PERSISTENCE OF LEGUMES IN DEHESA SYSTEM: INFLUENCE ON PRODUCTIVITY AND PASTURE QUALITY

Ana Hernández-Esteban, María Lourdes López-Díaz, Yonatan Cáceres, Gerardo Moreno
Instituto de Investigación de la Dehesa (INDEHESA)
University of Extremadura (Spain)
gmoreno@unex
the “DEHESA” system

pasture forage

MOTIVATION
ESTABLISHMENT OF PERMANENT PASTURES RICH IN LEGUMES

AGFORWARD AGroFORestry that Will Advance Rural Development

Livestock breeders INTERESTS

Mitigate seasonal differences

Reduce critical period

REDUCE FARMERS DEPENDENCE

QUALITY OF FEED

DIVERSIFY FORAGE OFFER

Reduce critical period

Reduce farmers' dependence

Mitigate seasonal differences

Increase feed quality

Diversify forage offer

AGFORWARD AGroFORestry
OBJECTIVE

SPECIFIC SELECTION OF SEED MIXTURES SUITABLE FOR SILVOPASTORAL PURPOSES

- Exclusion by shade
- Competition from deep rooting grasses and trees
- Self reseeding
- Cope with long summer
- Cope with cattle pressure

Cope with long summer
Cope with cattle pressure
assessments of the response of legume species to shade
comparison of different forages rich in legumes
influence on productivity and quality pasture
evaluation of the persistence in the long-term of legume species in dehesas
assessment of the response of legume species to shade
comparison of different forages rich in legumes
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evaluation of the persistence in the long-term of legume species in dehesas
DEHESA FARMS IN EXTREMADURA (CW SPAIN) with a chronosequence of pastures rich in legumes sown in previous years


* Farms provided by ASEDAGRO-FERTIPRADO
EXPERIMENTAL DESIGN

→ BIOMASS PRODUCTION

DEHESA FARM (4) × YEAR OF SOWING (diverse ages) × MICROHABITAT (canopy-out of canopy) × SAMPLES (8)

→ BOTANICAL INVENTORY TRANSECTS

DEHESA FARM (7) × YEAR OF SOWING (diverse ages) × MICROHABITAT (canopy-out of canopy) × TRANSECTS (104 SAMPLES)
View of the exclusion cages installed to monitor the abundance and biomass of pasture legume species sown in the previous years. In every plot (age), 6 cages under canopy and 6 cages beyond canopy were placed.
**Experimental Design**

**Biomass Production**

**Pasture sampling:** samples were taken in May (just before pasture becomes dry) in 50 cm x 50 cm squares

View of pasture rich in legumes sown in November 2015 (picture taken in June 2016).
One plant was collected every meter randomly
208 plants per plot (104 beyond canopy and 104 beneath canopy) in 8 transects with 25 m length
Identified and separated in LEGUMES, GRASSES and FORBS
RESULTS

PRODUCTION

SPECIES RICHNESS

LEGUMES REPLACEMENT
Fig. 1: Yield in t/ha along the different sowing ages in the different dehesa farms.
RESULTS PRODUCTION

YIELD (Kg/ha)

Fig. 2: Yield in kg/Ha in the chronosequence in ATOQUEDO dehesa farm under canopy and out of canopy (p=0.87292)

AGE: LS Means
Current effect: F(5, 178)=.36362, p=.87292
Effective hypothesis decomposition
Vertical bars denote 0.95 confidence intervals

HABITAT: LS Means
Current effect: F(1, 60)=.05169, p=.82091
Effective hypothesis decomposition
Vertical bars denote 0.95 confidence intervals

AGE*: HABITAT; LS Means
Current effect: F(5, 60)=6.6772, p=.00005
Effective hypothesis decomposition
Vertical bars denote 0.95 confidence intervals

HABITAT; LS Means
Current effect: F(1, 60)=.05169, p=.82091
Effective hypothesis decomposition
Vertical bars denote 0.95 confidence intervals

AGE: p=0.00005

HABITAT: p=0.82091
Fig. 3: Yield in kg/Ha in the chronosequence in ATOQUEDO dehesa farm separated into forbs, grasses and legumes. (p=0.0000)
RESULTS SPECIES RICHNESS

Fig. 4: Promedium species richness in all the dehesa farms:
- Clustered by maturity (left top)
- Under canopy and out of canopy (left bottom)
- Initial distribution at control parcels (right)
Fig. 5: Average number of species richness per group (grasses, legumes, forbs) clustered by maturity in all the farms (p=0.24146)

Fig. 6: Average number of species richness under and out of canopy clustered by maturity in all the farms (p=0.77292)
### Results Legumes Replacement

#### Young Pastures (3 years)
- Hymenocarpos lotoides
- Lathyrus angulatus
- Lotus conimbricensis
- Lotus corniculatus
- Lotus parviflorus
- Lupinus luteus
- Medicago polymorpha
- Micropyrum tenellum
- Ornithopus compressus
- Ornithopus pinnatus
- Ornithopus sativus
- Trifolium angustifolium
- Trifolium arvense
- Trifolium campestre
- Trifolium cernum
- Trifolium cherleri
- Trifolium glomeratum
- Trifolium hirtum
- Trifolium incarnatum
- Trifolium michelianum
- Trifolium resupinatum
- Trifolium scabrum
- Trifolium stellatum
- Trifolium striatum
- Trifolium subterraneum
- Trifolium tomentosum
- Trifolium vesiculosum
- Vicia angustifolia
- Vicia benghalensis
- Vicia cracca
- Vicia lutea
- Vicia sativa
- Vicia villosa

#### Very Old Pastures (20 years)
- Astragalus pelecinus
- Hymenocarpos lotoides
- Lathyrus angulatus
- Lathyrus sphaericus
- Lotus conimbricensis
- Lotus parviflorus
- Medicago polymorpha
- Ornithopus compressus
- Ornithopus pinnatus
- Trifolium angustifolium
- Trifolium arvense
- Trifolium campestre
- Trifolium cernum
- Trifolium cherleri
- Trifolium glomeratum
- Trifolium hirtum
- Trifolium michelianum
- Trifolium resupinatum
- Trifolium stellatum
- Trifolium striatum
- Trifolium subterraneum
- Trifolium tomentosum
- Trifolium vesiculosum
- Vicia sativa

### Both Pastures
- Hymenocarpos lotoides
- Lathyrus angulatus
- Lotus conimbricensis
- Lotus parviflorus
- Medicago polymorpha
- Ornithopus compressus
- Ornithopus pinnatus
- Trifolium angustifolium
- Trifolium arvense
- Trifolium campestre
- Trifolium cernum
- Trifolium cherleri
- Trifolium glomeratum
- Trifolium hirtum
- Trifolium michelianum
- Trifolium resupinatum
- Trifolium stellatum
- Trifolium striatum
- Trifolium subterraneum
- Trifolium tomentosum
- Trifolium vesiculosum
- Vicia sativa
CONCLUSIONS: PRODUCTION

- The pasture production of the farms increases with the establishment of pastures rich in legumes. This improvement is due to the greater productive capacity of the sown legumes and their rhizobium inoculation, that permits a better development of the native species.

- The yield levels of grasses and legumes species remain higher than control ones along the time.

- In all the farms studied, the increase of production is not significant with the habitat (production beneath canopy and beyond canopy). This could be an important fact to be taken into account in future Common Agricultural Policy agreements.
CONCLUSIONS: SPECIES RICHNESS and SPECIES REPLACEMENT

- In terms of species richness, there is no significant difference among habitats or ages so we could say that the management of farms with pastures rich in legumes for a long period does not affect species biodiversity in the dehesa system.

- When considering the separation in FORBS, GRASSES AND LEGUMES, there is no significant difference but it is observed in very young pastures an increase in legume species and a light decrease in forbs that tends to the initial situation (control)

- There is not an evident species replacement in the dehesa farms with established pastures rich in legumes.
Thank you for your attention

Acknowledgements:
- This research is a contribution to the project FP-7 AGFORWARD and GR15184