LAND MANAGEMENT TO DEVELOP NATURALISTIC TOURISM

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Abstract

Integration of rural and urban economies might give solutions to land degradation and abandonment due to marginal productivity and organization complexity. The existence of complex agro-silvo-pastoral systems is contrary to high productivity, on the other hand it favors cultural uses of beautiful landscapes deriving from enhanced resource diversification.
Management of land abandoned by agriculture is necessary to control soil erosion, wildfires, biodiversity reduction and excessive diffusion of cosmopolitan species. Unfortunately this management is often very expensive.
Naturalistic tourism development might be an interesting monetary source from towns and can be reinvested in rural areas maintenance.
A trial carried out in Tuscany (Central Italy) has investigated changes in forage availability and consumption occurred between 1990 and 2000 and the possibility of cheap management by low animal stocking rates and very limited mechanical interventions. Possible interventions to improve the existing tourist facilities are also discussed.
Maintenance of current vegetation conditions resulted possible by minimal grazing and one mowing of residuals before summer. This kind of management resulted to favor tourist activities.

Key words: land care, management of diversified resources, grazing.

Introduction

Number of livestock reared on pastures has been notably reduced in Italy during the last 20-30 years especially because of progressive industrialization and urbanization. Most of Northern pastoral areas are nowadays abandoned, the same happens in marginal lands of Central Italy, while there is a diversified mosaic of overgrazed and undergrazed pastures in the South and islands (Staglianò et Al., 2000; Talamucci et Al., 1996; Talamucci and Pardini, 1996). The problem of vegetation degradation caused by reduced management is important also in other European Countries (Rigueiro et Al., 1999; Rochon and Goby, 1999; Spatz and Papacristou, 1999).
Management is very diversified in the peninsula, it is often sub-optimal and causes vegetation degradation. In turn, there is biodiversity reduction also where human activities had increased it before, in fact native pastures are extremely sensible to management changes because they are often types of secondary vegetation artificially originated by men at the place of the climax forests.
Moreover, biomass accumulation in pastures must be avoided because it causes productivity and quality reduction and increased fire hazards. Botanical changes lead to shrub encroachment and transitory degraded stages of forest before a good tree layer is grown again. Transitional shrubland usually is not interesting for landscape beauty.
Pasture management is therefore necessary even when this resource has lost economic interest for forage production. Unfortunately intervention cost often causes abandonment and lack of control on environmental risks or fragmentation of management efforts that are not planned.

Common solutions suggest the increase of pasture productivity by sowings and oversowings, fertilizations, new cultivar introduction. Unfortunately there is scarce interest to adopt these interventions where already lack the animals. Preventive evaluation of effective vocations of each pasture land is preferable to orient management towards efforts to conserve pasture especially for tourism, or to lead forest new introduction.
Pastures have nowadays renewed importance for their biologic, recreational and cultural functions. National Parks comprise about 260,000 ha of pastures (22% of total area, according to Corine Land Cover survey) and they generate important incomes through their flora and fauna. Many farms already make use of pastoral areas to organize trekking and back horse riding. These uses require the construction of organized lookouts, resting areas, pick-nick places, information boards, and can be integrated in the further diversification of the national economy at farm and territory scale.
This trial has evaluated the possibility of conserving a diversified and multi-purpose pastoral system by minimal management with animal grazing, also in view of the diversification of the farm incomes by naturalistic tourism (Talamucci et Al., 1997).

Materials and methods

A trial has been carried out in a private farm of Coastal Tuscany. Climate is Mediterranean with annual rainfall 680 mm and average temperature14,6 °C. Summer rainfall is 95 mm only and limits the productivity of the vegetation.
Local cattle and horse breeds are reared. Rotational grazing comprises native pastures (97 ha, 12% of grazing area) and sown subterranean clover pastures (20 ha, 2,4%), firebreaks sown with subterranean clover (60 ha, 7%) and a thinned out oak forest (630 ha, 78%).
Number of reared grazing animals has passed gradually by 179 cattle heads plus 560 sheep and 10 horses (equivalent to 269 livestock units) in 1990, to 44 cattle and 15 horses only (equivalent to 59 LU) in 2000. New incomes have been got by the started naturalistic tourism after buildings restructuration.
Pastoral system current organization and productivity were studied in this trial and results were compared with those got in trials conduced in the same farm ten years before (Pardini et Al., 1987; 1993; 1994; 1995; 1999; Pardini, 1992; Pardini and Rossini, 1997; Talamucci et Al., 1995; 1996).
Measurements carried out were the following:

- Pastoral system organization (interview to the manager),
- Productivity and quality of the grazed areas:
  - seasonal and annual dry matter production (biomass quantity into exclusion cages, cut and weighted each month),
  - dry matter intake by the animals (difference between production into cages and residual after grazing out of the cages),
  - botanical composition (linear analysis in each grazed typology).
    Results were compared to data recorded in former trials.
- Tourist opinions of the area (interviews to 50 customers, comprising landscape beauty esteem and suggestions for improvement).

Results and discussion

Pastoral system organization (fig. 1)

Cattle can graze native and sown pastures from February to mid June (143 days) and again from the end of September to the end of November (61 days). Animals are excluded from pasture parts reserved to hay production and they can graze harvest residuals at the end of May. Animals are moved into the firebreaks at the end of vegetation growing period (mid

June) also in order to reduce fuel biomass height and quantity. Cattle enter spontaneously into the thinned forest when even dry grass is finished in firebreak. They stay in firebreak and forest 107 days, forage in the forest is not enough however animals get shadow and they are also integrated with hay from sown meadows of the farm. The same happens in winter when animals stay 54 days in the forest.
Areas that are not or insufficiently grazed due to livestock reduction, are mown yearly and mechanically cleared from encroaching shrubs any 4 to 8 years.

Productivity and quality of grazing land

Forage production and residuals after grazing (Figure 2, Table 1).

Forage availability is very low inside forest, in fact production is mainly concentrated in tree canopy that can not be reached by animals. Forage production is however better seasonally distributed than in the other three resources.
Annual forage production has been slightly higher in 2000 (27.0 t.ha^{-1} DM in the total of the system) than 10 years before (26.7). This is probably due to reduction in organic fertilization that is consequent to reduced animal number.
On the contrary, residuals after grazing have been higher in 2000 (10.6 t.ha^{-1} DM equivalent to 39.3% of the availability) than in 1990 (7.8 tons equivalent to 29.1%). These residuals are currently mowed before summer beginning in order to reduce fuel biomass. The production of the total area (Table 2) has been calculated in 1953.5 t.ha^{-1} DM in 2000 and 1750 t in 1990. If we apply the percentage of utilization to the whole system, 1185.8 tons are available for animals in 2000 (theoretically sufficient to support 260 livestock units if calculations are done on the bases of the forage biomass only) and 1240.1 tons were available in 1990 (theoretically sufficient to 272 LU).
On the base of the available forage biomass we infer that animal stocking rate was almost optimal in 1990 (262 LU reared and availability for 272) and it is dramatically lower than present potential (59 LU reared and calculated availability for 260).

Table 1: Comparison of forage production (DM t.ha^{-1}) and residual after grazing (DM t.ha^{-1}) in 2000 and 1990.

	Production (2000)	Residual (2000)	Production (1999)	Residual (1999)
Thinned forest	0.8	0.3	0.4	0.2
Sown firebreaks	8.7	3.2	8.9	2.6
Native pastures	7.5	4.0	8.0	2.3
Sown pastures	10.0	3.1	9.4	2.7

Table 2: Comparison of forage production (DM tons), theoretical forage availability (DM tons) of the whole grazing area, real livestock number and potential livestock number in the years 2000 and 1990.

	Year	
	(2000)	(1990)
Total production (DM tons)	1953.5	1750.0
Theoretical forage availability (DM tons)	1185.8	1240.1
Real livestock number (heads)	59	262
Potential livestock number (heads)	260	272

Botanical composition

78 plant species were recorded in 1990 (Pardini, unpublished data) and 73 in 2000. However specific contributions of some of the species has largely changed with increase of unpalatable shrubby species especially inside forest (*Juniperus communis, Erica scoparia, E. arborea, Cistus salvifolius, Sarotamnus scoparius, Spartium junceum*). Vigorous perennial grasses have diffused in pastures and firebreaks taking the place of legumes (*Festuca arundinacea, Bromus inermis, Lolium multiflorum*). These data suggest that there is a trend to new colonization by pre-forest vegetation and reduction of forages quality.
Biodiversity index (table 2) maintained enough well through the period, probably thanks to mechanical interventions that kept the ecological conditions formerly originated by grazing. However there is change in botanical composition with increasing presence of cosmopolitan species.
Biodiversity index (table 3) increased in sown pastures thanks to new diffusion of native species. The index was maintained in native pastures and sown firebreaks, these are the areas subject to more intensive grazing and residuals are mown after animals are moved away. The low grazing intensity has allowed the regrowth of shrubs under forest canopy, but these were controlled mechanically and the biodiversity index has persisted rather well.

Table 3: Variations in Shannon's biodiversity index in the four resources of the system between 1999 and 2000.

	Shannon index (2000)				Shannon index (1990)			
	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn
Thinned forest	1,02	1,25	1,30	1,13	0,98	1,10	1,45	1,24
Sown firebreaks	0,91	0,71	1,44	1,12	0,65	0,90	1,71	1,30
Native pastures	1,85	1,81	1,68	1,67	1,82	1,79	1,71	1,69
Sown pastures	0,63	0,33	1,56	0,94	0,35	0,19	0,91	0,74

Tourist opinions

All customers expressed appreciation for site beauty and especially for the managed areas.
A list of possible interventions to improve touring and cultural interest of the farm area was used to interview a group of 50 tourists that were visiting the farm.
Tourists expressed the following preferences:

1. 100% would appreciate the equipment of resting areas (tables, benches, rubbish bins, barbecues, lookout platforms supplied with information boards).
2. 100% expressed interest for higher education of the guides on ecological-agricultural-forestry topics.
3. 80% would appreciate the setting of trekking or back horse riding lanes supplied with lookout platforms, rubbish bins, information boards showing species names of plants and some naturalistic characteristics of each.
4. 50% would appreciate simplifications of some passages from sector to sector: gates removal and substitution with openings that allow man, cars and wild game passage but not cattle.

Customers availability to pay more for better services was asked and understood in all interviews. Unfortunately none of these facilities was available in the farm (not even in those nearby). However examples of adapt infrastructures can be taken from other farms and from rangeland management in other countries. These results are concordant with those already published by Pardini et Al. (1999).

Conclusions

Livestock number in the trial farm is little and grazing areas are largely underutilized by animals. Mechanical control as support to animal effects on vegetation is necessary to avoid shrub encroachment, this management has been sufficient to prevent quick changes in vegetation. Some technical difficulty is encountered in other farms when tractors have to clear on steep and rough slopes and this might be a limit to diffusion of this technique that is also more expensive than animal grazing only, however these difficulties can be overcome by planning of the areas where to concentrate clearing efforts for tourist visit. The adoption of double grazing-mechanical control on vegetation is esteemed technically possible and economically convenient for many farms of the area and, theoretically can be proposed for any area where naturalistic tourism is already a consistent reality. However the only alternative at present is the progressive reduction of areas that can be visited and possible future land abandonment.

However a planning of the areas to conserve as pastures is suggested and must be done in order to concentrate management efforts and to analyze conversion strategies for different areas that will be reforested.

Money necessary to allow land management and conservation can be got by naturalistic-tourism, this activity might be further developed. Development will require also farm infrastructures improvements, including lookouts, resting and picnic areas preparation. Consistent effort should be done to develop also educational uses of the farmland: information boards should be placed along trekking pathways, in lookouts picnic and resting areas. Farm guides should be trained to give information on botanical, animal and ecological topics.

A general consideration concerns marginal utility to increase pasture productivity and to improve seasonal distribution of production in conditions like the case study, consequently the classical agronomic means (like sowings, oversowings, mineral fertilization, new cultivar introduction) will have secondary utility in comparison to land use planning needs. When the farmland is utilized mainly for tourism it is necessary to orient towards new management purposes (Pardini, submitted for printing EOLSS).

Naturalistic tourism is an interesting indirect management tool that can contribute to increase money flow from towns to rural areas. Cultural use of territory can contribute also to improve land care education that, unfortunately, in Italy is still often considered a secondary priority.

Figure 1: Area proportion of each grazed resource and periods of grazing (grey), forage harvesting (upward arrows) and hay distribution to animals (downward arrows).

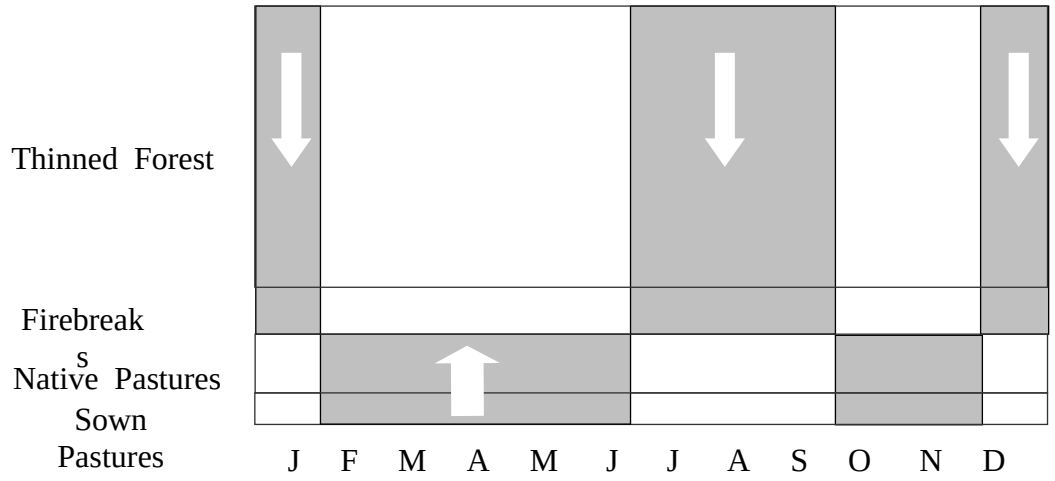
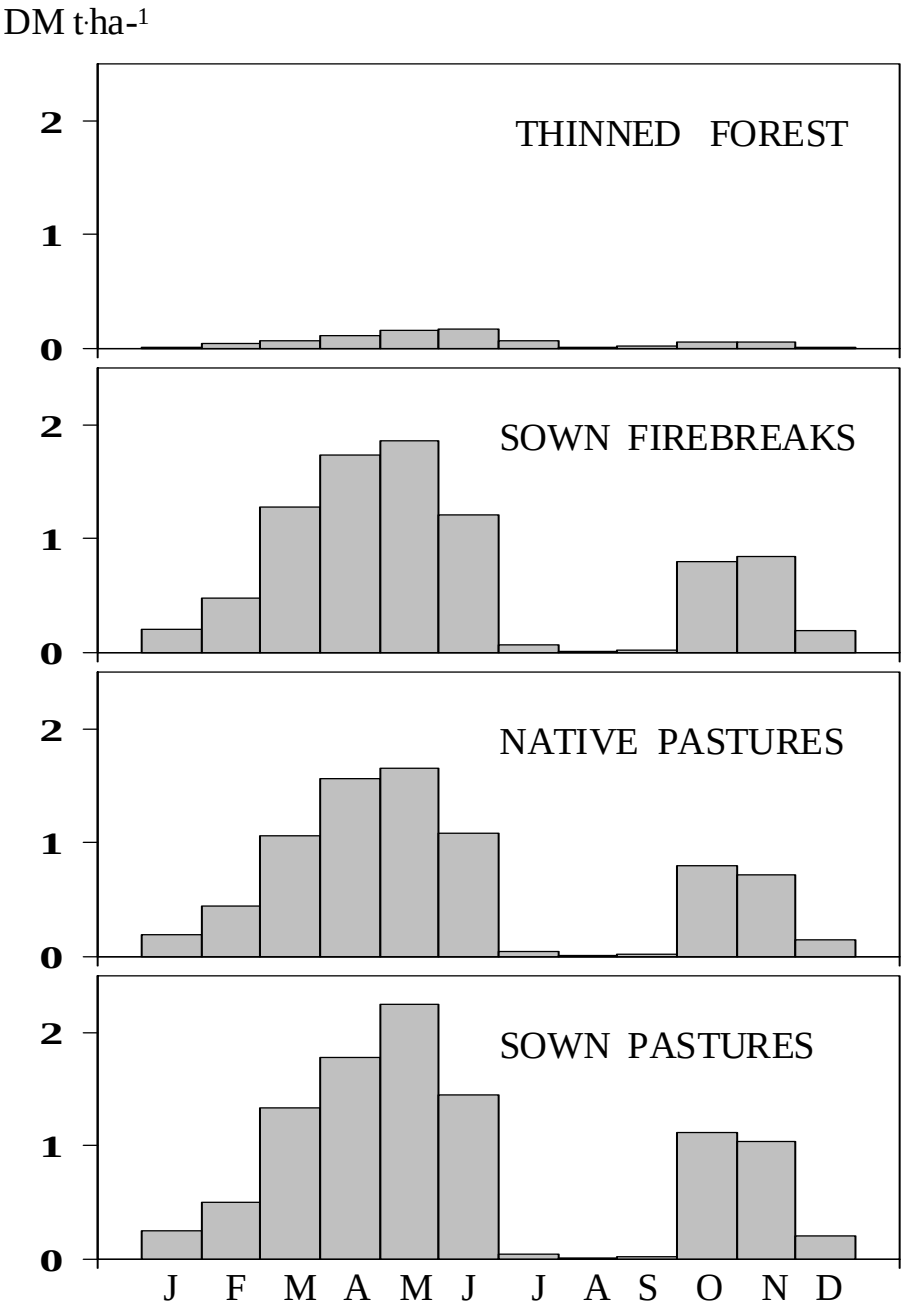


Figure 2 – Monthly forage production (DM tons ha^{-1} available for animals)



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