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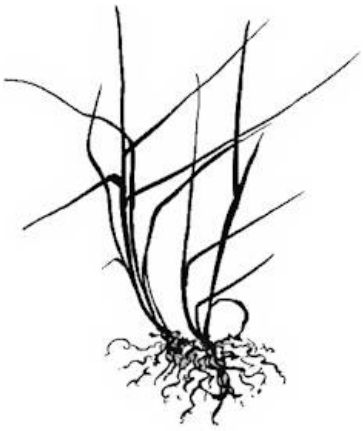

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# VALUES OF SURFACE APPLICATIONS OF LIMESTONE AND SUPERPHOSPHATE ON DIKELAND AND UPLAND PASTURES

by
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## INTRODUCTION

'Dikelands' in the Bay of Fundy region are low-lying areas of water-deposited silt. They have resulted from centuries of flooding by high tides in coastal areas. Dikes now protect an estimated 76,000 acres of this land from flooding by salt tides.

Little information has been available on the value of this land as pasture for beef cattle.

This is a report on the gains of yearling beef steers on dikeland and on adjacent upland pastures that received surface applications of either limestone or limestone and superphosphate. The trials were conducted at Nappan, N.S., from 1952 to 1957.

## PLANS OF GRAZING TRIALS

The experimental areas were two 9-acre fields of moderate fertility, one on dikeland (Acadia clay loam) and the other on adjacent upland (Tormentine sandy loam). The areas had been in pasture or hay and had not received lime or fertilizer applications for many years before the start of the trials. Soil samples from the dikeland and upland fields had pH values of 5.4 and 5.2, respectively, at the start of the trials. Both areas had good surface drainage. The dikeland pasture was on a low-lying level area typical of the land surrounding the Bay of Fundy (Figure 2). The upland fields were on a gentle slope (Figure 3).

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Each area was fenced into nine 1-acre fields. Two treatments and an untreated field were replicated three times on both dikeland and upland and randomized to reduce the effect of soil variability to a minimum. Materials applied and the amounts applied annually are given in Table 1.

Ground limestone and superphosphate were applied on the surface with a fertilizer distributor at the start of the grazing season, when the land was in condition to carry machinery but before growth had started.

**TABLE 1.** Amounts And Frequencies Of Limestone And Super- Phosphate Applications On Dikeland And Upland Pastures, Nappan, 1952-57.

| Treatment | Material | Amount applied (lb. per acre) | When applied |
|---|---|---|---|
| Untreated | No limestone or superphosphate | | |
| L | Ground dolomitic limestone | 1,000 | Annually 1952 to 1957 |
| LP | Ground dolomitic limestone | 1,000 | Annually1952 to 1957 |
| | Superphosphate | 600 | 1952 |
| | Superphosphate | 200 | Annually 1953 to 1957 |

## EXPERIMENTAL ANIMALS AND THEIR MANAGEMENT

Yearling grade Hereford steers were the experimental animals. They were divided into six lots; one was assigned to the fields in each treatment at the beginning of the grazing season, starting in 1952. Steer gains were recorded for five consecutive years from 1953. The six groups of animals were practically. uniform in weight and condition. They were rotated within the replicated treatments on each pasture type; the growth of all fields was grazed as nearly alike as possible by adjusting the numbers of animals according to the amount of forage available for grazing and the gains of the steers. A water bowl was installed at the end of each field and salt was available to all animals throughout the season. The steers had no feed other than the pasture furnished by the 1-acre fields. The animals were pastured on the average from May 25 to October 13; the average length of the grazing season was 141 days.

A total of 203 animals were used in the study between 1953 and 1957. Each was weighed before going on pasture, at the ends of 28-day intervals, and at the end of each pasture season. Each time an animal was added to or removed from a field it was weighed. The response to a treatment was measured by the live-weight gain per acre. The quantities of total digestible nutrients (T.D.N.) that the steers obtained from the fields were determined by the reverse use o feeding standards, described by Sylvestre and Williams (6).

**TABLE 2.** Average Beef Gains in Pounds Per Acre From Limestone Alone and Limestone and Superphosphate Applied on the Surface of Dikeland and Upland Pastures, Nappan, 1953-57.

| Year | Dikeland | | | Upland | | |
|---|---|---|---|---|---|---|
| | Untreated | L | LP | Untreated | L | LP |
| 1953 | 398 | 287 | 538 | 222 | 237 | 467 |
| 1954 | 327 | 317 | 583 | 250 | 291 | 479 |
| 1955 | 320 | 328 | 507 | 226 | 257 | 458 |
| 1956 | 407 | 432 | 566 | 235 | 252 | 375 |
| 1957 | 292 | 331 | 487 | 177 | 266 | 413 |
| Average | 349 | 339 | 536 | 222 | 261 | 438 |

## GAINS IN WEIGHT OF STEERS

### On Dikeland Pasture

Steer gains per acre of untreated pasture averaged 349 pounds (Table 2). There was little difference in average steer gains between the untreated and the limed pastures. However, the gains for the limed fields showed a small progressive increase over those for the untreated fields in the last three years of the trial; this indicates a delayed response to the lime treatment. Steer gains on the fields that received both limestone and superphosphate averaged 54 per cent greater than those for the untreated pasture; this was statistically highly significant.

**On Upland Pasture**

Average steer gains were 222 and 438 pounds per acre for the untreated and LP fields, respectively (Table 2). The increase in gain from applications of limestone and superphosphate was highly significant. Gains for the upland fields that received limestone alone averaged 18 per cent greater than those for the untreated fields. This increase was not statistically significant.

In these trials the response of Tormentine sandy loam pastures to surface applications of superphosphate alone was not measured, and data from other sources are not available. However, an earlier grazing trial (1) was conducted for 14 years on Nappan sandy clay loam of moderate fertility, in the same general area. The gain was 39 per cent higher for a field that received surface applications of superphosphate than for an untreated field. In the 1952-57 trials the gains for the LP fields were 97 per cent greater than those for the untreated pasture. The average steer gains for the untreated fields in both trials correspond closely, and other trials indicate little difference between the two soil types in their response to fertilizer (3).

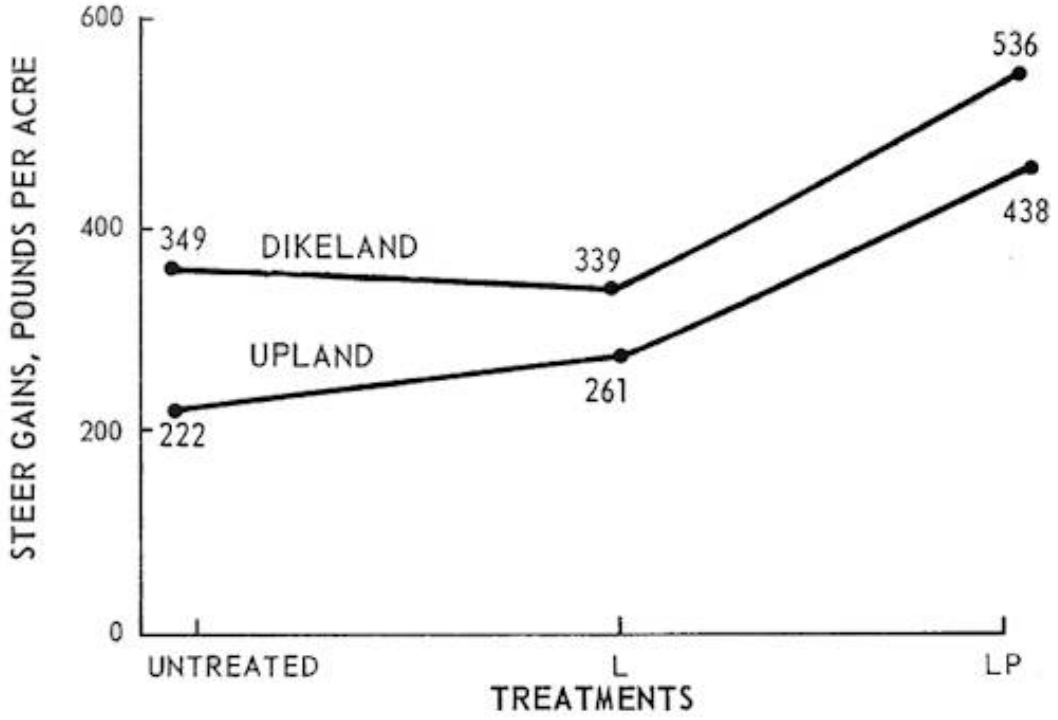


**Figure 1.** Steer gains per acre resulting from surface applications of limestone and superphosphate on dikeland and upland pastures, 5-year averages 1953 to 1957.

## A Comparison of Dikeland and Upland Pastures

The gains per acre were higher for dikeland pastures than for upland pastures (Figure 1) and the difference was highly significant for both untreated and treated fields. A comparison of the gains for the untreated and LP fields shows that the responses of each soil type to combined applications of limestone and superphosphate were well maintained during the trials (Table 2).

Many experiments on dikeland and upland soils show that hay and grain yields in crop rotations are increased when limestone is worked into the soil (2, 3, 4, 5). There was no response from surface applications of this soil amendment on dikeland pasture, and relatively little increase on upland pasture; this is associated with a lack of limestone penetration in these heavy soils. This was indicated by the slight differences in pH values between limed and unlimed fields at depths of 2 to 3 inches at the end of the trial. Soil samples from limed and unlimed upland fields had pH values of 5.23 and 5.11, respectively; samples from limed and unlimed dikeland had pH values of 5.44 and 5.43, respectively.

**TABLE 3.** Average Carrying Capacities and Production of Total Digestible Nutrients (T.D.N.) Per Acre of Dikeland and Upland Pastures Treated With Lime and Superphosphate, Nappan, 1953-57.

| Treatment | Number of steers | T.D.N. (lb.) |
|---|---|---|
| | Dikeland | |
| Untreated | 1.6 | 1,663 |
| L | 1.7 | 1,726 |
| LP | 2.4 | 2,562 |
| | Upland | |
| Untreated | 1.0 | 1,065 |
| L | 1.1 | 1,251 |
| LP | 1.9 | 2,101 |

**Figure 2.** Steers grazing on a dikeland field that received annual applications of limestone and superphosphate. Dike in the background is being repaired. 1959.

**Figure 3.** Steers grazing on an upland field that received annual applications of limestone and superphosphate. 1959.

## CARRYING CAPACITIES OF PASTURES

Average carrying capacities and calculated total digestible nutrients (T.D.N.) produced on LP dikeland were 50 and 54 per cent higher, respectively, than for the untreated fields (Table 3). The LP fields on upland pasture supported 90 per cent more animals and produced 97 per cent more total digestible nutrients than the untreated fields; these differences showed little variation between seasons.

Limestone alone applied on dikeland pasture had little effect on either carrying capacity or T.D.N. production. The L fields on upland had average carrying capacities and T.D.N. production 10 and 17 per cent higher, respectively, than the untreated fields.

Progressive increases in wild white clover were observed on both soil types during the trial. There was little weed growth on the dikeland pasture, but weeds were more numerous on the upland fields. Detailed records were not kept on the effects of the soil treatments on weed growth.

## VALUES OF GAINS

The calculation of returns per acre from the pastures in these trials is based upon an average value of $15.00 per 100 pounds of steer live-weight gain, and the average prices paid for limestone and superphosphate used during the trial.

### LP Treatments on Pastures Give High Net Returns

The net value of the live-weight gains on the dikeland pasture that received annual surface applications of limestone and superphosphate was 40 per cent more than for the untreated fields (Table 4). On upland pasture the net returns for the LP fields were 77 per cent more than those for the untreated fields. The extra gains were made at a cost (for limestone and superphosphate) of $3.48 per 100 pounds of live-weight gain. Limestone dressings alone were unprofitable on dikeland pasture; they increased gains on upland pasture for an average net return of $2.25 for $1.00 invested.

A beef producer may wish to calculate net returns from his own enterprise. To do so he can substitute the average beef prices that he receives and his average costs for limestone and superphosphate for those used in this trial.

**TABLE 4.** Average Cash Returns Per Acre From Dikeland And Upland Pastures Treated With Limestone And Superphosphate, Nappan, 1953-57.

| Treatment | Live-weight gain(lb.) | Cost of materials applied (s) | Net value of live-weight gain [1] ($) |
|---|---|---|---|
| | | **Dikeland** | |
| Untreated | 349 | — | 52.35 |
| L | 339 | 1.80 | 49.05 |
| LP | 536 | 7.03 | 73.37 |
| | | **Upland** | |
| Untreated | 222 | — | 33.30 |
| L | 261 | 1.80 | 37.35 |
| LP | 438 | 7.03 | 58.67 |

[1] Based on the returns for live-weight gain less the cost of materials applied.

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## SUMMARY

Excellent beef gains resulted from surface applications of limestone and superphosphate (LP) on dikeland and upland pastures at Nappan in 1952-57. The average annual gains per acre for five years for untreated dikeland and upland pastures were 349 and 222 pounds, respectively; for similar pastures that received surface applications of both limestone and superphosphate annually, 536 and 438 pounds, respectively.

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