Pastures in the Italian Highlands

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THE Italian highlands, formed by the Alps and the Appenines, cover nearly one third of the whole country. The mountain pastures on these highlands present a variety of environmental conditions such as soil differences, degree of erosion, elevation, character and kind of precipitation, and character of vegetation. Effective plans both for the improvement and for the maintenance of sustained yields of Italian mountain pastures require careful attention to those factors.

Range and permanent pastures occupy about 53 percent of the mountain area. Range, as used here refers to the rocky, brush covered slopes or to those areas abandoned because of erosion—a sort of "no man's land" grazed only intermittently—generally by goats or small flocks of sheep. All of the pastures have been grazed for hundreds of years, while those in the Central and Southern portions of the Italian peninsula have been under some type of grazing use for more than two thousand years. Incidentally, it is extremely gratifying for a range technician to find pastures in excellent condition after more than 1000 years of use. Such examples are rare, but they do exist in Italy.

Much but not all of the land n ow grazed was originally covered by forests, importantly oak and pine.

The pastures (the more productive of the lands which are grazed) are extremely important in the Italian rural economy. The maintenance of a satisfactory livestock population, and the possibilities for increased amounts of meat and dairy products are directly related to availability of more high producing pastures. Moreover, practically all cattle, sheep, and goats, are slaughtered directly off pasture, and an important part of the Nation's butter and cheese is produced on mountain pastures.

While the quality of livestock generally could be greatly improved and production increased by use of better sires, and some increase could be made in the amount of winter forage grown on farms, for livestock, the Nation must look to higher yields on summer pasture if a permanent increase in the supply of animal products is to be attained. There are only very limited opportunities for establishing additional pastures. The forage required for increased production of meat and dairy products must come from the improved yields of pastures now in use.

An indication of the potentialities for increased production of animal products is seen when Alpine pastures in poor condition, producing only 30 to 40 kilos of meat per hectare are compared with similar pastures in good condition which are producing 160 to 200 kilos of meat per hectare. In American terms this is a range from a low of 66 pounds of meat per acre from pastures in poor condition, to a high of over 440 pounds per acre from pastures of the same type in good condition.

The Alpine Pastures

The Alpine mountains of Northern Italy are characterized by high, barren, steep peaks with intervening grass-covered narrow valleys, and an annual precipitation of 60–70 inches fairly well distributed throughout the year. The effective season of plant growth, and con-

sequently the period of profitable grazing is 90–100 days. Forage plants suitable for pasture grow at elevations of 4000 to 8000 feet. Moderate to serious erosion is a factor on part or the whole of 50 percent of the mountain pastures in the Alpine mountains. Erosion is present but less serious on an additional 30 percent of these pastures.

Most of the pastures in the Italian highlands are owned by neighboring communes or by private individuals. A few pastures are owned by the State and administered by the Forestry Corps. The pastures are customarily rented either to groups of livestock owners or to individual livestock operators who have farms in the lower valleys or plains. Pastures are generally rented or leased for the season without restrictions as to time or numbers of stock. Some leases do specify numbers and inclusive dates of grazing use; however, in these rare instances, no close check is made with reference to numbers actually grazed or of the specific period of grazing. The lease is generally made for one year to the highest bidder.

The pastures of the Alps vary in size from 50 to 400 hectares. Generally, however, the pastures contain from 60 to 100 hectares (1 ha = 2.46 acres).

Water is generally plentiful, but it is frequently poorly located. Adequate troughs and tanks for supplying drinking water for stock are generally lacking.

Only a very few pastures are fenced and none are cross-fenced for deferred and rotational grazing. Herders or shepherds generally accompany the livestock. At night while the herder sleeps, the stock are customarily placed in corrals or sheds.

Practically all the animals grazed on mountain pastures are milk stock. Most of the animals are of low to medium quality; very few herds or flocks are of improved grade. Practically no pure-bred herds or flocks are found. Butter and cheese are made in a small building located on the pasture. A majority of the pastures of the Alps are grazed by

FIG. 1. GOOD CONDITION PASTURE, CONSISTING OF GRASSES AND LEGUMES

The cattle are the milking strain of a comparatively new Red & White Italian Breed, *Valdostana* developed in the Aosta Valley, Northwest Italy.

cattle, but a few flocks of sheep and goats are also grazed. Both the sheep and goats are milked. On many pastures sheep and goats are also grazed at the end of the season after the cattle. Whatever herbage is not taken by the cattle is grazed to the surface of the ground.

A study of the flora of typical Alpine pastures reveals that where there are good stands of the desirable grasses the volume yield is generally high. Where the vegetation consists of secondary or less desirable forage, intermediate or low yields are produced. Where the undesirable forage plants dominate, only low yields of grazable forage are found.

Sampling the pasture flora and rating condition of high, intermediate and low producing pastures in the Alpine valleys indicate the following plants to be the more important.

ALPINE PASTURE FLORA

Desirable Forage Plants

Grasses	Forbs (broad-leaved)
Deschampsia caespitosa	*Trifolium pratense*
Festuca ovina	*Trifolium repens*
Fectuca rubra	*Trifolium alpinum*
Phleum alpinum	*Trifolium saxatile*
Anthoxanthum odoratum	*Lotus corniculatus*
Poa alpina	*Crepis spp.*
Poa bulbosa	*Leontodon hispidus*
	Leontodon autumnalis

Less Desirable Forage Plants

Grasses & Sedges		Forbs
Agrostis rupestris	*Koeleria hirsuta*	*Plantago media*
Agrostis alba	*Poa violacea*	*Achillea millefolium*
Agrostis vulgaris	*Poa compressa*	*Ranunculus acer*
Calamagrostis tenella	*Poa chaixi*	*Carum carvi L.*
Calamagrostis villosa	*Festuca silvatica*	
Trisetum spicatum	*Festuca pulchella*	
Trisetum argenteum	*Bromus inermis*	
Avena pubescens	*Carex echinata*	
Koeleria vallesiana	*Carex leporina*	

Undesirable Forage Plants

Grasses & Rushes	Forbs	
Scirpus pauciflorus	*Rumex alpinus*	*Cerastium alpinum*
Nardus stricta	*Hieracium auricula*	*Alchemilla alpina*
Briza media	*Luzula sudetica*	*Soldanella alpina*
Juncus arcticus	*Horminum pyrenaicump*	*Brunella vulgaris*
Juncus filiformis	*Polygonum viviparum*	*Nepeta nuda*
	Cerastium cerastioides	*Campanula spp.*
	Potentilla erecta	

Other criteria found to be of value in judging pasture condition included:

(1) Density of vegetation, especially where the less desirable or undesirable plants dominate the flora. Usually where undesirable plants have widely invaded the pasture there is a tendency for the vegeta-

tion to grow in bunches, with many bare spots or only thinly covered areas. One exception is noted where the worthless grass *Nardus stricta* is the principal invading plant, it may cover the surface in a dense stand. Usually, the high yielding pastures have an even dense stand of vegetation.

(2) Pastures in good and excellent condition have high percentages of tufted hairgrass (*Deschampsia caespitosa*). Pastures in only fair condition generally do not contain more than 5–10 percent of tufted hairgrass, and frequently the species is absent in poor condition pastures.

(3) *Nardus stricta* is an indicator of overgrazing, of acid soils, of eroded soils, and where there is little available nitrogen. It can be quickly eradicated from pastures by correcting the acidity, adding nitrogen, and following good grazing practices.

(4) When the soil is at least moderately fertile, and neutral in reaction, important indicators of overgrazing are, *Agrostis spp.*, *Trisetum sp.*, *Poa violacea*, *Potentilla erecta* and *Polygonum viviparum*.

(5) When fertile pastures, with soils which are acid in reaction, are continually overgrazed *Ranunculus spp.*, *Rumex sp.*, and *Senecio alpinus* become dominant. Correcting the acidity by the application of lime and following good grazing methods will allow grasses and clovers to again replace these species which, while they protect the soil from erosion are of little value as forage plants.

(6) Erosion was found to be closely associated with the kind of plants found on the pastures. No erosion was observed on pastures in good or excellent condition, but destructive erosion was prevalent on many pastures classed as poor to very poor. Fair condition pastures generally exhibit moderate to severe erosion on slopes over 15 percent. An apparent contradiction is the absence of current erosion on areas covered by thick stands of the pest *Nardus stricta;* however, in all instances where widespread invasion by this grass was observed, the sites were found to have lost most or all of the top soil. The present vegetation was growing on the subsoil.

Using these criteria as guides, a preliminary pasture condition classification for the Alpine pastures producing such plants as those listed in the pasture flora was found to be as follows:

Percentage Composition by Condition Classes

	DESIRABLE PLANTS	LESS DESIRABLE PLANTS	UNDESIRABLE PLANTS
	%	%	%
Excellent condition...	85–100	0–10	0–5
Good condition.....	70–85	10–20	0–10
Fair condition.....	50–70	20–35	10–25
Poor condition.....	20–50	35–55	20–40
Very poor condition...	5–20	25–35	40–70

Estimated Grazing Capacity

Excellent condition.....	⅛ to ¼	ha.	per	cow	month*
Good condition...	¼ to ½	"	"	"	"
Fair condition....	½ to 1	"	"	"	"
Poor condition...1	to 1½	"	"	"	"
Very poor condition 1½	to 3	"	"	"	"

* 1 cow month is the amount of forage required to supply one 450 kilogram cow a full ration for one month.

The Appenine Pastures

The Appenine Mountains, especially those forming the Southern rim of the

Po Valley and the Central portions of the Italian peninsula are of lower elevation than the Alps and are rounded peaks and ridges that are frequently covered with trees, brush, grasses or weeds. The most important grazing areas are found in rounded valleys, flat or nearly flat basins, and low undulating hills. The mountain pasture lands in the Appenines generally lie at elevations between 3000 to 4500 feet, where the rainfall varies from 15 to 35 inches per year. Dry summers prevail. There are generally 90 to 100 days from late May to early September when no effective rain falls. Winter snow accumulation is slight and may vary from 1 to 3 feet but in some seasons the snow of each recurring storm may stay on the ground only a few days. Summer temperatures are high, with some hot weather during Spring, so that water losses by evaporation are high. The period when temperatures are warm enough for growth may extend from early April to mid October or early November. However, because of the prevailing high temperatures, aridity of some soils and the scarcity or total lack of rain during 60–90 days of mid summer heat, the growth periods of forage plants are limited to short seasons in the spring and fall. Moderate to serious erosion is in evidence on 80 percent of the mountain pastures of the Appenines.

The Appenines also contain extensive areas of moderate to steep mountain slopes, principally at elevations of 1800 to 3600 feet, that formerly were covered by grasses and associated forage plants. Former conditions are indicated by remnant patches of top soil and relict forage species which may still be found. Some of these areas, particularly those with southerly exposures on limestone formations, were probably once the most productive mountain grazing lands in the Nation. These slopes generally have lost their top soil by erosion processes extending back over many years and exhibit rocky ground surfaces growing only

FIG. 2. FAIR CONDITION, MOUNTAIN PASTURE COMPOSED OF GRASSES, LEGUMES, AND WEEDS
The sheep are grade *Bergamasca*, a breed raised for wool and mutton in the Northern Italy Provinces.

brush, weeds and unpalatable grasses from the soil or subsoil that remains between the rocks. Practically all these slopes are suffering from very serious erosion. Little study has been made of the possibilities of reclaiming these lands for pasture.

Inspections of the mountain pastures in the Appenines similar to those in the Alps, permitted the development of a list of the more important plants, and a segregation of these into three categories of desirability as a basis for classifying the pastures as to condition. Greater variations were found in soils, exposures and precipitation than in the Alps. An example is given below of a study of the mountain flora of the commune owned "Piano di Pezza" pasture. This nearly circular mountain basin of 300 hectares has a silty clay subsoil and is located near Aquila in the region of Abruzzo. The condition criteria developed here in basin pastures were found to be applicable to similar pastures in an area of approximately 60 kilometers square. Dry pastures, with gravelly or sandy subsoils, in this area required a separate plant list and segregation of species, in order to accurately classify them as to condition. Still other compilations and field studies were necessary for developing range condition guides for appraising mountain pastures in the Appenines, South of Naples.

Percentage of Desirable, Less Desirable and Undesirable Pasture Plants by Condition Classes

	DESIRABLE	LESS DESIRABLE	UNDESIRABLE
Excellent condition...	90–100	0–5	0–5
Good condition.....	75–90	5–15	0–10
Fair condition.....	55–75	10–25	5–25
Poor condition.....	30–55	20–45	25–45
Very poor condition ..	5–30	10–25	45–75

SEGREGATION OF MOUNTAIN PASTURE PLANTS

(AQUILA—Central Appenines)

Desirable Forage Plants

Grasses	Forbs (broad-leaved plants)
Festuca elatior	*Trifolium montanum*
Festuca ovina	*Trifolium repens*
Dactylis glomerata	*Lotus corniculatus*
Poa pratensis	*Medicago hispida*
Poa violacea	*Crepis alpestris*
Agrostis rupestris	*Crepis conyzaefolia*
Bromus inermis	
Phleum pratense	
Agropyrum repens	

Less Desirable Forage Plants

Grasses & Sedges	Forbs (broad-leaved plants)
Phleum alpinum	*Plantago montana*
Poa alpina	*Leontodon autumnalis*
Poa annua	*Geranium phaeum*
Koeleria pubescens	*Achillea millefolium*
Festuca silvatica	*Daucus carota*
Bromus rubens	*Astragalus baeticus*
Bromus secalinus	*Astragalus pilosus*
Bromus tectorum	*Lathyrus montanus*
Carex sp.	*Vicia silvatica*
Carex mucronata	

Undersirable Forage Plants

Grasses & Rushes	Forbs (broad-leaved)
Nardus stricta	*Cirsium eriophorum*
Holcus lanatus	*Cirsium lobelli*
Festuca sp.	*Centaurea rupestris*
Andropogon distachyius	*Carduus chrysacanthus*
	Sedum rubens
Brush	*Euphorbia feplus*
Artemisia glacialis	*Lactuca virosa*
Arctostaphylos Uva-Ursi	*Rumex alpinus*
Juniperus sabina	*Erigeron alpinus*
	Polygonum bistortoides
	Polygonum alpinum

More sheep than cattle are grazed in the Appenines. The season of grazing for sheep varies from 145 to 200 days de-

pending on elevation and exposure. The sheep generally are kept on farms in the winter in the larger valleys and coastal plains on the southern two thirds of the peninsula on both the East and West coasts. The mountain pastures of the Appenines are generally of larger size than those of the Alps; some exceed 1000 hectares in area.

Management Problems

The more important problems found on the mountain grazing lands include:

1. Too early turnout.
2. Depleted plant residue and organic matter.
3. Invasion of weeds and brush, and non-palatable grasses.
4. Excessive travel and trailing to water and bed grounds.
5. Depleted fertility.
6. Sheet and gully erosion.

Recommended Management Practices

Applicable remedial measures to improve mountain pastures are:

1. Regulated season of use based on the plant growth requirements of the best forage plants and pasture condition.
2. Development of adequate livestock water supplies to eliminate travel and trailing.
3. Systematic use of properly located bed grounds.
4. Adherence to systematic grazing plans providing for deferred and rotational grazing of the three or more units of each pasture.
5. Liming, fertilizing and reseeding depleted areas.
6. Adjustment in grazing to build up surficial plant residue and organic matter.
7. Stabilization of eroded and gullied areas by vegetation and organic mulches.