



Shade tolerant legumes

Improving the productivity of Mediterranean silvopastures

www.agforward.eu

Silvopasture quality and productivity

In silvopastoral systems, light interception affects productivity of flora beneath the canopy in various ways. In general, herbage production decreases with reduced light intensity. Thus, the use of shade tolerant cultivars of selected species can play an important role in successful silvopastoral management.

Due to their nitrogen fixing ability, the incorporation of shade tolerant legume species may have a special role in increasing the quality and productivity of silvopastures and in enhancing soil fertility.



Grazing cattle on unshaded plots over-sown with legume-based mixtures, near to the dense tree trial.
Ref : G.A. Re



Plots of legume-based mixtures under dense tree canopy Ref : G.A. Re

Shade tolerant legumes for agroforestry

Farm-scale field experiments in agroforestry systems using legume species are very rare. Some species have been reported to have adapted to shaded environments including: *Medicago rugosa*, *M. polymorpha* and *Trifolium spumosum* (Mauro et al. 2014). In addition, positive effects on shade for the persistence and productivity of pasture mixtures with burr medic (*Medicago polymorpha*) and subterranean clovers (*T. yanninicum* and *T. brachycalycinum*) under silvopastoral and vineyard agroforestry systems have been seen (Franca et al. 2016, Muscas et al. 2017).

Innovative mixtures

The study compared two mixtures: a commercial mixture from Fertiprado in Portugal, and a mixture from the ISPAAM institute in Italy with a native sward.

ISPAAM mixture:

T. subterraneum cv *Campeda* (40%)

M. polymorpha cv *Anglona* (40%)

Lolium rigidum cv *Nurrav* (20%)



Fertiprado mixture :

T. subterraneum (60%)

T. vesiculosum (3%)

T. resupinatum (3%)

T. incarnatum (6.5%)

T. isthmocarpum (1.5%)

T. glanduliferum (1.5%)

Ornithopus sativus (20%)



Advantages

The efficacy of sowing legume-rich mixtures depends on:

- the adaptation of species within the mix to the specific pedo-climatic conditions and shading levels,
- the level of hardseededness,
- the persistence of the species from year to year.

In silvopastures, the grazing management/cutting regime is very important for establishing and, thereafter, maintaining a balanced ratio between introduced legumes and native grasses.



Unshaded (top) and shaded (bottom) plots of legume-based mixtures under scattered tree canopy.
Ref: F. Sanna

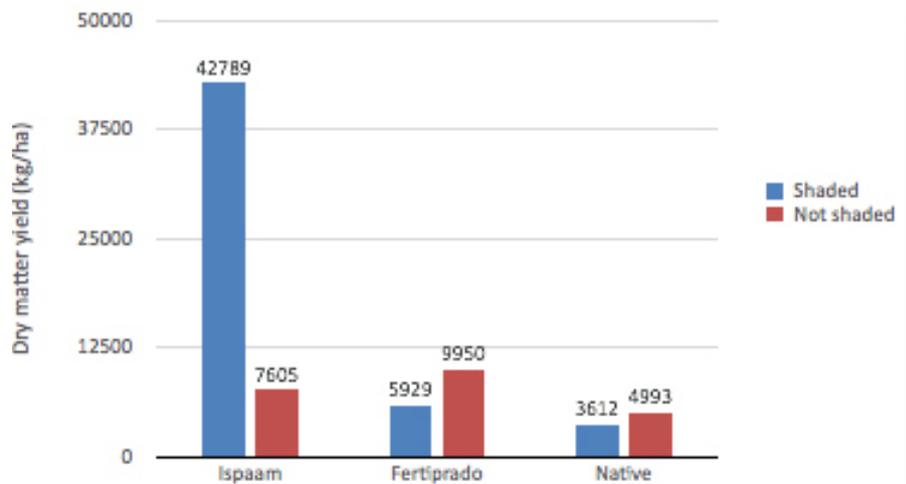
Antonello FRANCA, Giovanni Antonio RE, Federico SANNA

antonio.franca@cnr.it

Institute for the Animal Production System in the Mediterranean Environment, Consiglio Nazionale delle Ricerche – ISPAAM Sassari, Italy
www.agforward.eu

November 2017

This leaflet is produced as part of the AGFORWARD project. Whilst the author has worked on the best information available, neither the author nor the EU shall in any event be liable for any loss, damage or injury incurred directly or indirectly in relation to the report.



Total dry matter yield (kg/ha) in the first year of the trial

Scattered trees (8-10 trees/ha)

- The oversowing of adapted mixtures improved silvopasture productivity up to 2 times.
- The best adapted species to shade are *T. subterraneum* CAMPEDA (Ispaam mixture) and *Ornithopus sativus* (Fertiprado mixture).
- Shading reduced the productivity of the legume-rich mixtures by 70%-90%.
- Shading conditions facilitated the seed hardening of *T. michelianum*, which favours longer persistence.

	CP		NDF		ADF		ASH	
	Shaded	Not shaded						
Fertiprado	18,5a	12,5b	41,6a	37,2b	29,3	27,6	12,3a	9,3b
Ispaam	14,9a	9,5b	47,3a	44,7b	32,6a	28,5b	9,8a	6,1b
Natural pasture	9,5	9,6	52,5	54	30,2b	33,8a	6	6,2

Crude Protein (CP), Neutral Detergent Fibre (NDF), Acid Detergent Fibre (ADF) and ashes (ASH) of different species in shaded and not shaded conditions. Acid Detergent Lignin and Ether Extract did not differ significantly and are not reported.

Dense trees (30-40 trees/ha)

- *M. polymorpha*, *T. incarnatum* and *T. michelianum* significantly showed longer stems in shaded conditions, producing a more fibre-rich forage.
- Leaf area was significantly higher in all species in shaded conditions.
- Shading reduced the productivity of mixtures by 50-60%.
- Shading resulted in an increase in the nutritive value.
- ISPAAM mixture results indicate that it is more competitive against un-sown species than the Fertiprado mixture.

Further information

Franca A, Caredda S, Sanna F, Fava F, Seddaiu G (2016). Early plant community dynamics following overseeding for the rehabilitation of a Mediterranean silvopastoral system. *Grassland Science*, 62: 81–91. doi: 10.1111/grs.12114.

Mauro RP, Sortino O, Dipasquale M, Mauromicale G (2014). Phenological and growth response of legume cover crops to shading. *Journal of Agronomy and Crop Science*. 152: 917-31.

Muscas E, Cocco A, Mercenaro L, Cabras M, Lentini A, Porqueddu C, Nieddu G (2017). Effects of vineyard floor cover crops on grapevine vigor, yield, and fruit quality, and the development of the vine mealybug under a Mediterranean climate. *Agriculture, Ecosystems and Environment*, 237: 203–212.