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# Restoring of an abandoned farm area with trees and herbaceous resources by fallow deer grazing

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**SUMMARY** - Abandoning of farm surfaces, once utilized for agricultural activities, causes a general simplification in natural vegetation and environmental degradation. For these reasons it is necessary to point out new possibilities of land management, in order to reduce such environmental impact. In this paper the possibility of restoring a degraded hilly area in Tuscany (Central Italy) is shown, with the utilization of fallow deer (*Dama dama*) grazing on a trees/herbaceous association.

**Key words**: Continuous grazing, pastoral system, land management, utilization.

***RESUME*** *- "Restauration d'une zone agricole abandonnée avec des arbres et des ressources herbacées en utilisant des daims". L'abandon des surfaces agricoles, utilisées dans le passé par des activités complexes, a eu pour conséquence une simplification généralisée de la végétation spontanée et une dégradation de l'environnement. Actuellement on ressent la nécessité d'expérimenter de nouveaux modèles de gestion du territoire. Dans ce contexte on a examiné la possibilité d'améliorer une surface dégradée de la colline Toscane (Italie centrale), où des daims* (Dama dama) *ont utilisé une association de ligneux et d'herbacées selon la technique du pâturage continu.*

***Mots-clés*** *: Pâturage continu, système pastoral, gestion du territoire, utilisation.*

## Introduction

The abandonment of large farm surfaces has affected first the so called marginal lands (in terms of fertility, slope, social and economic conditions); in the last years, according to new agricultural policies of EU about productive surplus, also a large amount of surface formerly well utilized with a lot of intensive crops, has been utilized with more extensive practices or no cultivation at all. A lot of papers have studied the problems concerning marginal lands (Talamucci *et al.*, 1987; Grignani *et al.*, 1993; Talamucci, 1993) in various Italian environments and all of them have pointed out the extreme fragility, at any level, of the ecosystems that follow the abandonment of land. An index of level of degradation caused by abandonment can be found in natural vegetation, which is really the true reflection of every management change.

The aim of this paper was to show the possibility of restoring an abandoned area with a complex tree/shrub/herbaceous association, using extensive management, in order to reduce shrubs development and utilizing practices with no environmental impact. We show the results of a trial regarding the possibility of a very extensive utilization, with wild animals of an area formerly utilized for olive trees. In the area a natural pasture with a lot of shrubs was developed.

## Materials and methods

The area is located in the experimental farm of University of Florence, about 25 km south of the city (central Italy). A hilly surface of 5.7 ha of specialized olive orchard, now abandoned, has been continuously grazed with 19 fallow deer (*Dama dama*), with a stocking rate of 3.3 deer $ha^{-1}$ . The resources utilized by animals were natural pastures, olive sprouts, bramble (*Rubus* spp.) and broom (*Spartium junceum*). Productive and utilization data from pastures were collected in exclusion cages (1 $m^2$ wide) with monthly cutting. Productive data on shrubs and olive sprouts (only of the current annual production) were obtained by relationships, found with a lot of sample cutting, between

dimensions (height, diameters, volume) on whole plants or branches and DM weight. Utilization rate for woody species was recorded on sample branches, permanently marked, as ratio between length utilized by animals and total length before grazing (Ferguson and Marsden, 1977; Jensen and Urness, 1981; Stagliano, 1997). All the resources were also compared, using a complex system, to the theoretical and real intake of animals.

## Results and discussion

In Table 1 the DM production for each resource and for the whole system is shown, in the different seasons. We can easily see that pasture always accounts for about 90% of the system production, but with a very high level of irregularity during the year (more than 50% of total system forage availability is represented by spring pasture yield). Woody resources generally have a very low productivity, and in all periods their production is almost insignificant (especially in broom). Olive sprouts and bramble seems to be resources that can contribute in some way to the whole system, but their maximum production is in spring, in a period of great herbage surplus. Winter seems to be the most critical period, with about 300 kg $ha^{-1}$ DM in three months.

Table 1. Seasonal DM production (kg $ha^{-1}$) for each resources and for the whole system

| Period | Pasture | Bramble | Olive sprouts | Broom | System |
|---|---|---|---|---|---|
| Winter | 290 | 7.0 | 10.0 | 0.0 | 307 |
| Spring | 2230 | 39.1 | 102.0 | 1.6 | 2373 |
| Summer | 970 | 30.2 | 30.0 | 0.4 | 1031 |
| Autumn | 630 | 1.3 | 0.8 | 0.0 | 632 |

Table 2 shows annual production and utilization rate for the whole system: the global offer is represented, almost entirely, by herbage mass, which has been utilized by animals with a utilization rate of 50%. Woody resources contributed in a minimal way to the total system availability (just more than 200 kg $ha^{-1}$ DM), with a reduced contribution of broom, due to its low productivity and frequency (only 9 plants $ha^{-1}$). Nevertheless this species resulted in a very good palatability for the animals (about 70% of intake). Slightly higher was the contribution of bramble, due especially to the presence of a small number of plants of great dimensions; others plants contributed to the global production in inverse ratio to their dimensions. Rate of intake of bramble was the lowest among the resources (33%) and depending on size, with maximum percentage of utilization for the smallest plants. Olive sprouts were woody resources with maximum yield (more than 140 kg $ha^{1}$ DM), because of a great diffusion of plants. Leaves and young sprouts resulted very palatable for fallow deer. Total system production exceeded 4 t $ha^{-1}$, with utilization ratio of about 50%.

Table 2. Number of plants (woody species), production (kg $ha^{-1}$) and utilization (%) for different resources and for the system

| Resource | Plants $ha^{-1}$ | Production (kg $ha^{-1}$ DM) | Utilization rate (%) |
|---|---|---|---|
| Pasture | - | 4120 | 50 |
| Bramble | 36 | 78 | 33 |
| Olive sprouts | 111 | 142 | 46 |
| Broom | 9 | 2 | 68 |
| System | - | 4342 | 49 |

In Table 3 the utilization for different resources, in absolute and percentage values, is reported. More than 95% of fallow deer diet is made up of herbaceous resources, while the total amount of woody

species contributed only less than 5% all through the year. In total, with a stocking rate of only 3.3 deer $ha^{-1}$ (about 0.4 UBA $ha^{-1}$), 2152 kg $ha^{-1}$ were utilized by animals, with a daily intake of about 1.8 kg per head.

Table 3. Annual intake of deer for each resources (absolute and percentage)

| Resource | kg $ha^{-1}$ DM | % |
|---|---|---|
| Pasture | 2060.0 | 95.7 |
| Bramble | 25.4 | 1.2 |
| Olive sprouts | 65.2 | 3.0 |
| Broom | 1.3 | 0.1 |

Total intake: 2152 kg $ha^{-1}$ DM
Average stocking rate: 3.3 deer $ha^{-1}$
Average daily intake: 1.8 kg DM $deer^{-1}$

Productive monthly data have been compared to a theoretical trend of requirements (Poli, 1996) and real intake of the experiment, describing in this way the complex multi-resources system presented in Figure 1. Production is reported here as monthly average of growth intensity (kg $ha^{-1}$ $d^{-1}$) of the whole system, subdivided into herbaceous and woody components. Among these olive branches (deriving from spring pruning and left on the ground) were also considered.

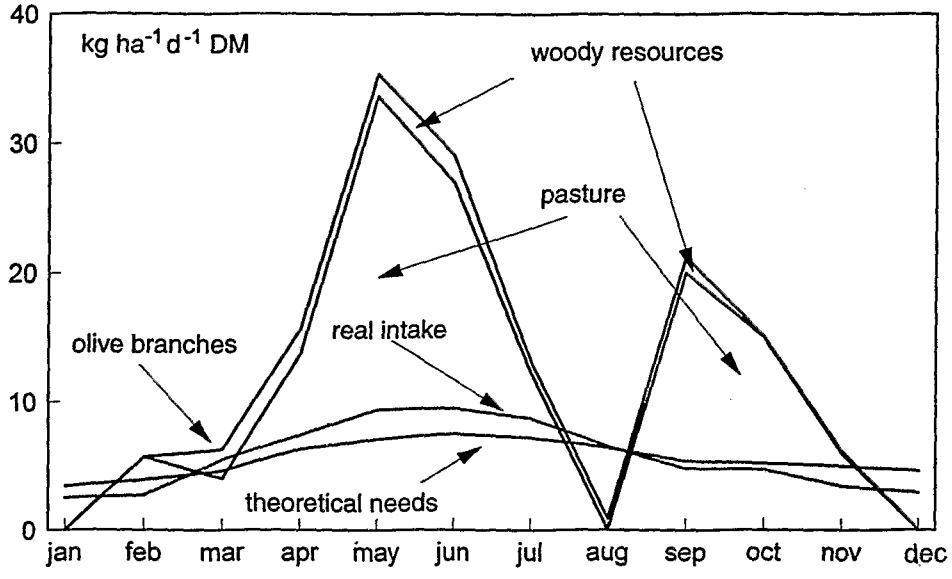


Fig. 1. Productivity of the whole system, theoretical and real intake of 3.3 deer $ha^{-1}$.

The most critical periods were mid-summer (August) and winter time (December-January). The system resulted not very balanced, with an excessive forage offer in spring and, in a lower measure, in autumn. In any case the system was able to be self-sustainable, because of great fallow deer frugality, which consisted mainly in the possibility of utilizing the forage production of surplus period, even with deferred grazing. For this reason a little difference is present between the theoretical and real requirement lines: fallow deer can have a flexible utilization, increasing intake during surplus periods and reducing it in gap ones.

## Conclusions

This work showed the real possibility of improving management of marginal or abandoned land with a pastoral utilization in an extensive way, even with non-traditional livestock systems (fallow deer in our experimentation) and with very low external inputs. In fact the whole system, even if critical periods were present due to irregular distribution of yield, was able to maintain the imposed stocking rate, with almost no extra-system resources, represented only by a very small quantity of hay in exceptional events. This was possible only for the kind of livestock used, with a very high level of frugality.

## References

Ferguson, R.B. and Marsden, M.A. (1977). Estimating overwinter bitterbrush utilization from twig diameter-length-weight relations. *J. Range Management,* 30 (3): 231-236.

Grignani, C., Cavallero, A., Acutis, M. and Dufour, C. (1993). Le tipologie pastorali della Provincia di Imperia: Risultati di un quadriennio di ricerche sulle loro caratteristiche vegetazionali, produttive e di utilizzazione potenziale. In *Sistemi Agricoli Marginali*, CNR, P.F. IPRA, pp. 69-91.

Jensen, C.H. and Urness, P.J. (1981). Establishing browse utilization from twig diameters. *J. Range Management,* 34 (2): 113-116.

Poli, B.M. (1996). Feeding and nutrition in fallow deer: A review. *Suppl. Ric. Biol. Selvaggina,* XXV: 31-61.

Staglianò, N. (1997). *Valutazione di risorse foraggere diversificate in aree aziendali liberate dall'agricoltura e destinate al pascolamento con animali selvatici*. Ph.D. Thesis, University of Florence.

Talamucci, P., Sarno, R. and Cavallero, A. (1987). I sistemi foraggeri. In *I Sistemi agricoli marginali*, CNR-IPRA, Rapporto intermedio, pp. 133-177.

Talamucci, P. (1993). Alcune considerazioni sui sistemi pastorali a risorse diversificate nelle aree Mediterranee. In *Actas XXXIII Reunion Cient. SEEP*, Ciudad Real, 29 March - 2 April, pp. 15-33.