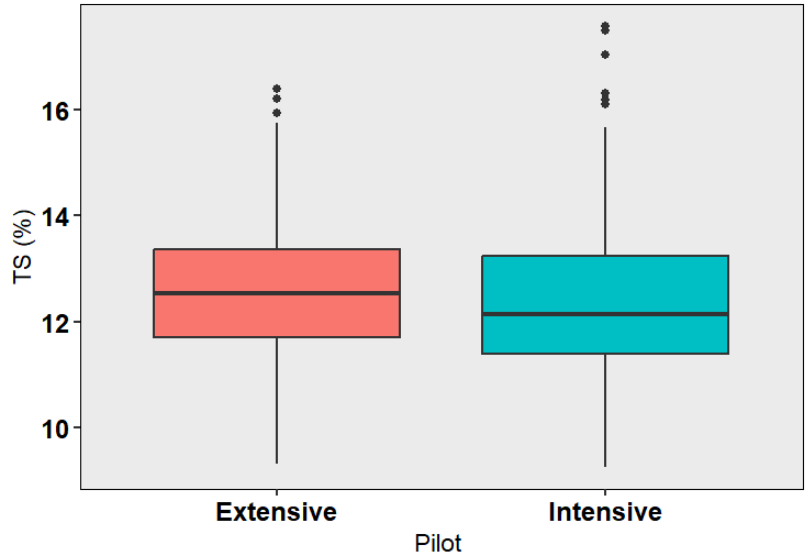
Results

Chemical composition





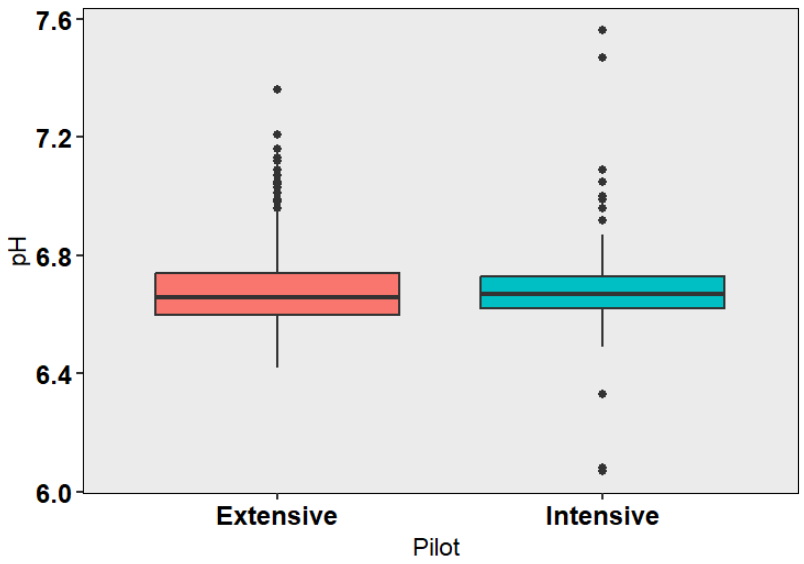


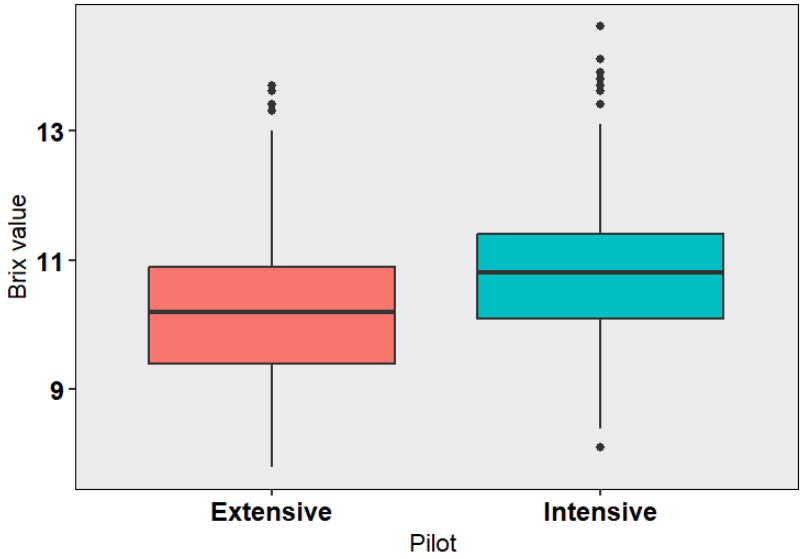


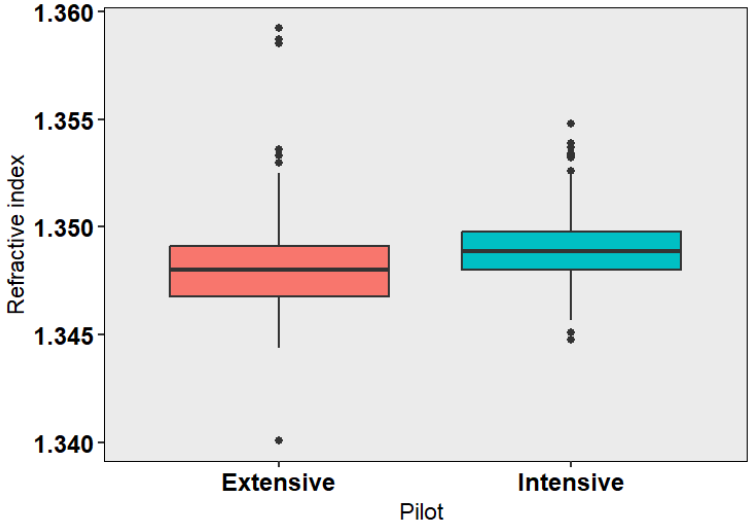
Chemical composition	Extensive	Intensive
Fat (%)	4.90 [a]	4.87 [a]
Protein (%)	3.34[a]	3.29 [a]
Lactose (%)	4.78 [a]	4.90 [a]
TS (%)	13.15 [a]	13.20 [a]

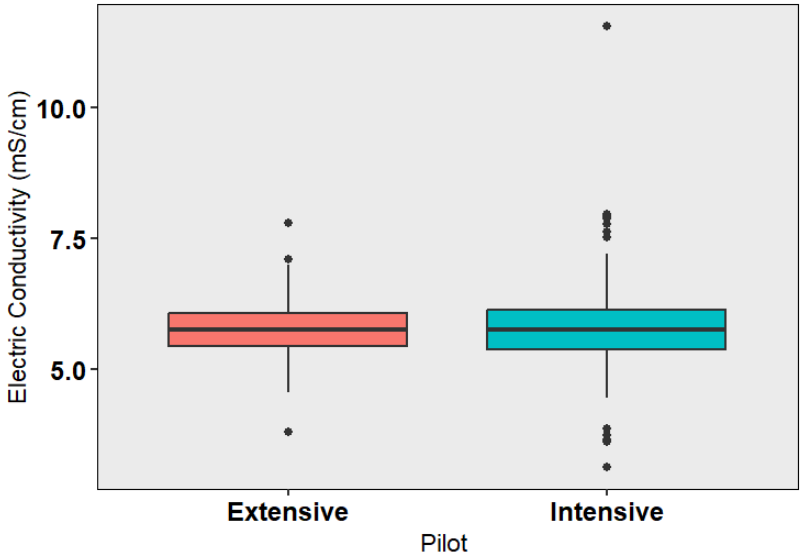
Physicochemical properties

Results





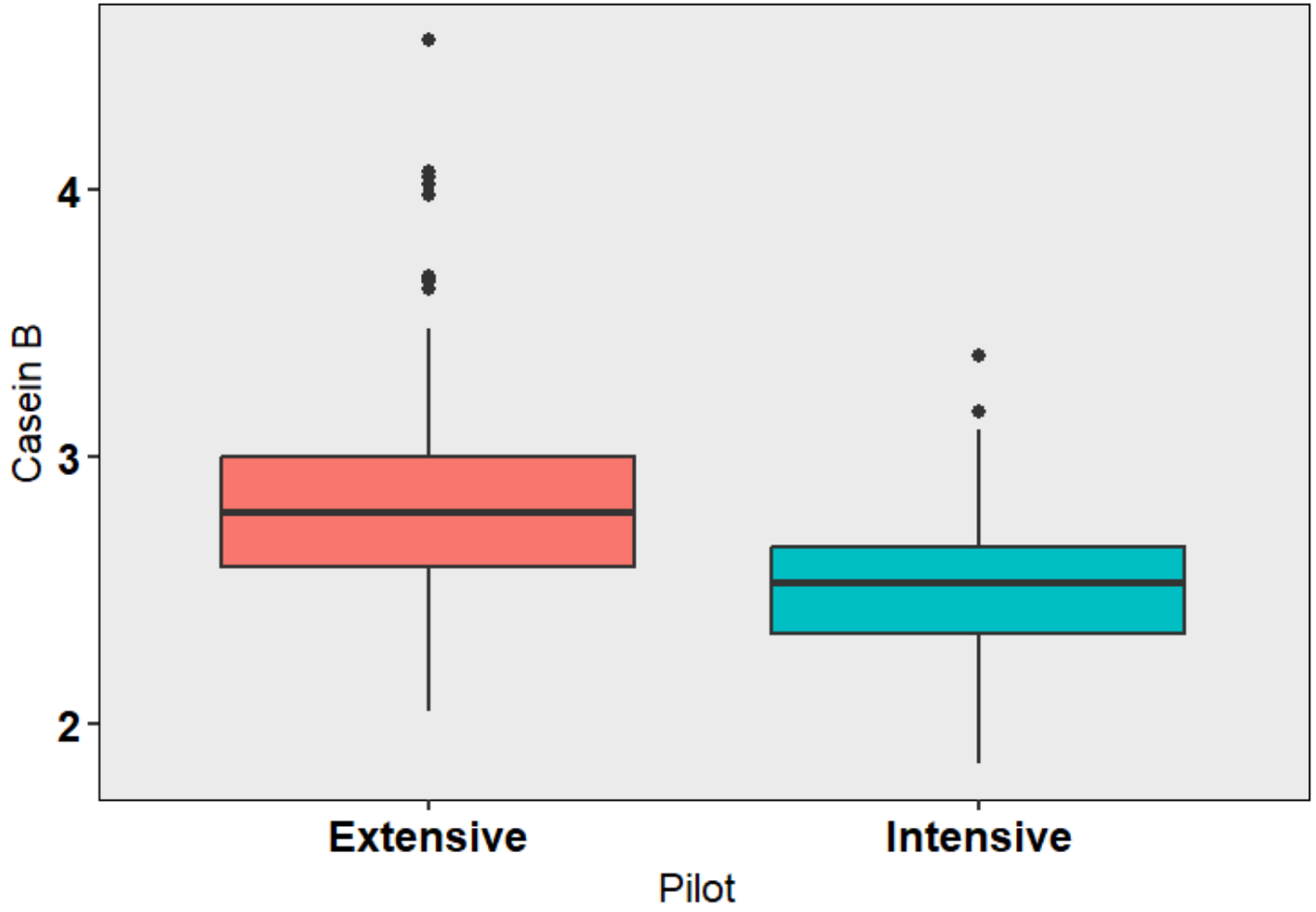




Physicochemical properties	Extensive	Intensive
Ph	6.74 [a]	6.73 [a]
Refractive index	1.349 [a]	1.350 [a]
Electric conductivity	5.98 [a]	5.90 [a]
Brix values	11.40 [a]	10.90 [a]

Results

Effect of production system on Casein content



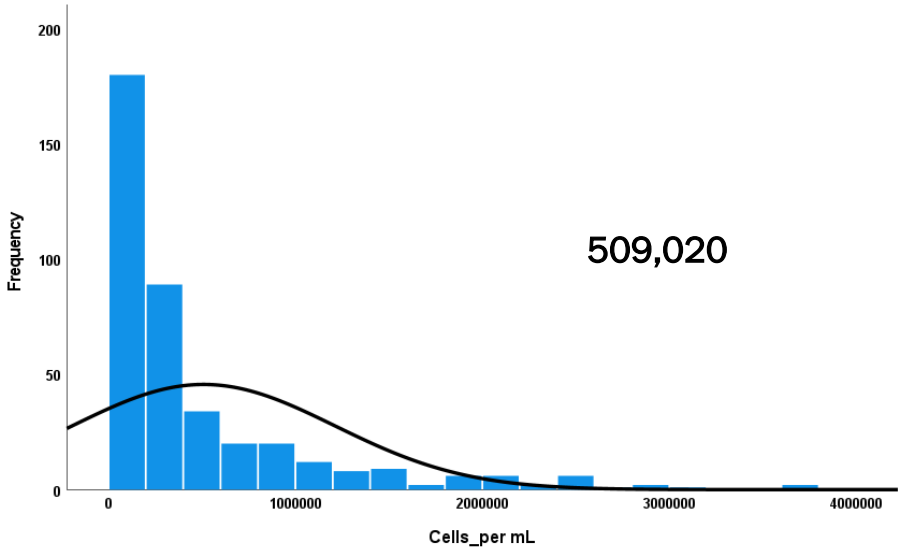
	Extensive	Intensive
Casein content	3.00 [a]	2.26 [6]

Results

Effect of production system on milk somatic cell count and total bacterial count

Intensive

Extensive



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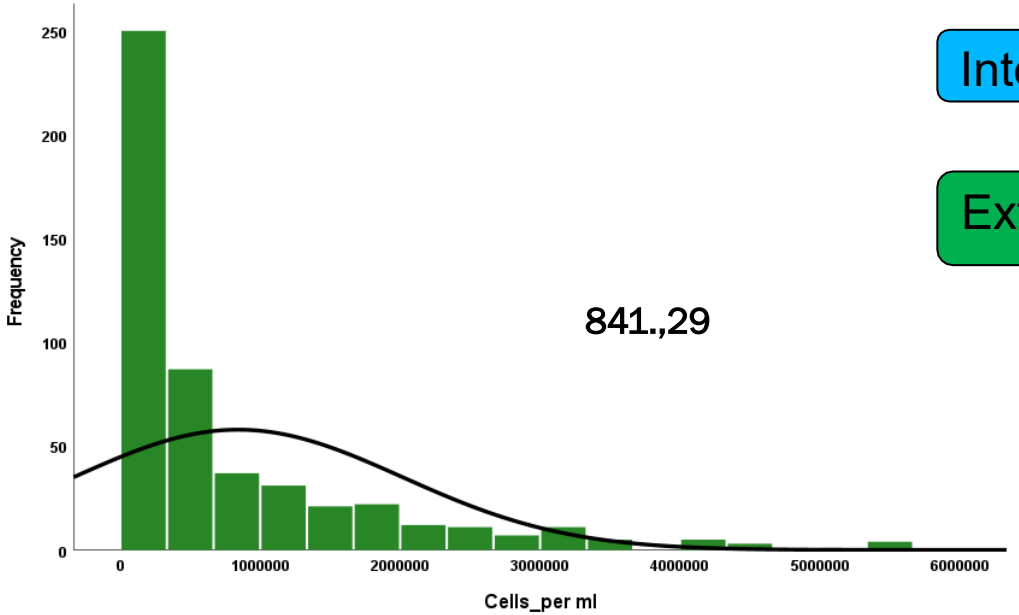

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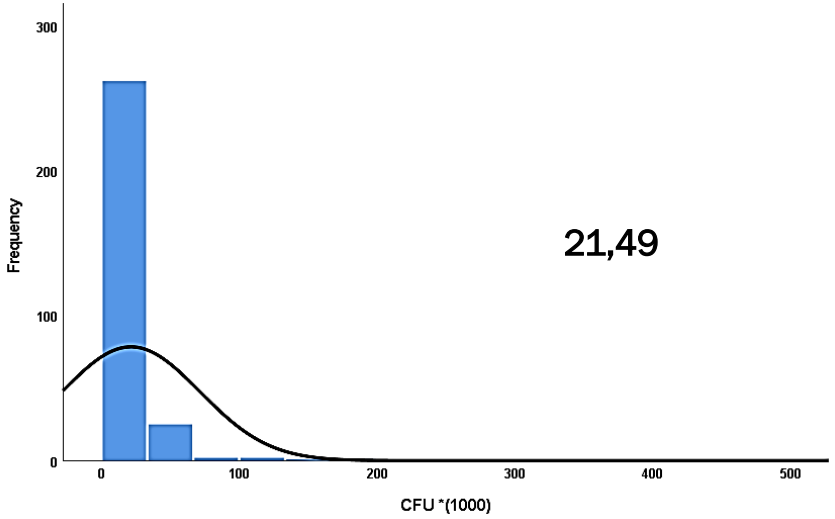

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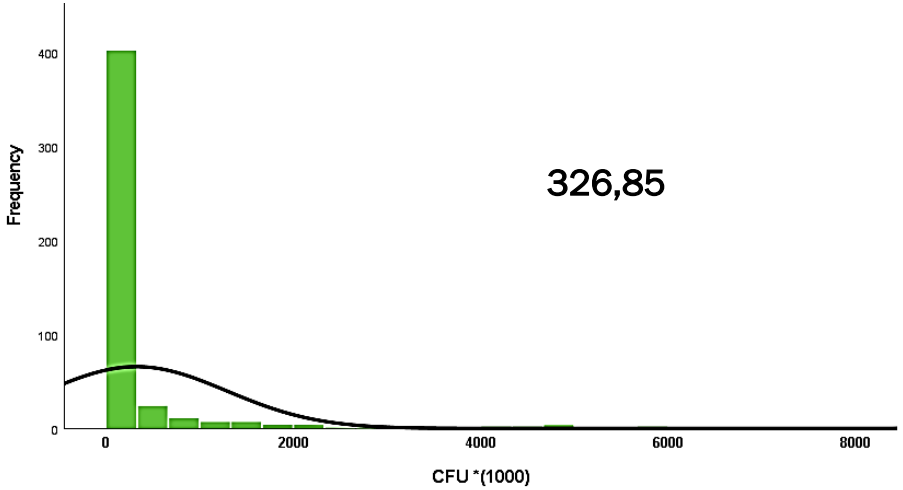

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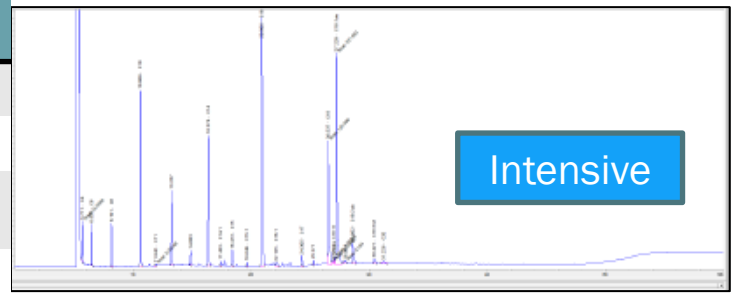
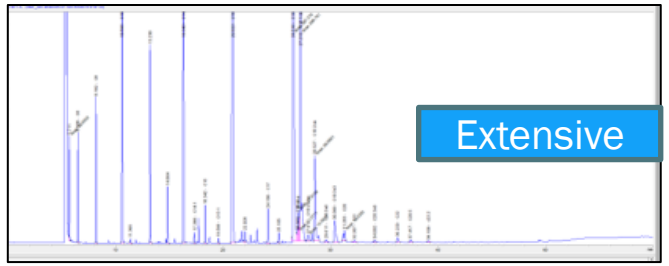
Results

Fatty acids profile of the milk produced on extensive and intensive farming system

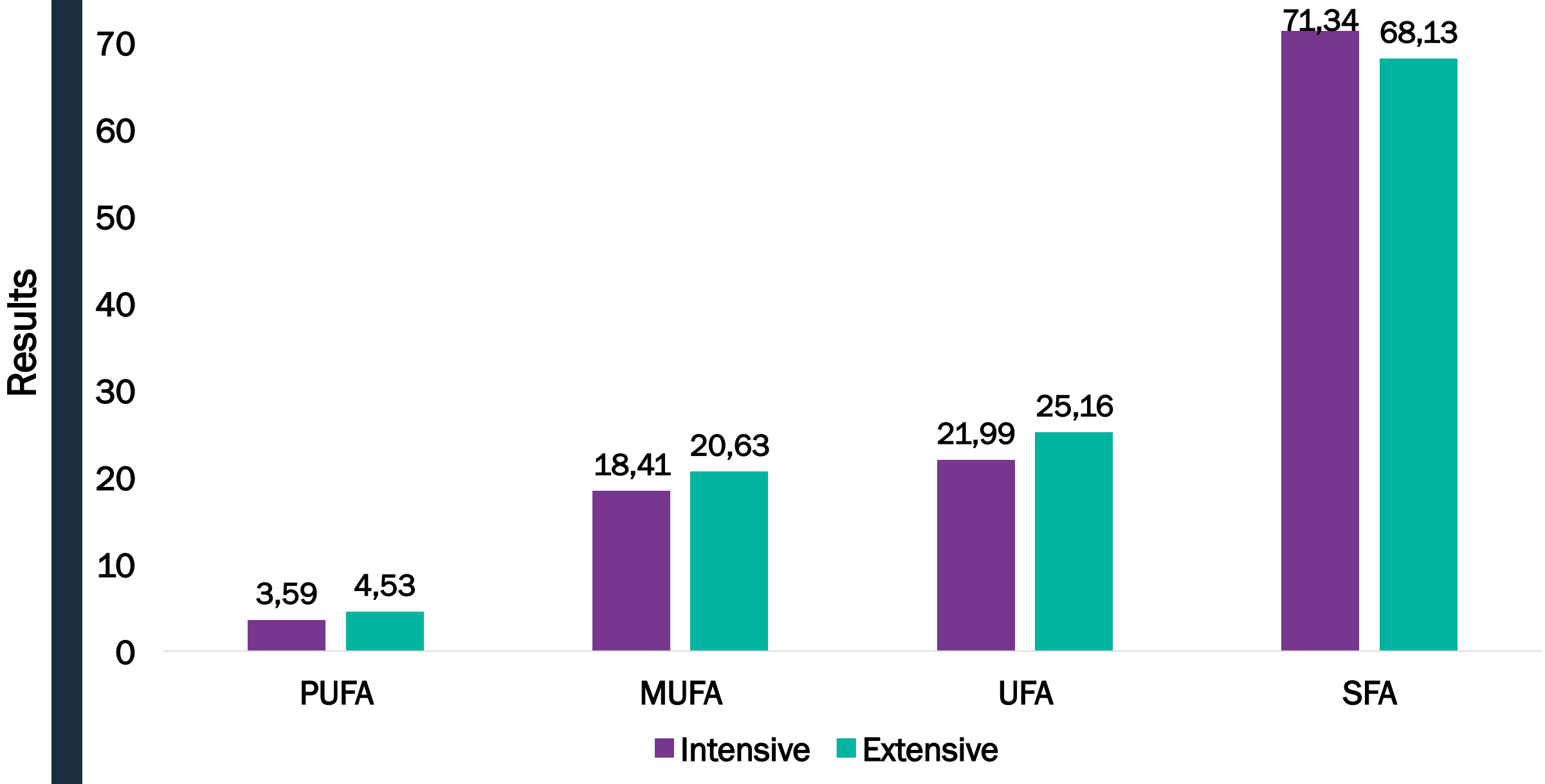
Fatty acids	Intensive (%)	Extensive (%)	Fatty acids	Intensive (%)	Extensive (%)
C:4:0	1.91	1.10	VA	0.56	0.79
C:6:0	2.12	1.38	18:1cis	17.66	19.23
C:8:0	2.72	2.02	18:2 trans_ALA	0.44	0.53
C:10:0	10.32	8.52	18:2 cis	2.12	2.51
C:11:0	0.19	0.12	18:3n6	0.16	0.11
C:12:0	4.74	3.96	18:3n3_LA	0.66	0.84
C:13:0	1.01	0.97	CLA	0.40	0.62
C:14:0	10.29	10.60	C20:0	0.25	0.61
C14:1	0.29	0.22	C21		0.10
C15:0	1.02	0.59	C20:2	0.18	
C15:1	0.22	0.10	C20:3n6	0.13	0.07
C16:0	29.71	30.82	C20:4n6		0.07
C16:1	0.45	0.41	C20:3n3	0.21	0.14
C17:0	0.68	0.64	C22	0.14	0.13
C17:1	0.22	0.18	C20:5 EPA	0.15	0.09
C18:0	11.64	13.16	C22:2		0.04
t18:1	0.32	0.42			





VA: vaccenic acid *LA: Linoleic acid*
CLA: Conjugated linoleic acid *ALA: A-linolenic*

Fatty acids profile of the milk produced on extensive and intensive farming system



Conclusions

Milk chemical composition and physicochemical properties were not influenced by the farming system

Higher values in SCC and TBC in the extensive farming system, possibly is due to the differing milking practices between the two farming systems.

The higher PUFA content observed in the milk from goats on the extensive farming system is attributed to grazing.

Extensive farming system

Intensive farming system

code: re-farm

ARISTOTLE UNIVERSITY OF THESSALONIKI

Thank you for your attention!

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