Use of Annual Self-Reseeding Legumes in an Oak Forest in Central Italy

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USE OF ANNUAL SELF-RESEEDING LEGUMES IN AN OAK FOREST IN CENTRAL ITALY.

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ABSTRACT
A trial has been carried out for three years in an oak coppice geometrically thinned out of Mediterranean Central Italy, about the functioning of a pastoral system made by four different resources: native pasture, subterranean clover (*Trifolium brachycalycinum* Katzn. et Morley) in pure stand, strips thinned out and firebreaks improved with oversown subclover, all grazed by sheep. Subclover increased the forage yield and improved the palatabilty of the pasture and the regularity of grazing; the higher biomass intake by animals reduced the quantity of dried biomass in summer and contributed to keep low either fire hazards or flame diffusion speed. Data underlined the importance of deferred grazing and of the combination of different native or improved resources on the seasonal distribution of production and animal intake.

KEYWORDS
Subclover, firebreaks, sylvo-pastoral systems, undersowing, grazing.

INTRODUCTION
Some trials carried out in Central Italy have shown the possibility of utilizing *Trifolium brachycalycinum* to increase forage availability in coppices geometrically thinned out (Pardini et al., 1994). Other data collected in the same environment (Pardini et al., 1993; Pardini et al., 1995) have shown the utility of oversowing subterranean clovers in firebreak lines with the purpose of increasing phytomass consumption by animals, as already underlined by Etienne (1987) and reducing the quantity of dried inflammable vegetation. Thinned strips and grazed firebreaks have been also used in forage systems made by a variable number of resources (Talamucci et al., 1995). The aim of this research was to evaluate the real possibility of feeding a flock grazing through all the year in a system based on natural and sown resources belonging to a forestal area.

METHODS
In a Central Italy location, a sheep flock was kept grazing for three years (1992-1995), in a sylvo-pastoral system based on four resources: native pasture (35% of the whole surface), firebreak lines sown in pure stand (35%), strips thinned out (15%) and subterranean clover oversown with subterranean clover inside a wood of *Quercus cerris* and *Q. pubescens* (15%). Strips into the wood were cut in February 1992 together with a mechanical treatment in the firebreaks already existing. Each strip was 5 m wide, firebreaks were 30 m. Sowing and oversowing of subclover were conducted in September 1992.

The flock was made of 30 sheep of "Comisana" race; stocking rate above the whole surface of the utilized resources, was 1.5 L.U. per hectare. Practically, a particular rotational grazing, with periodical changes of surfaces in relation to forage availability was adopted. The flock was kept, each year, as shown in figure 1. The wood nearby strips and firebreaks was 30 hectares and, during summer and winter periods, gave only shadow and shelter to the animals. Data were collected about monthly yield and utilization of DM; inflammable phytomass quantity during the three summer months; flame speedness in an artificial burning; CP and CF contents of the forage.

RESULTS AND DISCUSSION
Dry matter yield and utilization. In figure 2 are reported yield and monthly intake of dry matter of the four resources and those from the combination of the resources into the system. Some resources (native pasture and subterranean clover) were utilized green, while others (strips and firebreaks) were utilized as standing hay. The best link between yields and consumptions, month by month, was from subterranean clover. The integrated system showed the most regular distribution of production and met better animals requirements. In the three years average, maximum dry matter yields (table 1) were those of the subclover, followed by native pasture, productions of the firebreak line (including shrub sprouts up to 1.50 m height into the two boarding surfaces nearby the cut and entering two metres inside the wood); those of the strips (including the sprouts) were lower. In the three year average, annual phytomass intake was higher in the firebreaks, followed by subterranean clover and by thinned strips; the lowest utilization was in the native pasture. The index of irregularity of the resource (sum, as absolute value, of the monthly differences between production and intake compared to the total production) was lower in subclover (figure 2), but this resource was utilized only eight months of the year; the whole system had a slightly higher index (41%), while the highest values were scored by strips (100%) and firebreak lines (93%), mostly grazed at deferred stage.

Combustible phytomass quantity. The utilization of the strips and of the firebreaks was almost entirely concentrated in summer when the other resources were finished already. Sheep utilized almost entirely the standing hay, in the three summer months only 9% of the phytomass present before the grazing was left and, above all, sprouts were almost entirely defoliated preventing a dangerous source of flame diffusion. The utilization of the other two resources was interrupted at summer because of the forage shortage; subterranean clover left the lowest quantity of dry refuse (0.48 $t.ha^{-1}$).

Flame diffusion speed. A burning trial was made in August 1995 within special strips, one metre wide and twenty metres long. Diffusion was really slow in the subterranean clover sward and effectively reduced in improved sward in comparision to native pasture. Reduced speed of flame diffusion is probably related to the higher intake of fuel phytomass by grazing animals and to the short habit of subterranean clover.

Forage chemical contents. Subterranean clover showed the highest protein content (table n. 2), strips showed the lowest protein content and the highest fibre; behaviour of native pasture and firebreaks was within the other two. Quality of forage decreased in late utilization, but in firebreaks improved with subterranean clover this decrease was lower than expected.

CONCLUSIONS
The possibility of mantaining a flock grazing all year in a system based on native pasture, subterranean clover swards, strips thinned out and improved firebreak lines was confirmed. The positive effect of grazing on the prevention of fire hazards, particularly with deferred grazing as in the case of the strips and the firebreaks, was confirmed too. In this trial subterranean clover helped to balance the seasonal distribution of forage and contributed to reduce fire hazards and flame diffusion speed. The combination of resources allowed a good regularity of production and intake throughout the year. In the case that ewes are substituted by milking sheep, some integrations or

availability of more intensive areas nearby is required.

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Table 1
Mean annual dry matter yield (t.ha^{-1}), intake by animals (%), quantity of fuel biomass during the three summer months (t.ha^{-1}) and flame diffusion speed (m.min^{-1}).

	DM yield (t.ha^{-1})	Intake (%)	Fuel biomass (t.ha^{-1})	Flame speed (m.min^{-1})
Native pasture	4.2 b	53.1 b	1.22 a	2.70 a
Subterranean clover pure stand	7.3 a	69.0 a	0.48 b	0.55 c
Thinned strips	1.6 c	65.2 ab	0.43 b	1.77 b
Firebreak	3.3 b	71.3 a	0.65 b	1.05 c

Values having same letters are not significantly different ($p<0.05$)

Table 2
CP and CF contents in forages grazed at normal stage and at deferred grazing stage (% on dry matter).

	CP (%)	CF (%)
Native pasture	13.5 b	23.0 bc
Subterranean clover pure stand	17.6 a	20.9 c
Thinned strips	12.4 b	24.3 bc
Firebreak	14.8 b	21.1 c
Thinned strips at deferred grazing stage	5.8 c	40.5 a
Firebreaks at deferred grazing stage	7.9 c	31.4 ab

Values having same letters are not significantly different ($p<0.05$)

Figure 1
Combination and utilization of the four different resources used in the studied systems.

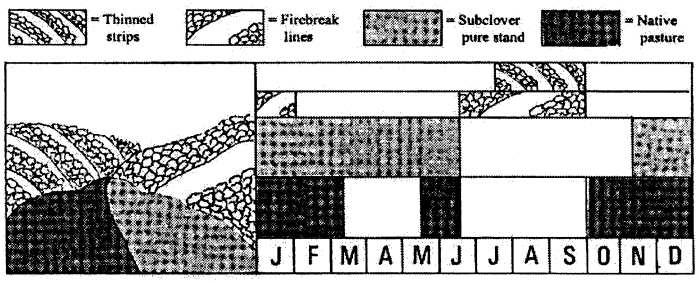

Figure 2
Month DM yeild, animal intake and irregularity index of the four resources and of the integrated system.