

Effectiveness of specific stocking rates to avoid habitat deterioration, applied in accordance to the Italian GAEC standard 4.6 (ex 4.1c) of cross compliance

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Abstract

The present paper aims at providing an evaluation of the effectiveness of the application of GAEC standard 4.6 (ex 4.1c) of cross compliance in the Italian grazing system, in the light of the recent bibliography. Given the changes occurred in the last decades and the effects of application of the rule, the latter appears broadly positive but susceptible of adjustments. Nowadays the Italian grazing system is no longer characterized by a problem of overstocking, which led the legislator, in the past, to identify and enforce the limit of 4 LU/ha as maximum stocking rate. The problem is probably the opposite: the too low rate and the absence of animals on many grazing areas of Italy. These areas, when totally abandoned by pastoral herding, have evolved, or rather convoluted, towards a shrub vegetation of nutritional and landscape low value. Recent bibliography shows, on one side, the value of 3 LU/ha as high rate, while on the other side, it speaks of need or urgency to maintain a minimal stocking rate for the conservation of pastures, otherwise overgrown by bushes and plants not appetite by animals. With these statements, here we propose an update of stocking rate limits, subordinated to individual interventions by Regions for specific situations: minimum 0.3 LU/ha, maximum 3 LU/ha, and suggest Regional supplementary measures, mostly concerning the study for locating macro-areas (zoning) and specific stocking rates, which ought not be less than 25% of the potential rate in any case.

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Key words: habitat preservation, Italian cross compliance, grazing system, stocking rate.

Acknowledgments: this study was funded by EFFICOND¹ Italian project, Coordinator Dr. Paolo Bazzoffi, CRA ABP, Firenze, Italy.

Received for publication: 25 March 2011.
Accepted for publication: 12 May 2011.

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Italian Journal of Agronomy 2011; 6(s1):e17
doi:10.4081/ija.2011.6.s1.e17

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Introduction

A global view of Italian zootechny shows that today there is no longer a problem of overloading of livestock, which led the legislator, in the past, to identify and enforce the limit of 4 LU/ha as maximum stocking rate. In 2003, within the Common Agricultural Policy reform, the Reg. 1782/2003 was published in order to regulate the grant to agriculture conditioned to the maintaining of lands in good agricultural environmental conditions (GAEC). In particular, the European Council wanted to adopt measures to encourage the preservation of permanent pastures, in order to avoid a massive conversion into arable crops (points 3. and 4. of preliminary statements; art. 5). The Rule 4.1c of cross compliance (become standard 4.6 with the Italian MD dated 22/12/2009) aimed to ensure a minimal level of maintenance and avoid the deterioration of the habitat by maintaining the surface of permanent pasture as recorded in 2003 and fixing a minimal and maximum stocking rate, respectively 0.2 and 4.0 Livestock Units per hectare (LU/ha). If we consider the total livestock in relation to grazing areas, the threshold of 4 LUs is rarely achieved. The problem, thus, is probably the opposite: the too low rate and the absence of animals on many grazing areas of Italy (Figure 1). While in the past the over-grazing, and the excessive stocking rate, caused the extinction of many appetite grazing species and the prevalence of not appetite weed species (causing the degradation of pasture vegetation), nowadays this phenomenon does not occur with the same trend, due to the strong falling number of animals full or partially using grazing resource. These areas, when totally abandoned by pastoral herding, have evolved, or rather convoluted, towards a shrub vegetation of nutritional and landscape low value (see above, concerning standard 4.1.a). Stated that the generalizations at national level, given the great diversity of the territory, might lead to overestimation or underestimation of real values, we can report that the recent bibliography shows on one side the value of 3 LU/ha as high rate, while on the other hand, it speaks of need or urgency to maintain a minimal stocking rate for the conservation of pastures, otherwise overgrown by bushes and plants not appetite by animals. Regional legislation at local level can be useful for establishing supplementary measures for the application of the Rule in object, concerning the mowing to clean up the permanent pasture, to limit the dissemination of species undesired by animals; the zoning study and the individuation of their maximum and minimum stocking rate; the promotion of native breeds; compensatory grants for organic or agro-environmental farms.

¹EFFICOND (EFF= environmental efficacy of COND = cross-compliance [Condizionalità in Italian] standards) is a project of the CRA (Agricultural Research Council) started in 2009 to answer the specific needs of the RRN National Rural Network) to monitor and assess the environmental-protection measures imposed by the CAP on the national agricultural policy and implemented via the Regional Rural Development Plans (PSR). The project's main goals are the assessment of the Standards' environmental efficacy and the development of agro-environmental indicators for the assessment of the Standards' efficacy at a national level.

Brief description of the state-of-the-art

The post-war onwards, the Italian zootechny has undergone deep changes in terms of total consistency and heads reared within each system. From the 1950s to now, sheep and goats have suffered in absolute the greatest decrease, from around 13 million heads to approximately 9 million; on the contrary, the cattle have been a minor reduction altogether, but highest in terms of system: over 70% of the animals raised in extensive systems were replaced with selected breeds in intensive farming (Cavallero and Ciotti, 1991; Cavallero *et al.*, 1997; 2000). Cattle herd, until that time managed under a pastoral model, where the source of feed was represented essentially by spontaneous vegetation, has been increased and characterized by the concentration of farms and animals in lowlands, more populated and rich in facilities, the use of concentrate feeds and industrial supplements.

This deep change is today visible not only in the Italian Alpine arch, but also in the South-Central Apennine regions. According to some estimates, in all the Italian Alpine arch, about 800 thousand hectares of pasture, meadow-pasture and native pastures have been abandoned since 1960, which means about 45% of the surface covered with meadows and pastures is practically disappeared.

The only data related to the period 1990-2000 (4th and 5th censuses of agriculture by ISTAT) (ISTAT, 1990; 2000) are sufficient to represent the deep changes occurred in the Italian livestock in the last decades. Data analysis highlights the following situation:

- 500 thousand hectares of mountain areas, mainly of meadows and permanent pasture, are no longer used;
- farms decreased by about 40,000 units;
- grazing-fed heads declined by approximately 300,000 heads.

Indisputable in this deep transformation is the rearing of Friesian cows, typically farmed intensively: in these years the breed has replaced most of the dairy native breeds of Italian mountain and hilly areas. The phenomenon, although at least, has concerned even sheep and goats, where a small proportion of indigenous, typically grazing breeds, more suited to intensive or semi-intensive rearing, was replaced by breeds such as Sardinian sheep and Saanen and Alpine goats. The disappearance of the great historical transhumance of sheep and cattle, from Materan and Apulian plains towards the mountains of Abruzzo and Molise regions is an example of how the national traditional livestock sector has changed over recent years (Figure 2), while attention remains lively on Alpine cattle parades (for example in Trentino Alto-Adige, Piedmont and Val d'Aosta regions). From this description of our livestock system results that today there is no longer a problem of overloading of grazing animals on pastures, which led the law-maker to identify and enforce the limit of 4 LU/ha as maximum stocking rate. In fact, if we consider the livestock in relation to the amount of total available grazing areas, we can see that the threshold of 4 LUs/ha is rarely achieved. The problem, then, is likely the opposite, due to the too low stocking rate and the absence of animals grazing on many areas of Italy. While in the past the excessive concentration of animals per unit area, and the consequent over-grazing, caused the extinction of many grazing species and the undesired weed species prevail (resulting in deterioration of the pasture vegetation) (Bovolenta, 2004; Bovolenta *et al.*, 2005; Peyraud and Delaby, 2001), today this phenomenon is strongly reduced for the cited strong falling number of animals, full or partially using grazing resource. These abandoned areas, when totally pastoral herding, have evolved, or rather convoluted, towards a shrub vegetation and landscape low-grade value. When the height of turfgrass exceeds 20 cm (and this is just one of the consequences of under-rating in moderately or highly fertile and productive soils), a clear fall of herbage taking occurs (Figure 3). The cause lies in both the strong herbage trampling and contamination with excrement, and in the minor harvesting and intake efficiency by the animal (Cavallero and Ciotti, 1991).



Figure 1. Herd of Piedmontese cattle in Susa Valley (Bardonecchia Alps, province of Torino). Courtesy of L. Battaglini.



Figure 2. Herdsmen used to move by horse during the long travel of transhumance from lowlands to high pastures; here the herdsman leads the Podolico cattle at the pastures, in Ferrandina (province of Matera). Courtesy of U. Agnello.



Figure 3. Goats grazing on a pasture at low stocking rate; notable the partial invasion by *Rhododendron ferrugineum* (high Strona Valley, province of Verbania) and height of herbage. Courtesy of M. Verona.

It also occurred that in better situations of fertility and climate, without excessive degradation due to damage caused in the past, there is also the resumption of shrubs, maquis shrublands and, in cold areas, of trees or forestry. In these areas, the action of grazing animals, managed with seasonal stocking rates reduced till 60% of balanced ones (0.29-0.48 LU/Ha), under a *controlled* grazing management, is able to limit or stop the growth of these species (Cavallero *et al.*, 2000; Reyneri *et al.*, 2000) (Figure 4).

Stating that the generalizations at national level, given the great diversity of the territory (Pardini and Rossigni, 1997; Cavallero *et al.*, 1992; Fondazione Fojanini, 1994), might lead to overestimation or underestimation of real values, we can report that the recent bibliography shows the value of 3 LU/Ha already as high rate. On the other hand, authors speak of need or urgency to maintain a minimal stocking rate for the conservation of pastures otherwise overgrown by bushes (Cavallero *et al.*, 2000) (Figure 5).



Figure 4. Cattles resting near Riale (province of Verbania), it is visible the slope showing evident signs of expansion of *Alnus viridis*. Courtesy of M. Verona.

From a zootechnical point of view, an important clarification is necessary: speaking generically of LUs can lead to think that the grazing action of animals is equal regardless of species. Numerous studies have shown that the species reared on pasture (cattle, sheep, goats, equines) are clearly distinguishable both for procedures of taking herbage (cows mow, sheep tear up the collar in case of shortage of grass, goats and horses cut) and the choice of categories of plants (cattle and sheep prefer herbs, horses and goats, in addition to herbs, also shrubs and tops and buds of young trees) (Bullitta and Porqueddu, 1992; Gusmeroli *et al.*, 2005) in relation to the grazing season. From this, we can deduce that aiming at the maintaining of open space, it is necessary to promote the combination of breeds and species, with the result of a harmonious use of pasture and maintaining good environmental heterogeneity, consisting of the natural alternation of woods, pastures and crops (Figure 6). The action of grazing animal affects also the percentage of dead and necrotic biomass on the pasture: grazing



Figure 6. Each animal species has a specific way to graze. The ideal condition for a pasture would be to balance all the species, for period and number. Courtesy of U. Agnello.

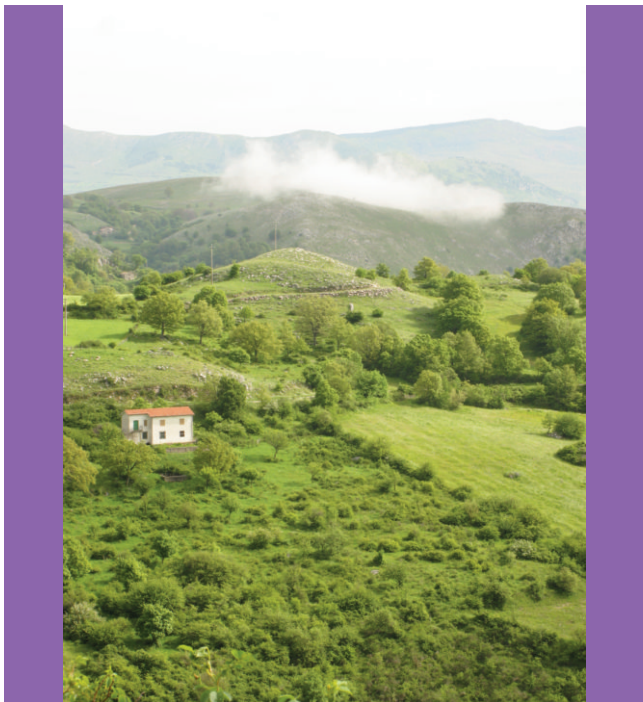


Figure 5. In this plot the absence of grazing animals is leading to the invasion of bushes and trees (Appennine's hills, Basilicata region). Courtesy of U. Agnello.



Figure 7. The action of controlled grazing can help to limit the trigger to fire, removing biomass and promoting the re-growth (larch wood grazed, Gianna Alps, Pellice valley, province of Torino). Courtesy of M. Verona.

activities contribute also to remove biomass and promote the re-growth, the tillering and thickening of turfgrass, thus limiting the trigger to fire, with positive effects on risk of leaching and soil disruption (Staglianò *et al.*, 2000; Talamucci *et al.*, 1996). The action of trampling also plays a physical containment of the species not appreciated by animals, herbaceous and shrubs and trees, contributing to maintaining the balance of the mountainous-hilly environment (Cavallero and Ciotti, 1991) (Figures 7 and 8).

With these statements, the herdsman and his animals can be seen under a dual role: producer-service provider and bio-processors of plant resource into foodstuffs of high functionality for human consumption, resources otherwise lost. In fact, in addition to merely animal products (milk, meat, cheese, skin, fibre), they provide to communities those indirect services that too often offer modest income, compared to the large effort in terms of energy and passion, income that in a mere calculation does not justify the continuation of production activities (Del Re and Rossi, 2002) (Figure 9).

These indirect services are carried out at three levels: i) conservation of animal and plant biodiversity (Chemini and Gianelle, 1999; Argenti *et al.*, 2000) involved in traditional products and its germplasm: it is the case of in situ conservation of breeds at risk of extinction (pre-

served also despite passed genetic improvement plans of herds), which are the best users of pasture, thanks to their rusticity; the downside is the lower level of production in quantity, despite the high quality, and at present it is still a penalty in income; ii) environmental preservation and plant and animal biodiversity of naturalistic interest: the animal performs a crucial action of vegetation control, through stripping, fertilisation by manure, the trampling of plants and soil; the choice of the stocking rate per unit area is essential, for the reasons outlined above, as well as the type of the herd or flock, for the specific use of pasture (Figures 10 and 11); iii) the preservation of the landscape and the tourist vocation: the maintenance of hilly and mountainous landscape has reflections on the tourist offer, in particular of agritourism, for the segment of the market in which the customer is seeking a return to nature and a detachment from extreme anthropic forms.

Consequently, the herdsman can appear under an ecological light, an invaluable tool in land management and conservation of the genetic patrimony, both animal and plant. Unfortunately, the difficulties of this sector are leading to a gradual abandonment of pastures, due to the closure of farms. In the latest ISTAT census (ISTAT, 2000), in fact, there has been an average national reduction in farms with pastures of 22.7%, with peaks of 50% in the North West Italy and 21.9% in Southern



Figure 8. The action of controlled grazing can help to limit the trigger to fire, removing biomass and promoting the re-growth (beech trees wood – Lucan Appennine). Courtesy of U. Agnello.



Figure 9. Often the mere income from animal products would not justify the continuation of activities in some areas; here, the return of cattles for afternoon milking (Santanel Alp, Soana valley, province of Torino). Courtesy of M. Verona.



Figure 10. Wild orchid in the Abruzzo's National Park. Courtesy of L. Sepe.



Figure 11. Example of precious bio-diversity: an *Onobrychis montana* pasture at Moncenisio (Cenischia valley, province of Torino). Courtesy of M. Verona.

Peninsular, compared to 1990. Disappearance of man means disappearance of animals, and consequently the territory guard, that is the control of the environment.

The present study shows the urgent need to ensure, by appropriate policies and interventions at the regional level, the good use of permanent pastures, according to multiple addresses:

- rationalisation of the use of public and private lands, for a homogeneous distribution of livestock and rational utilisation of grazing resources (Ziliotto *et al.*, 1992; Argenti *et al.*, 2006);
- benefits and incentives to the care and protection of the mountain pastures;
- adaptation and improvement of infrastructure serving farmers using the pastures (roads, water points, etc.) (Figure 12);
- economic incentives to in situ conservation of biodiversity in risk of extinction.

Synthetic response in terms of quantity and/or quality (scoring)

From the study of bibliography (Dietl and Bassetti, 1993), we see that the under-stocking leads to a reduction of Pastoral Value (up to 55%), while the effect is smaller concerning the number of species; moreover, it leads to an accumulation of necromassa by 30% more than the optimum stocking rate (Staglianò *et al.*, 2000).

Proposals for updating of the standard

Rule 4.6 (ex 4.1c) concerns the entire surface at pasture (grassland and permanent pasture), which extends for about 3.451.000 ha, i.e. 27% of the UAA (Utilised Agricultural Area) (Agricoltura e ambiente, 2010). In fact the grazing area that has characteristics of risk of deterioration of habitats, for which the Rule 4.1 might find application, is limited to restricted areas, which do not exceed in total 10% of the area under permanent pasture. For example, in Figure 13 this is represented in red (intense grazing) and blue colour (severe grazing), considering the risk of desertification under a grazing pressure factor (Costantini *et al.*, 2007).

From past experimental data we have seen that the excessive stocking, near to 3 LUs, leads to a decline in species with the highest pasture value, while it has a negligible effect on density of turfgrass. Low stocking rate (0.1-0.2 LU), on the contrary, it is often cause of increase of species at low pasture value (Peyraud and Delaby, 2001) (Figure 14).

In order to increase the biomass of pasture species, the most effective agronomic action is represented by the cleaning up through herbage meadows (Bullitta and Porqueddu, 1992), which can improve up to double the fodder bio-availability; another action is fertilizing, especially on poor and shallow pastures, where the action of grazing and trampling and the nature of the soil matrix can compromise the habitats even by respecting the limits of the standard. These actions represent a significant additional burden for the breeder, for which the Regulator might establish a form of additional financial support.

In the light of the foregoing, and taking into account the compensatory allowance which may be a compensation for those farms engaged in the mountain pastures and autochthonous livestock breeding (Regione Autonoma Valle d'Aosta, 2006), we propose the following update of stocking limit at national level:

- minimum 0.3 LU/ha,
- maximum 3 LU/ha.

Regional interventions appear fundamental, considering the wide variability of territory and its grazing resources, that means the complex grazing system. The studies carried out in several Regions shows different minimum stocking rate (0.1, 0.2 or 0.4), depending on the characteristics of soil, pastures and climate (Bianchetto *et al.*, 2009; Mayer and Huovinen, 2007) (Figure 15).

Indicative calculation of the stocking was elaborated by the estima-



Figure 12. A water point in the wood - Lucan Appennine. Courtesy of U. Agnello.

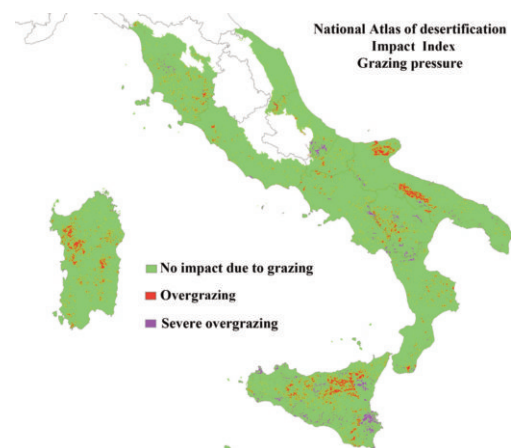


Figure 13. Area at risk of desertification due to overgrazing.



Figure 14. A stony pasture, characterised by high level of *Asphodelus*, consequence of high stocking rate. Courtesy of U. Agnello.



Figure 15. Native pasture in Sardinia. The wide variability of soil, climate and vegetation needs a study in order to individuate the best limits of stocking rate. Courtesy of M. Salis.



Figure 16. The native breeds, such as Pezzata Rossa Valdostana cattle, are recognised as privileged users of surface at hydrogeological meltdown risk (upland plain rich of *Carex sp.*, Alpage du Glacier, Aosta). Courtesy of M. Verona.



Figure 17. The decrease of grazing animals has caused the progressive growth of brush and trees on exclusively herbaceous slopes, previously open to animals (intermediate belt in the figure; Abruzzo's National Park). Courtesy of L. Sepe.

tion of annual cumulated production (annual production cumulated = herbage production in different seasons + re-growth after all grazing periods) expressed in Milk Units of Fodder (MFU). In less favourable environments for climatic conditions, soil fertility and decline of turf-grass, production is between 900 and 1300 MFU per year, which corresponds to 0.3-0.4 LU/ha of maintainable stocking (Mayer and Huovinen, 2007). In more favourable environments actually the grazing resource usable by animals reach values of MFU 3800-5000, corresponding to a stocking rate of about 2 LU/ha. We have opted for a higher stocking rate (3 LU/ha) because in many grazing areas part of the animals' requirements are covered by non-fodder supplements, mostly grains. Regional legislation can play a crucial rule for establishing, at local level, any supplementary measures for the good application of the standard object of the present study, such as:

- run one mowing per year for cleaning up the permanent pasture, to limit the dissemination of undesirable species;
- study for the location of macro-areas (zoning) for custom maximum and minimal stocking rates, which should not, in any case, be less than 25% of the potential rate (Staglianò *et al.*, 2000); this study should take into account the previous situation of pastures, the vegetation and the grazing animal type, to point out grazing strategies different from *free grazing* (i.e., year round grazing and rationed grazing), with higher instantaneous stocking rates in very productive areas (Bovolenta *et al.*, 2005; Ziliotto *et al.*, 2004);
- promote the rearing of native breeds, commonly recognised more rustic and less *heavy*, as privileged users of surfaces at hydrogeological meltdown risk (Figure 16);
- compensatory grants for organic or agro-environmental farming.

Conclusions

Standard 4.6 (ex 4.1c) requires a revision with reference to the question of stocking rate, in the light of the new reality of the Italian grazing system. Effectiveness, finally, depends on the measure in which the stocking rates are commensurate with real pasture resources and individual grazing production system (Figure 17). Current ones (minimum 0.2, maximum 4 LU/ha), certainly do not contribute to avoid the deterioration of habitats. We propose new stocking rate limits at national level - minimum 0.3 LU/ha and maximum 3 LU/ha - but we recommend interventions of individual Regions as urgent, in order to identify the best stocking rates, custom to the particular characteristics of the territory (zoning).

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