

Range Management and Improvement in New Zealand

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Highlight

Approximately one-third of New Zealand is in improved pasture and additional areas are being developed each year. These are high producing, seeded mainly to turf forming grasses and legumes, fertilized periodically by air, and intensively managed for wool, lamb, mutton, and beef production. Range lands occur chiefly in the colder South Island, generally at elevations above 3000 feet. Wool production is paramount, although some lamb, mutton and beef are produced. As a result mainly of heavy rabbit infestation and burning to provide fresh forage in past years, these ranges were seriously deteriorated followed by excessive runoff and erosion. Rabbits have been controlled, burning largely eliminated, and better range and livestock management is being applied.

The establishment and management of improved pastures in New Zealand has reached a high art or science. The improvement and management of range lands is in a much less advanced stage. There are, however, examples of well planned range operations which have brought about recovery from past deterioration and profitable sustained economic use for livestock production, together with desirable watershed management.

New Zealand is a nation consisting of two large and many small islands in the Southern Hemisphere, extending from near the 34th to the 47th parallels south. That is comparable in the western United States from Los Angeles, California to the Columbia River in eastern Washington. With average annual rainfall in the North Island ranging from 20 to 100 inches, rather well distributed throughout the year, and a temperate climate, the North Island is generally favorable for improved pasture development, except limited rugged mountain areas. The South Island is colder, and its climate is influenced greatly by the high mountain chain (Southern Alps) which extends the entire length of the island near its west coast. While rainfall is high west

of the mountains, the slopes there are too steep for pasture development. Average annual rainfall east of the mountains ranges from about 12 to 15 inches in high central plains to about 25 to 40 inches further east, with somewhat higher amounts in the mountains. Plains, valleys, and hills below 3000 feet in elevation, with rainfall of 18 inches or more, in the South Island are generally suitable for improved pasture development. The rest that is grazable is largely range land.

Out of a total area of approximately 66 million acres, about 44 million are occupied as "farms" or "runs" (ranches), of which 7 million acres are used in arable farming, horticulture and other farming purposes. (Du Four et al., 1967). Improved pastures have been developed on approximately 21 million acres. About 22 million acres are native or naturalized pasture, native or planted forest, or scrub, much of which is grazed. About 4 million acres of the farm area are primarily dairy farms. Some 33 million acres are reported to carry about 60 million sheep, while beef cattle are also grazed to some degree on these lands. Relatively large areas of scrub, native forest and depleted native pastures are being developed as improved pasture each year.

Farming has evolved chiefly as an export industry with low prices for dairy products, especially, but also relatively low prices for wool, lamb,

mutton, and beef. This has necessitated low farm labor costs, and in the case of sheep and beef cattle production, relatively large properties and large sheep numbers per owner operator.

The native pasture, or range, conditions are different from most of the range area of the world. The island climate, young geology and soils, and lack of grazing animals before white settlement, give a different basis for growth and use of palatable native vegetation than is generally the case in other countries. With white settlement not only were domesticated animals introduced, but also deer, rabbits, and other wild animals were imported. Without natural enemies and a lack of regular adequate harvesting, this population, especially deer and rabbits, increased tremendously. The result was excessive overgrazing and destruction of the palatable vegetation accompanied by loss of much topsoil. With naturally unstable soils on steep slopes, clearing and burning of forest and tussock grass growth from such slopes, increased runoff and terrific erosion both of slopes and stream channels occurred. In some areas there was failure for economic livestock production. The Government provided for the establishment of Rabbit Boards; financed by rates (a special type of taxes) assessed against land areas affected, and a campaign of rabbit control or extermination was instituted that has finally reduced the rabbit population to a reasonable number. Deer and other wild animal control, largely conducted by the Forest Service in forested mountain areas, is also effective.

Most of the tall tussock grasses and other coarse vegetation on remaining range lands are of low palatability for domestic livestock. (The Tussock Grassland Research Committee, 1954). The forage value of such lands depends primarily on the inter-tussock herbaceous vegetation. Sometimes it is almost nil. In other cases the inter-tussock vegetation is scabweed, which does protect what is left of the soil, but has little, if any, grazing value.

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Some areas, however, recovered and support a dense inter-tussock cover of palatable or reasonably palatable native and naturalized introduced grasses and other herbs. Much of the tussock area, however, is of an intermediate condition.

Most of the farms and runs are what might be termed of single family economic size, sufficient to give a reasonable income. This fits in with long established Governmental policy. The Land Settlement Promotion Act controls aggregation of land by individuals and in general keeps farms to a "living area" size. However, if land is owned by a company of 10 or more members it is exempt from the Act. In some of the larger "runs," especially in the South Island where there is chance for considerable further development of improved pastures, the value of farms may increase greatly through expenditure of otherwise taxable funds for that purpose.

Sheep are not herded, even in rugged mountains. They are grazed in paddocks (pastures) and are moved from pasture to pasture or mustered for shearing or sale by the use of well trained dogs and the whistle, or call, of the owner. Shearing is handled by migrant crews.

Improved Pastures

Improved pasture development and management throughout New Zealand is very good, being almost entirely a combination of turf forming introduced grasses and clovers with suitable fertilizer treatment both for establishment and maintenance, and grazing procedures well adapted to each major situation. Research relating to the problem has been outstanding, covering both fundamental and practical aspects, both by the Department of Scientific and Industrial Research and by Agriculture. (Cockayne, 1956; Corkill, 1966; Cullen, 1966; Levy, 1956; O'Connor, 1966; Suckling, 1966). Progressive farmers follow the research closely and apply procedures unusually promptly.

Suitable grasses and clovers, especially varieties derived from perennial ryegrass, orchard grass, and

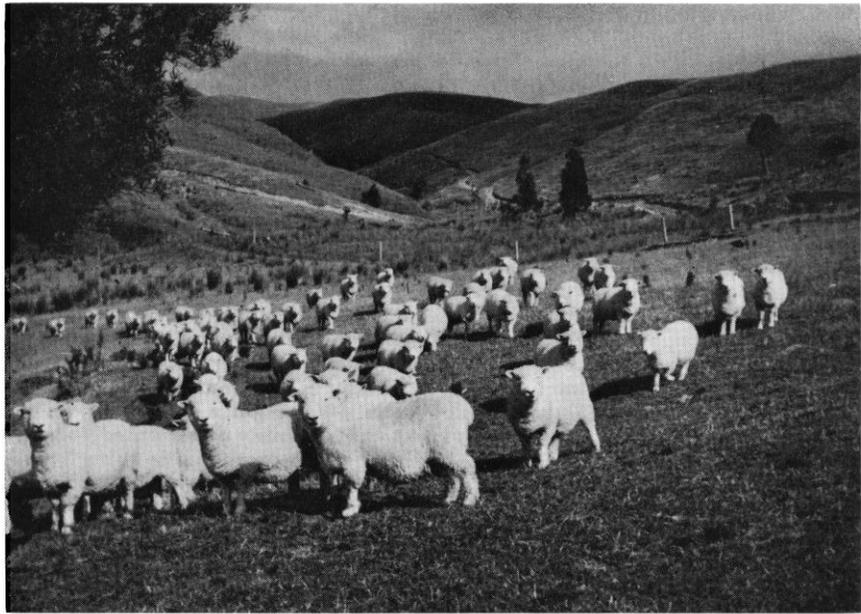


Fig. 1. "Mob-stocking." Eight hundred eighty seven (887) New Zealand Romney ewes on a 22 acre Hill improved pasture, properly grazed. Ewes will now move to new pasture. North Island.

white clover, adaptable to the many climatic, soil, and topographic conditions, have been developed through introduction, selection, and breeding. Where cultivation is practicable, economic procedures have been evolved for soil preparation, seeding and fertilizing. In hill country, fire is ordinarily utilized to remove the unwanted native vegetation and airplane seeding and fertilization are applied. Superphosphate is required almost throughout, but the amount needed varies greatly. Nitrogen may be applied initially. Sulphur is needed in many areas, sometimes 20 to 30 pounds per acre per annum. Lime is needed on some soils, sometimes to offset aluminum toxicity. Various minor elements, such as molybdenum, magnesium, cobalt, copper, and selenium, are also required in various parts of the pasture area.

Once pastures are established, management is important. In general, grazing needs to be rather heavy, "mob-stocking," intermittent, and with suitable rest periods (Fig. 1). This requires a rotational system of grazing of reasonable sized pastures so that the forage can be utilized in a few days, or weeks at most, and then allowed to pro-

duce a new crop. This type of grazing results in a cycling of nitrogen for high production—up to 14,000 pounds of dry matter per acre. The use of the grazing animal in proper utilization of the forage and even unwanted vegetation plays a great part in efficient maintenance of high productivity in the pastures.

After weaning of lambs, they are ordinarily given the chance to have abundant forage on fresh pasture. The dry ewes may be utilized to tidy up pastures through closer utilization, and cattle are grazed along with sheep to utilize some of the coarser vegetation that would otherwise compete with effective growth of the forage most needed in wool and lamb production.

Periodically, pastures need renovating and the necessary procedures are well developed. In the hill country of the North Island this usually includes rather close grazing for a short period, called "bare," but a good sod remains. Then the pasture is topdressed by airplane with suitable fertilizer and sometimes DDT, after which it is rested from grazing for at least a month. Clover is sometimes reseeded along with the fertilizer. Such renovation or topdressing is required about

every three years. In some areas annual topdressing is required.

In the South Island, especially, provision for winter and spring is extremely important. The warm-faced slopes are accordingly given an autumn rest so that suitable growth is available for the winter and spring periods. The dark-faced slopes and higher elevations are utilized primarily in summer.

Alfalfa is grown on many flats and low ridges, especially in the South Island, but also in the North, for hay, silage and for grazing. In grazing it, a rotation system is essential. In the semi-arid Central Otago, alfalfa is grown without irrigation on suitable soils and topography with only 12 inches average rainfall. Under such conditions it is not as thick a stand as on most cultivated lands with rainfall of 20 inches or more, but it makes one or more crops of hay and can be grazed after cutting, in autumn and early winter.

In most parts of the South Island, supplementary feed in the form of hay and/or turnips is usual. This period extends from three to five months of winter. Sometimes oats are also grown for autumn and winter grazing.

The New Zealand Romney is the most widely used sheep on farms. It is based primarily on the English Romney with some English Leicester and Lincoln blood, and once established as a breed in years past, carried forward as such. It is well adapted to the improved pastures widely available. In many flocks especially on level and rolling pastures, part of the ewes are bred to Southdown rams to produce fat lambs for sale. In some, Border Leicester rams are utilized to develop crossbred ewes which are reported to have greater fertility and also produce good lambs. The Corriedale, another important New Zealand breed, is prominent on the Canterbury Plains of the South Island. The Perendale is still another, developed from a cross of the New Zealand Romney with Cheviot. It is said to be a better mother and also well adapted to grazing

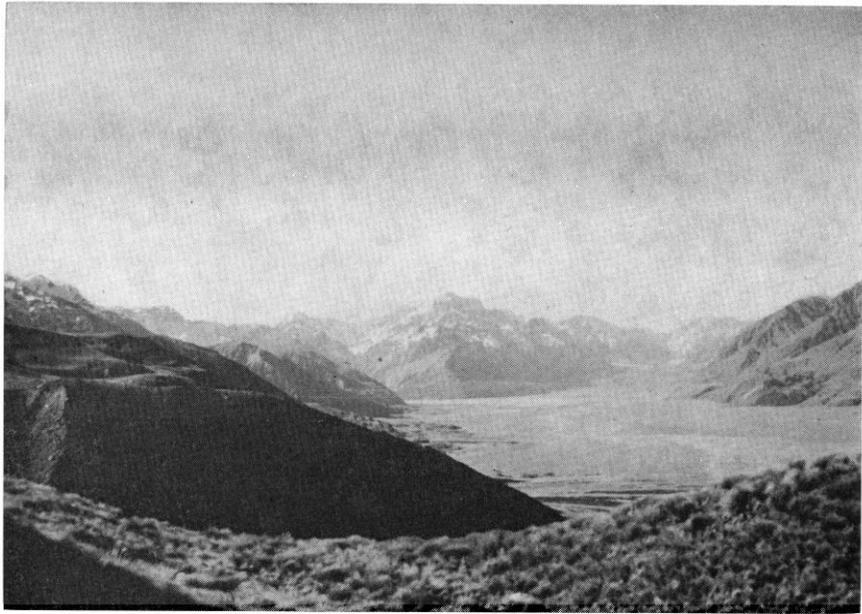


FIG. 2. Range on mountain slopes in foreground grazed by Merino sheep. Mt. Cook and part of the Southern Alps in the background. South Island.

hill farms and gives a greater lamb crop.

Polled Angus and Herefords are the two principal beef breeds. On some farms Friesian steers are being fattened on pasture, and in others Friesian bulls are being used with Angus and Hereford cows, and on still others Friesian cows are being bred to Angus and Hereford bulls for beef production.

"High Country" Grazing

The term "High Country" relates to those runs in the South Island which have a considerable part of their holdings located at elevations above 3000 feet. These include some flats, considerable hills and mountains which may run up to 5000 or 6000 feet in elevation. They cover a considerable area, primarily range lands, and produce a great deal of fine wool, some lambs, mutton and beef. Most of the country above 3000 feet is grazed by sheep, mainly Merinos, which do well in that cooler climate (Fig. 2). Steep slopes in the mountains are commonly grazed by Merino weathers for wool production alone. Much of the hill and flat country below 3000 feet in elevation with annual rainfall of 18 inches or more, is gradually

being converted to improved pasture or for winter feed crops which supplement the range lands and assure better sustained year round nutrition of animals.

In the past when there were considerable numbers of rabbits and burning was a common practice in an effort to keep the range open for grazing and provide young green forage, the vegetation was thinned drastically, and much of the topsoil was washed away through erosion. Large areas were reduced to scree or gravel, and the remaining vegetation was insufficient to prevent considerable soil and rock creep. (The Tussock Grassland Research Committee, 1954). Riney and Dunbar (1956) described criteria for determining status and trend of High Country grazing lands and minimum requirements for conservation, which imply the maintenance of a soil-vegetation balance and the prevention of increase in depletion of existing soil and vegetation. Now that rabbits are controlled, the vegetation is making a slow recovery, unless there are more domestic animals on the range than the palatable vegetation can support efficiently.

One of the greatest needs for efficient grazing of range lands at

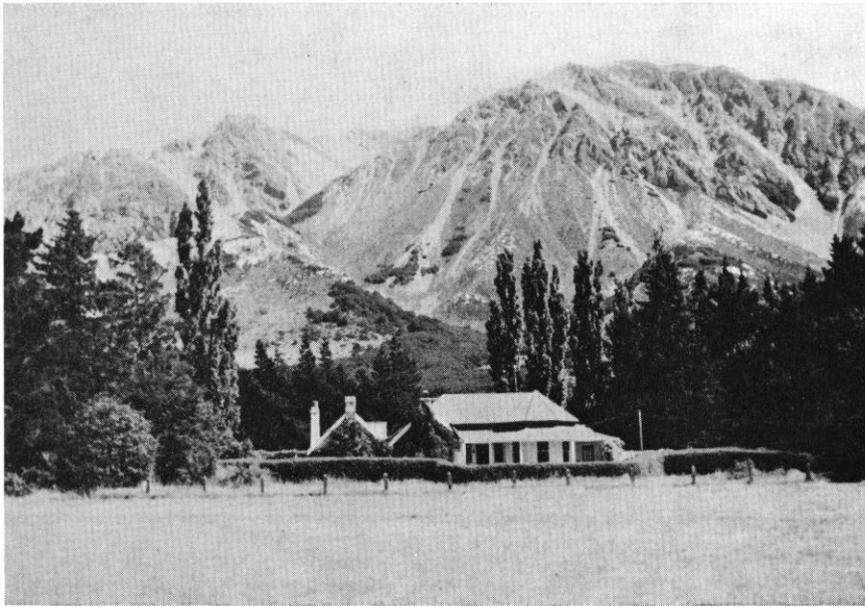


FIG. 3. Typical headquarters home in the "High Country." Soil conservation plans call for non-grazing of upper slopes in the background. South Island.

elevations above 3,000 feet and semi-arid range below that elevation which has an average annual rainfall of only 12 to 16 inches, is to determine suitable degrees of grazing and proper seasonal use, as well as other features of management which will aid recovery of vegetation and rebuild soil under grazing use by sheep or cattle or both. Such management is apt to be very different from that applicable to the improved pastures in New Zealand. On such range lands there are several instances where lower stock numbers have produced an equal amount or in some cases a higher amount of wool than from the original larger flock numbers.

Watershed Management and Soil Conservation

The serious erosion situations on pasture and range lands and their adverse effect on stream flow and channels appear to be well recognized, at least by the New Zealand government. The soil conservation work of the Catchment Boards indicates that it has real potential for reducing erosion and at the same time facilitating increased income from many areas treated. In general, when a farmer or rancher agrees to the development of a plan

for his farm or run, soil conservators formulate a plan which they believe will reduce, or even overcome the erosion which is occurring. This is worked out jointly with him. Such plans now provide for removal of grazing from steep mountain areas classified as Class VIII and those in Class VII which are eroding badly (Fig. 3). These plans normally provide some subsidy for carrying out necessary features of the plan. About 1000 conservation farm plans are operating.

All farms and runs of course, do not require such plans. However, there are many local land slips which do not vegetate quickly, and other critically erodible soils which do need prompt and effective action to check the erosion. On such areas necessary treatments are vital. There are also limited erosive situations on farms, many of which can be corrected by tree planting and other minor erosion control procedures. Soil conservators can give advice in connection with such situations without the necessity of formulating plans for the entire farm operation.

The Lands and Survey Department has three "Blocks" in the South Island with steep slopes to 6,000 feet where erosion was severe.

Progress on these has demonstrated that economic livestock production can go hand in hand on such areas with soil conservation. This involved good land and stock management, including judicious stocking, fencing for grazing control, top dressing and oversowing with suitable seed mixtures on lower elevation areas where that proves effective, and improvement in both the livestock and the property.

Land Development

The Department of Lands and Survey is taking large areas of low value land and making them far more productive through land development operations. Much of this area at one time was considered wasteland incapable of effective utilization. Development of properties has made possible settlement of many family-size farms which could not otherwise have been possible.

At the present time there are about 1,860,000 acres of Crown or Maori land under development or turned over for farming by other departments. When an area is taken over for development, all features necessary to eventually sell family-sized units fully developed with improved pasture—where that is possible—livestock, fences, water, a nice home, shearing sheds or dairy facilities, yards or corrals, roads and truck tracks, air strip and fertilizer bin, and other necessary items, are thoroughly planned. The cost of development comes from Land Development loans which pay interest, and from livestock production while the area is being fully developed for sale. In 1968 report of the Rotorua District it states that Lands' holdings through New Zealand were carrying some 1,560,000 sheep and 218,000 cattle. In that district alone over the last 20 years 977 settlers have been sold farms totaling 235,689 acres. At the present time more than 1,600 family units are under development in New Zealand. Most of the actual development work is done by contract under the guidance of the manager of a development block.



Fig. 4. Cows and calves grazing on naturally reseeded range in "Molesworth Development." Cattle graze to tops of mountains in summer. South Island.

Each year throughout the country settlements are being made available for purchase. All applicants must have certain qualifications which are passed upon by a committee. Then the successful purchasers are drawn by lot. Most developed farms with their livestock, at the present time about 1,400 ewes, cost approximately \$50,000 to \$60,000. The buyers must put up 15 percent of this amount. Long term loans are provided for the balance, usually with initial payments for reduction of the total coming after about 5 years. The Marginal Lands Board can also facilitate such operations by loans. It is expected that these units will not only furnish a satisfactory family income but will pay out in the time provided in the loan provisions. Good farmers can do better.

Molesworth, a 458,000-acre unit, is made up of what was four mountain runs in the north of the South Island. Summers are dry and warm. Winters are cold with snow even at low levels. Rainfall varies from 27 inches in the east to 60 inches in the west, and comes mainly in early spring and late autumn. Temperatures vary from zero to 80 degrees. The Government had to take these over because, with overgrazing by

rabbits, private owners were not able to operate them economically. The Department of Lands and Survey took over in 1938. For several years killing of rabbits proceeded, to overcome their overgrazing. In 1940, 723 cattle were put on the range, and killing of rabbits, deer, goats, and pigs continued. At that time most of the slopes were practically bare scree. The number of cattle grazing increased gradually. In 1953 seeding of slopes by airplane began. Usually strips on the lower part of slopes were seeded first with orchard grass and red and white clover. As these took hold, higher strips have been seeded. Elevations vary from 2,000 to 6,000 feet. There are extensive flats at about 3,200 feet. These have revegetated naturally. At the present time Molesworth is carrying 9,000 cattle (Fig. 4). It is really remarkable to see the stand of orchard grass and clovers on the poor slope "soils" and to note the spread of them and native and naturalized forage species on unseeded range areas. Erosion gullies which were frequent on slopes and in drainages are practically controlled, especially on shaded slopes. The operation ran at a loss in most years, sometimes small, until 1952, but now has

an accumulated profit of more than \$500,000. It does not pay income taxes but all profit goes to the Government. Approximately 2,300 cattle were sold in 1969 for about \$200,000. The striking features are the moderate or conservative grazing being practised on flats and on seeded and unseeded slopes, and the healing of erosion. Seasonal use is also applied to different parts so that weaned calves and fattening steers, as well as cows, have abundant forage throughout the year. This is an unusually fine demonstration of good range management.

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