The Aegean sheep breed revisited:

Phenotypic description and husbandry characteristics in island flocks of Greece

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Why revisit the Aegean sheep?

Historical footprint

A historically widespread population whose present-day identity is poorly documented Reported across the Aegean islands; the population was estimated at >100,000 breeding ewes in the 1970s.

Island selection pressure

Harsh terrain, seasonal grazing, limited feed resources and Mediterranean heat favor robustness over specialization.

Today's issue

Crossbreeding and fragmented recording make phenotypic identity and conservation status uncertain.





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Study objective and methods

Objective

Phenotypic characterization within the broader ENIPRO framework.

Describe the morphology, productive/reproductive profile and husbandry context of sheep identified by farmers as Aegean breed and matching the available breed description.

43 ewes

Morphologically characterized according to FAO Guidelines on the phenotypic characterization of animal genetic resources

6 islands

Agios Efstratios, Kythnos, Kea, Naxos, Ios, Sifnos

Selection

Farmer identification + consistency with existing description

Outputs

Morphometry, pigmentation, fleece, udder, productive indices & BCS

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Study area


STUDY AREA – AEGEAN ISLAND FLOCKS
N
BULGARIA
ALBANIA
GREECE
Agios Efstratios
(n = 10)
AEGEAN SEA
TÜRKİYE
Kea
(n = 10)
IONIAN
SEA
AEGEAN
SEA
Kythnos
(n = 8)
Naxos
(n = 10)
Sifnos
(n = 2)
Ios
(n = 3)
CRETAN SEA
Islands included
Agios Efstratios, Kythnos, Kea, Naxos, Ios, Sifnos
Animals
43 ewes in total
Geographical context
South-Central-Eastern Aegean Sea
Environment
Mediterranean insular ecosystems – extensive grazing systems

Morphological profile

Reported values are mean ± SE

The sampled ewes are a targeted phenotypic sample, not a random census of all sheep on the Aegean islands

Height at withers
68.33 ± 1.04 cm

Body length
61.35 ± 1.18 cm

Head length
25.28 ± 0.47 cm

Head width
13.83 ± 0.57 cm

Ear length
11.38 ± 0.48 cm

Ear width
6.85 ± 0.38 cm

Medium-sized, compact ewes with distinctive small horizontal ears and narrow, medium sized, slightly triangular head with a straight profile.





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Coat, pigmentation and appendages

A consistent visual phenotype with some within-population variation



Fleece

Coarse and white in all evaluated ewes.

Tail

Semi-fat tail;
33.69 ± 2.57 cm.

Pigmented markings

100% had black/brown spots on head, ears, muzzle, legs and/or hooves.

Skin pigmentation

Approximately 50% pink and 50% black skin.

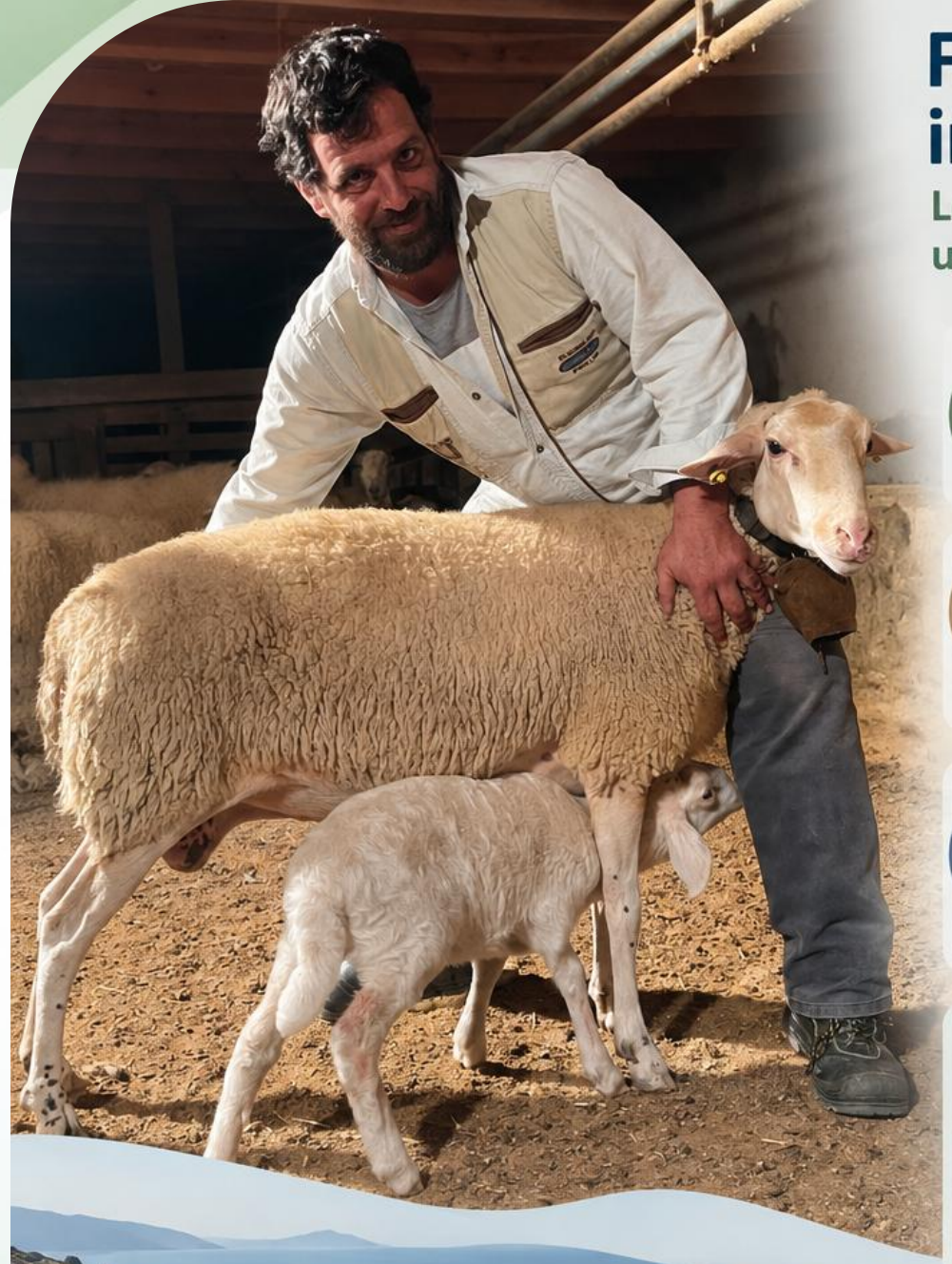
Horn status

79.06% of evaluated ewes were polled;19.17 ± 4.89 cm

Phenotypic signature

- WHITE COARSE FLEECE
- SMALL HORIZONTAL EARS
- DARK PERIPHERAL SPOTS
- SEMI-FAT TAIL
- MOST EWES POLLED

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Functional traits in the flock context

Longevity and moderate reproduction under low-input conditions

AEGEAN ISLANDS

Mean lactation number

5.04 ± 1.27

Mature ewes remained in production for several lactations.

Prolificacy

1.46 ± 0.42

lambs/ewe

Reproductive output was moderate.

Body condition score

1.93 ± 0.42

BCS was low, consistent with a nutritionally constrained production environment.

What the data support

- Mature ewes remained in production for several lactations.
- Reproductive output was moderate.
- BCS was low, consistent with a nutritionally constrained production environment.

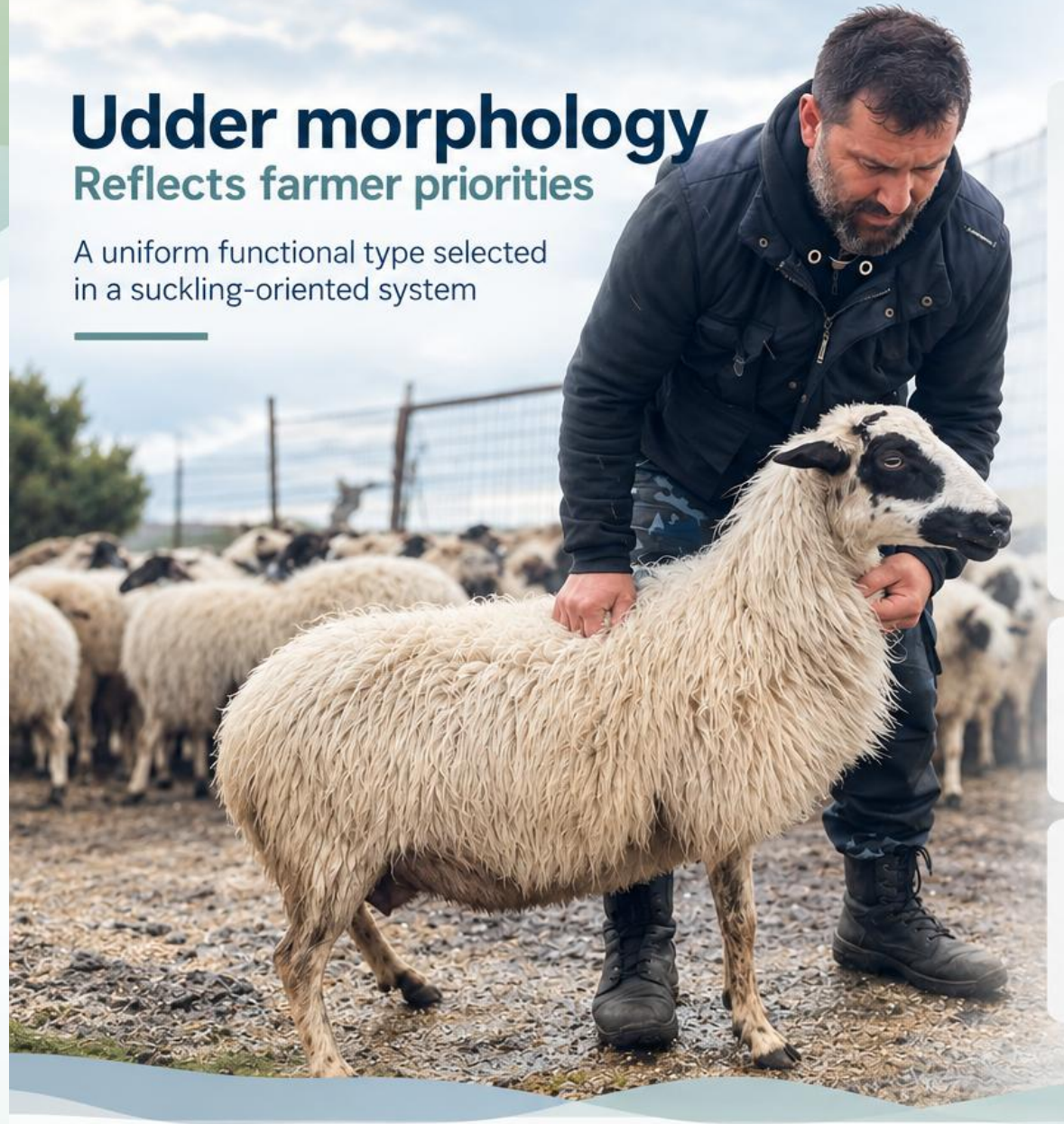
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Udder morphology

Reflects farmer priorities

A uniform functional type selected in a suckling-oriented system



A consistent udder type

Observed in all evaluated ewes



CYLINDRICAL
udder shape

WELL-FORMED
udder

TEATS POINTING SLIGHTLY FORWARD

Farmer preference

Farmers recognized this teat orientation as the most desirable type for natural suckling.

Interpretation

The uniformity is consistent with long-term farmer-mediated phenotypic selection for practical maternal function.

FUNCTIONAL TRAIT
Adapted to a suckling-oriented system

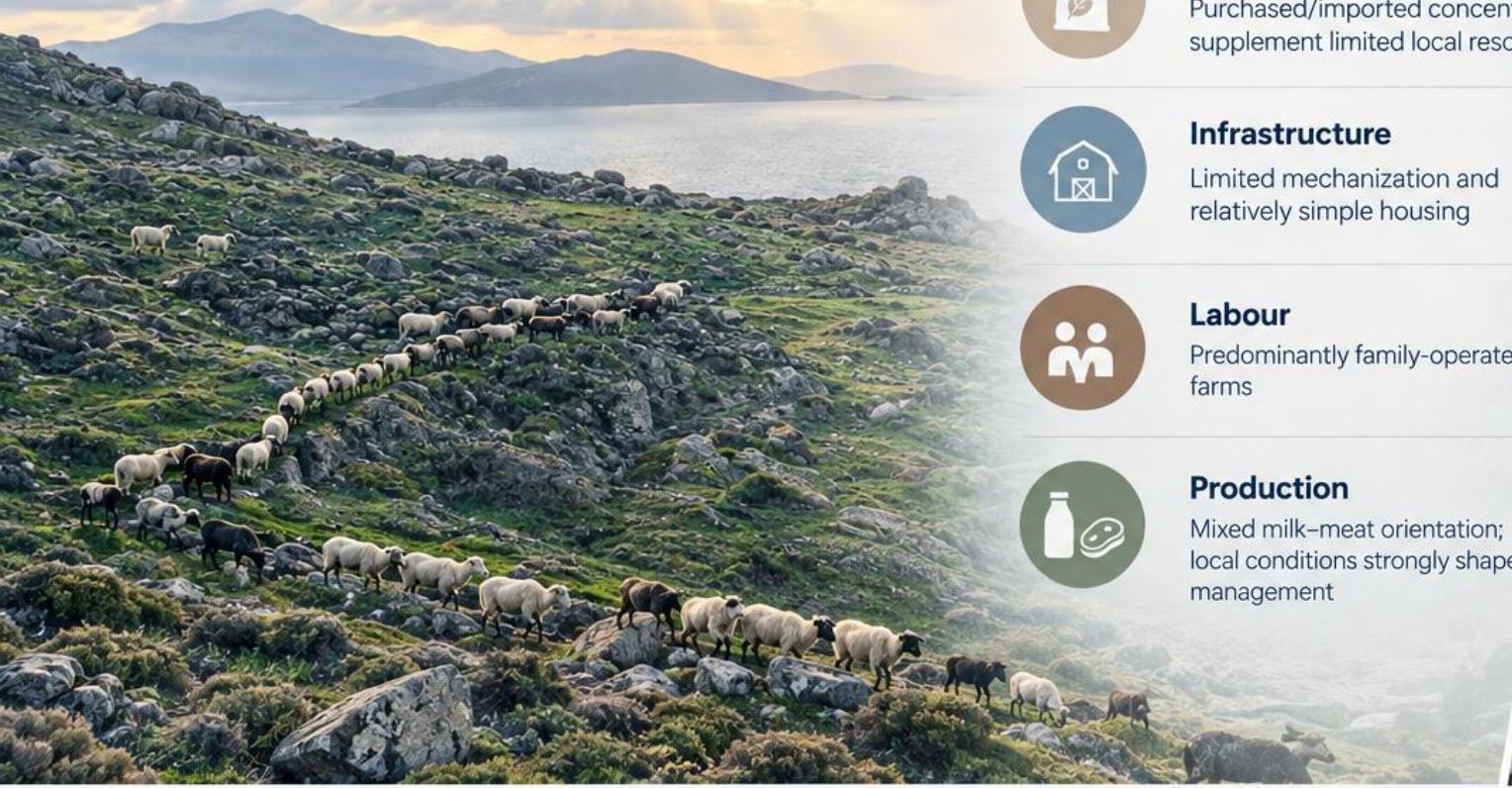
SHAPED BY FARMER PRIORITIES
A practical and resilient udder type

SUPPORTS FLOCK SUSTAINABILITY
Through functional maternal traits

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The production system: family-run and low-input

Resilient sheep farming systems, adapted to insular environments and shaped by local resources, traditions and family knowledge.



Flock size
Mostly 45–60 or 100–150 ewes; Agios Efstratios ~638

Grazing
Natural grazing and seasonal pasture are central

Feed inputs
Purchased/imported concentrates supplement limited local resources

Infrastructure
Limited mechanization and relatively simple housing

Labour
Predominantly family-operated farms

Production
Mixed milk–meat orientation; local conditions strongly shape management







A low-input system built on natural resources

Family knowledge sustains resilience

Local conditions shape management

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Health observations:
encouraging, but descriptive

These are farmer-reported observations, not prevalence estimates from a standardized epidemiological survey. They are presented as management context rather than evidence of disease resistance.



Reported disease was limited in the surveyed management systems.



Routine prevention

Antiparasitic treatments and region-specific vaccinations were reported.

Proactive health management is part of regular farm practice.

Mastitis

Farmers reported only a few cases per year.

Low incidence based on farmer observations.

Young stock

Diarrhea in lambs was among the main problems mentioned.

Common challenge in many extensive systems.



FOCUSED ON PREVENTION
Regular treatments and vaccinations

GENERALLY GOOD HEALTH STATUS
Based on farmer-reported observations

CONTEXT, NOT PREVALENCE
Descriptive information from field surveys

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The Aegean environment: simultaneous heat and hydric stress

Mediterranean island ecosystems are characterized by high temperature and seasonal water scarcity

HEAT STRESS

HOT, DRY MEDITERRANEAN SUMMERS

- Peak summer mean temperatures frequently **>28°C** in parts of the Aegean
- High solar radiation and long sunshine duration
- Summer heat coincides with the **lowest rainfall period**
- Heat load can compromise thermoregulation, intake, reproduction, milk production and welfare
- Etesian winds provide some convective cooling, but do not eliminate thermal stress



Greek modelling indicates increasing livestock heat exposure: mean sheep THI is projected to increase by **5–10%** across much of Greece, with severe heat-stress hours potentially **doubling** over large areas by mid-century.*

HYDRIC STRESS

SEASONAL WATER DEFICIT

- Rainfall is strongly concentrated in autumn and winter
- Summer precipitation can become negligible
- High temperature → increased evapotranspiration and atmospheric water demand
- Limited freshwater resources are characteristic of many small Aegean islands
- Reduced soil moisture → lower pasture biomass and quality
- Water scarcity therefore affects animals directly and indirectly through feed availability



Research on Greek islands confirms the combination of rising temperatures, drought risk and limited water availability; Naxos is among the islands where significant **warming** trends have already been identified.*

HEAT + WATER SCARCITY + SEASONAL FEED LIMITATION → STRONG ENVIRONMENTAL PRESSURE FOR FUNCTIONAL ADAPTATION

Aegean sheep have historically been managed under precisely these low-input, resource-limited conditions.

Thermotolerance
withstand high temperatures

→

Efficient resource use
feed and water frugality

→

Resilience
survival and productivity under harsh conditions



* Sources: Ptochos et al., 2023 (THI projections for Greece); Karali et al., 2024 (Climate change in Naxos island).

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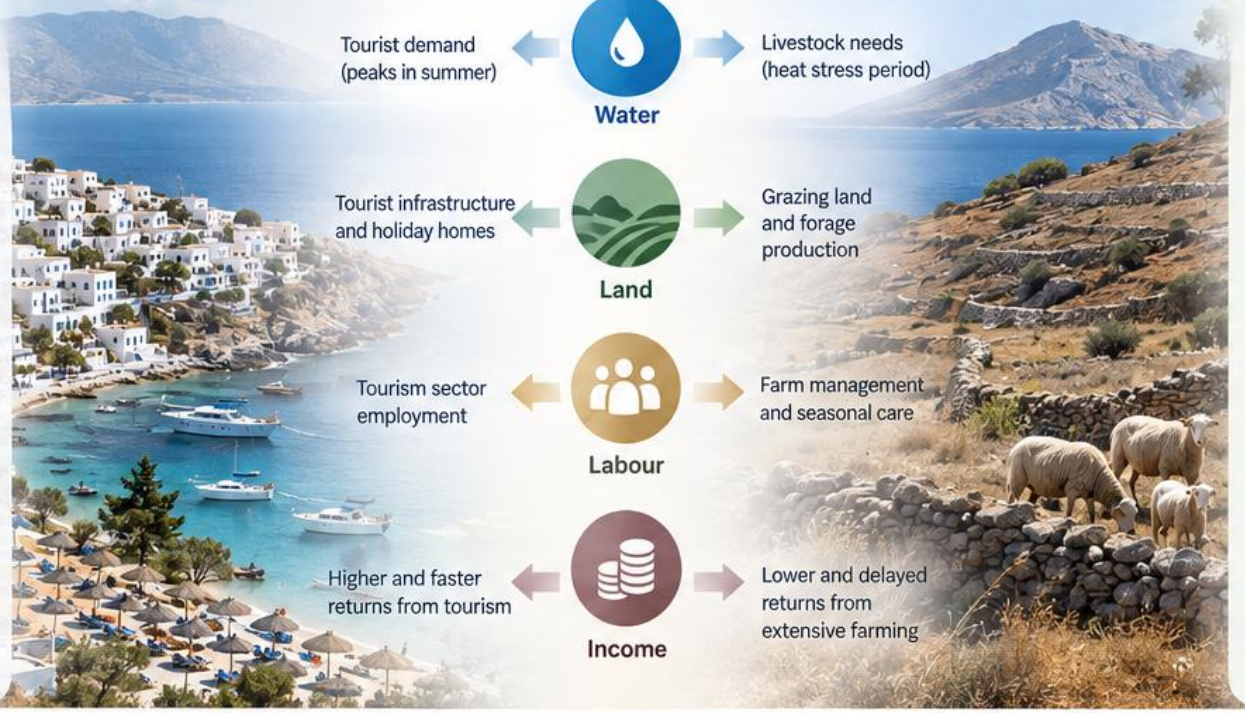
Tourism pressure on Aegean islands

A growing island economy increases competition for scarce resources, making livestock farming a secondary occupation

TOURISM EXPANSION

- Seasonal population can reach **5–15×** the resident population
- Rapid growth of accommodation and tourist infrastructure
- Higher and more immediate income opportunities
- Competition for local labour, especially during summer
- Rising land values and conversion of agricultural land to tourism use

COMPETITION FOR SCARCE RESOURCES



Tourism expansion	Resource	Island livestock farming
Tourist demand (peaks in summer)	Water	Livestock needs (heat stress period)
Tourist infrastructure and holiday homes	Land	Grazing land and forage production
Tourism sector employment	Labour	Farm management and seasonal care
Higher and faster returns from tourism	Income	Lower and delayed returns from extensive farming

ISLAND LIVESTOCK FARMING

- Traditional extensive systems adapted to marginal environments
- High-quality local products with cultural and gastronomic value
- Contributes to island landscape, biodiversity and fire prevention
- Increasingly part-time activity for many farmers
- At risk of abandonment due to resource and economic pressures

CONSEQUENCES

More part-time farming → Reduced investment and labour input → Agricultural abandonment → Greater dependence on imported feed and food

OPPORTUNITY: SYNERGIES INSTEAD OF COMPETITION

Local sheep farming can become part of the tourism value chain

- Local products
- Gastronomy and agritourism
- Authentic island identity
- Sustainable tourism
- Viable farming future

The challenge is not to protect sheep farming from tourism, but to make sheep farming economically relevant within a tourism-dominated island economy.

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Genomic context



Dataset

288 sheep from 7 insular groups/breeds (Lesvos, Zakynthos, Kefallinia, Asterousia, Kymi, Karystos), including 58 animals in the pooled Aegean group; genotyped with OvineSNP50

Population structure

Aegean, Kymi and Karystos occupied more intermediate positions, suggesting shared background and/or gene flow

Conservation interpretation

Differences are detectable, but the studied island breeds are not sharply discrete genetic units; phenotypic and genomic evidence should be interpreted together

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Putting phenotype and genetics together

PHENOTYPE



- Consistent morphology
- Distinctive ears
- Pigmentation pattern
- Functional udder type

HUSBANDRY



- Low-input grazing
- Family labour
- Limited mechanization
- Farmer selection

GENOMICS



- Shallow structure
- Mixed ancestry
- Low differentiation with some island breeds

→ **A locally adapted genetic resource worth documenting and conserving**



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Take-home messages

1

A recognizable Aegean phenotype persists

Small horizontal ears, medium compact body, coarse white fleece with dark peripheral markings, semi-fat tail and a largely polled female population.

2

The phenotype is embedded in a specific production system

Family-run, low-input flocks rely on grazing and purchased supplementation under island constraints.

3

Phenotype ≠ genetic proof

Genome-wide data show detectable but shallow structure; the pooled Aegean group needs finer island-level resolution.

4

Conservation should preserve function as well as appearance

Future work should integrate standardized phenotyping, pedigrees/performance recording, genomics and adaptation/welfare traits.



The Aegean sheep is best approached as a living island genetic resource — to be characterized, tested and conserved with scientific precision.

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Greece 2.0
NATIONAL RECOVERY AND RESILIENCE PLAN

Under the action "Economic Transformation of the Agricultural Sector" (MIS 5164849356)



