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GETTING THE MOST OUT OF

RYEGRASS IN ALASKA

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Use of ryegrass on Alaskan Farms has increased steadily* since recommendations for its use were publicized about 5 years ago.** The principal use for this grass has been late-season pasture and green-chop. Some of the major reasons for its popularity include:

- Low seed costs and ease of establishment.
- Rapid recovery after mid-season harvest and continued productivity during cool September weather. Forage remains acceptable until very hard frosts in October.
- High palatability at early stages of growth.***
- Continued high levels of milk production with ryegrass in contrast to "late-season slump" in milk output in September-October with perennial grasses.***
- Availability of ryegrass forage permits less intensive use of perennial grasses during late season, contributing to their better winter survival.
- Mid-season harvest of ryegrass interrupts growth of troublesome annual weeds preventing seed production and dispersal. Weed seed production is permitted to occur in annual crops harvested once in late season.

Because of (a) the growing popularity of this grass, (b) the need for maximum efficiency in Alaskan farming, and (c) the necessity of deriving a full understanding of the potentials and limitations of ryegrass in Alaska, several experimental studies on this grass have continued for a period of over 10 years at your Agricultural Experiment Station.

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* Based on seed imports and sales

** Klebesadel, L. J., A. L. Brundage, and W. J. Sweetman. 1963. Cash in on a new late-summer forage source -- common ryegrass seeded with early-harvested oats and peas. Alaska Agr. Exp. Sta. Forage Research Report No. 1 6pp.

*** See acknowledgment at end of report for sources of information.

These studies have been directed toward answering several questions including the following:

(1) Should mid-season harvest be followed by nitrogen topdressing? If so, how much?

(2) Should ryegrass be seeded alone? With oats? With oats and peas?

(3) When should ryegrass be planted for maximum utility? With a given date of planting, when should mid-season harvest be accomplished for optimum distribution of yields in first growth and in regrowth?

(4) Which ryegrass to use? Common? Annual? Perennial? Which variety? Do varieties react alike to different management approaches?

Results presented here are in the form of a progress report. These findings serve to modify certain of the original recommendations concerning ryegrass use in Alaska. Moreover, they add to an expanding basis of knowledge for utilizing ryegrass to its fullest potential in meeting forage requirements in this northern area.

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SHOULD MID-SEASON HARVEST BE FOLLOWED BY NITROGEN TOPDRESSING? IF SO, HOW MUCH??

EXPERIMENTAL PROCEDURES:

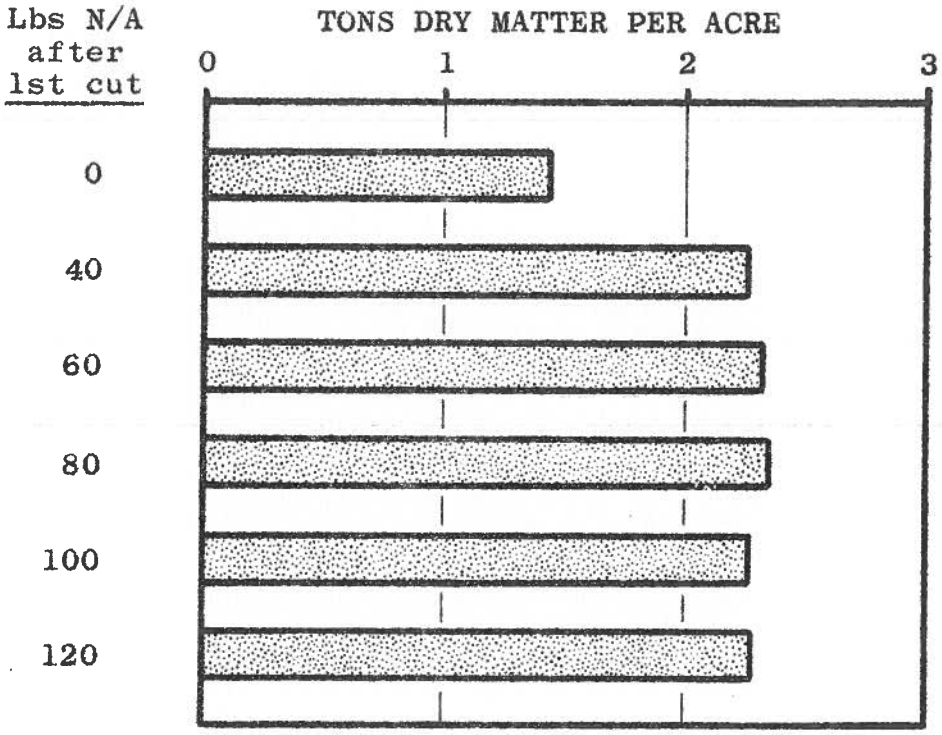
To answer this question, a ryegrass + oats + peas mixture was planted on an average date of 28 May in each of 3 years. A complete fertilizer applied to the seedbed prior to planting supplied nitrogen (N) at 30 to 40 lbs/A. Ryegrass was planted at 15 lbs/A and oats and peas each at 50 lbs/A. Approximately 50 days after planting (average date = 19 July), all growth on the experimental area was harvested. Plots were then topdressed with 33-0-0 to supply N at 0, 40, 60, 80, 100, and 120 lbs/A. After an average regrowth period of 66 days, plots were harvested (average date = 23 Sept.) to compare effects of nitrogen rates on regrowth that consisted primarily of ryegrass.

RESULTS:

Influence of rates of N topdressing on yields of regrowth, averaged over 3 years, are presented in Table 1. Forty pounds of N/A resulted in a marked increase in yield over no N topdressing. Rates of N over 40 lbs/A did not increase crop regrowth yields over the 40-lb/A rate. At the highest rates of N, lodging of the regrowth was more pronounced, resulting in incomplete recovery of some of the flattened areas of grass at harvest.

Possibly all of the N fertility needs of the initial growth of the season, as well as the N requirement of the regrowth, could be met with a heavier application of nitrogen at planting. This remains to be learned. Application of N after first cutting, however, INSURES the presence of needed N for ryegrass REGROWTH during the last half of the growing season--and the vital regrowth of ryegrass is its most important contribution in forage production programs.

Table 1. Influence of rate of nitrogen topdressing after first cutting on regrowth of annual ryegrass. Values are averages for 3 years. Average dates were: Planting = 28 May, first cut = 19 July, second cut = 23 September. Average days between plant and first cut = 52 days, first cut and second cut = 66 days.



SHOULD RYEGRASS BE SEEDED ALONE? WITH OATS? WITH OATS & PEAS?

Original recommendations for the use of ryegrass in Alaska suggested planting it with oats and peas harvested twice per season. The following results change that recommendation to omit peas from use with ryegrass.

EXPERIMENTAL PROCEDURES:

A small-plot study, conducted for 3 years, compared forage production from (a) ryegrass alone, (b) oats alone, (c) ryegrass + oats together, and (d) ryegrass + oats + peas together. Each plot was harvested twice, once near mid-season and once in late September.

Preplant fertilizer, 8-32-16 at 400 lbs/A., was disked into the seedbed. All plots were planted approximately 1 June each year. Annual ryegrass was planted at 15 lbs/A. Rodney oats were planted at 100 lbs/A where used alone or with ryegrass only, and at 50 lbs/A where planted with ryegrass + peas.

Three dates of mid-season harvest were compared, also. These were approximately 50, 60, and 70 days after planting, that is, about 20 July, 1 August, and 10 August. Nitrogen topdressing, 33-0-0 at 180 lbs/A, was applied immediately after each mid-season harvest. Second harvest each year was on or about 27 September.

RESULTS:

Forage dry-matter yields, averaged over the 3 study years, are presented in Figure 2. Results illustrate that within each crop or crop mixture compared, total season yields (total length of bars) were affected little by time of mid-season harvest. However, as mid-season harvest date was delayed, progressively more of the total season yield was obtained in the first cutting and commensurately less was provided by regrowth.

No advantage in dry-matter yield arose from including peas with oats and ryegrass. Peas regrew poorly after mid-season harvest. Over the 3 years and the 3 dates of mid-season harvest, the estimated percentage of peas in the regrowth at the time of second harvest ranged from none to 20%. In a 3-year study not reported here, peas were grown with oats, without mid-season harvest. Of the total pea dry-matter accumulation in a 97-day growth period, 67% was added during the last 34 days. Inasmuch as pea seed is relatively expensive, their use is quite clearly impractical where 2 harvests are taken per season.

THESE RESULTS SHOWING POOR PERFORMANCE OF FIELD PEAS WHEN HARVESTED TWICE PER SEASON DO NOT ALTER PREVIOUS RECOMMENDATIONS FOR THEIR USE IN CONVENTIONAL SPRING-SEEDED OAT-PEA MIXTURES FOR FORAGE WITH THE CROP HARVESTED ONCE IN LATE AUGUST OR SEPTEMBER.

In contrast to the meager regrowth of peas after mid-season harvest, ryegrass regrowth was more abundant, from tiller development, than the initial growth of the season. Spring-seeded ryegrass MUST be harvested in mid-season to remove the initial growth and stimulate tiller development which then becomes a vigorous regrowth of leafy, succulent forage. Spring-seeded ryegrass grown without mid-season harvest is a poor forage crop after mid-season--it becomes very rank, stemmy and non-leafy, high in dry matter, and unpalatable.

Regrowth ability of oats, after mid-season harvest, was intermediate between that of ryegrass and peas. As shown in Figure 2, oat regrowth was considerable with mid-season harvest on 21 July, 50 days after planting. With mid-season harvest on 31 July and 10 August (60 and 70 days after planting, respectively), oat regrowth was reduced markedly.

First-cutting yields of oats alone exceeded those of ryegrass alone. However, total yields for the season (2 cuttings) of oats alone were less than ryegrass alone or mixtures that included ryegrass, due to less regrowth of oats than ryegrass. (The poorer regrowth ability of oats in comparison with ryegrass is the reason why oats alone is better than oats + ryegrass for use as a companion crop to establish perennial forage seedings such as bromegrass.* The extremely vigorous regrowth of ryegrass is too competitive for desirable growth and establishment of the slower-growing perennial grass seedlings).

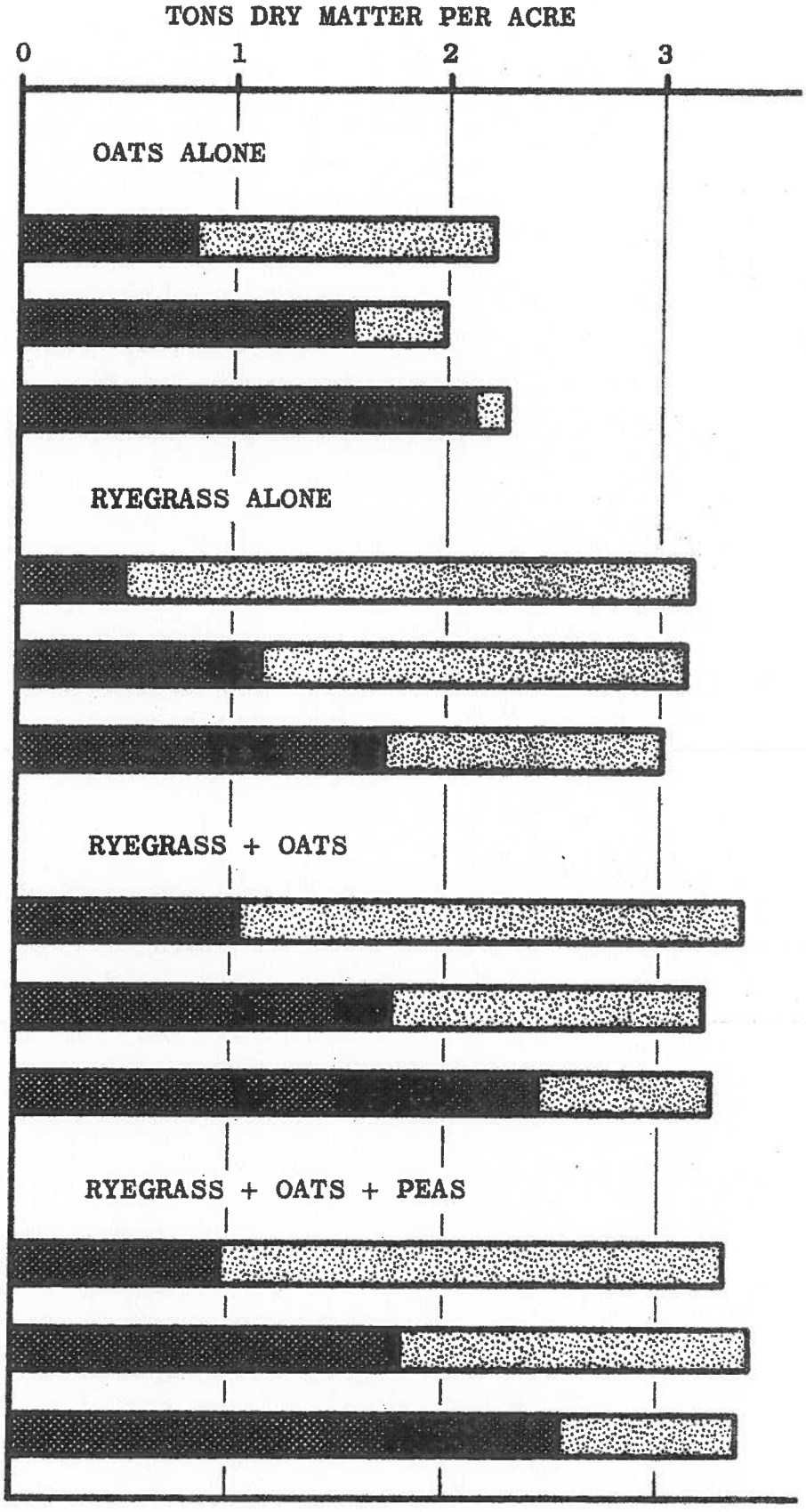
Ryegrass alone yielded approximately as much in total season yields as ryegrass + oats, despite the fact that first-cutting yields of ryegrass alone were less than those where oats were included.

Another consideration, in addition to forage yields, should be mentioned. Oats regrowth in the ryegrass + oats mixture contributed important physical support and lodging resistance to the finer-stemmed ryegrass. Rains during September caused heavy regrowths of ryegrass alone to become badly lodged.

* Unpublished data, Alaska Agricultural Experiment Station.

Table 2. Forage dry-matter yields from oats alone, ryegrass alone, ryegrass + oats, and ryegrass + oats + peas as influenced by 3 dates of mid-season harvest. Data represent averages of 3 years. Planted on or about 1 June each year. Second harvest (of regrowth) on all plots taken on or about 27 September each year.

Date of 1st cut	Days between: Plant & 1st cut	Days between: 1st cut & 2nd cut
OATS ALONE		
21 July	50	67
31 July	60	57
10 Aug	70	47
RYEGRASS ALONE		
21 July	50	67
31 July	60	57
10 Aug	70	47
RYEGRASS + OATS		
21 July	50	67
31 July	60	57
10 Aug	70	47
RYEGRASS + OATS + PEAS		
21 July	50	67
31 July	60	57
10 Aug	70	47



WHEN SHOULD RYEGRASS BE PLANTED FOR MAXIMUM UTILITY? WITH A GIVEN DATE OF PLANTING, WHEN SHOULD MID-SEASON HARVEST BE ACCOMPLISHED FOR OPTIMUM DISTRIBUTION OF YIELDS IN FIRST GROWTH AND IN REGROWTH?

MID-MAY is about the earliest that field plantings can be made consistently in Alaska, although individual agricultural areas, farms, fields, and seasons differ in the characteristics of each that determine when earliest field operations can be accomplished each year.

On most farms, small grains are given priority over forages for earliest planting because the grains require most of the growing season to mature. This often shifts planting time for annual forages to LATE MAY OR EARLY JUNE.

MID-JUNE is about as late as planting would be practical for annual forage crops intended for 2 harvests before the end of the growing season.

EXPERIMENTAL PROCEDURES:

Three planting dates and 4 mid-season harvest dates were compared in 1967 to evaluate forage productivity of (a) ryegrass alone, (b) oats alone, and (c) ryegrass + oats together. Preplant fertilizer, 8-32-16 at 400 lbs/A, was disked into the seedbed. Ryegrass was planted at 15 lbs/A and oats at 100 lbs/A. Plots harvested on each mid-season harvest date were topdressed immediately with 33-0-0 at 180 lbs/A. Planting dates, mid-season harvest dates, and the duration of growth intervals between the various dates of operations in the study are given in Figure 3. Regrowth on all plots was harvested 29 September.

RESULTS:

A great many observations and comparisons are available in the data presented in Figure 3. Only the most general can be discussed in this short report.

IT IS BELIEVED THAT IF FIGURE 3 IS KEPT FOR FUTURE REFERENCE, IT PRESENTS SOME VERY USEFUL GUIDELINES THAT MAY BE REFERRED TO BY FARM OPERATORS IN TIMING OPERATIONS WITH RYEGRASS TO MEET SPECIFIC NEEDS IN THEIR FORAGE PRODUCTION PROGRAMS. Although crop performance differs somewhat from year to year, as affected by growing conditions, our results should be helpful in planning the general approach to timing of operations.

Because forage requirements differ from farm to farm as influenced by many interacting factors, no concise recommendations regarding specific crop choice or timing of operations can be made that would be generally applicable. Therefore, our experimental results are presented with a minimum of interpretive comments.

Each reader can scan these results and go on to individual decisions in applying them to his operations. These experimental findings should assist in planning for late-season forage whether to use RYEGRASS ALONE, or RYEGRASS + OATS TOGETHER. After crop choice is made, scheduling of planting and mid-season harvest can be arranged for the best seasonal distribution of forage for the farm operator's specific requirements.

Possibly a spread of mid-season harvest dates might be adopted to bring on ryegrass regrowth ideal for grazing in different small areas at progressively later dates in late summer and early autumn.

Figure 3 reveals, as in the previous study, that with successively later mid-season harvests, progressively more of the total yield of both cuttings was obtained in the first cutting.

In total yields for 2 cuttings, ryegrass alone yielded virtually as much as ryegrass + oats, and both plantings with ryegrass yielded more than oats alone. However, within each crop, differences in total yields for the season were apparent, as influenced variously by dates of planting, dates of cutting, or an interaction between the two.

It is somewhat surprising that yields from the first date of planting (17 May) were little or not at all superior to yields obtained from plantings made 12 and 30 days later (29 May and 16 June, respectively). It may be that deficient rainfall during the early part of the 1967 growing season may have limited the progress of the earlier plantings to below their fullest potential for forage production.

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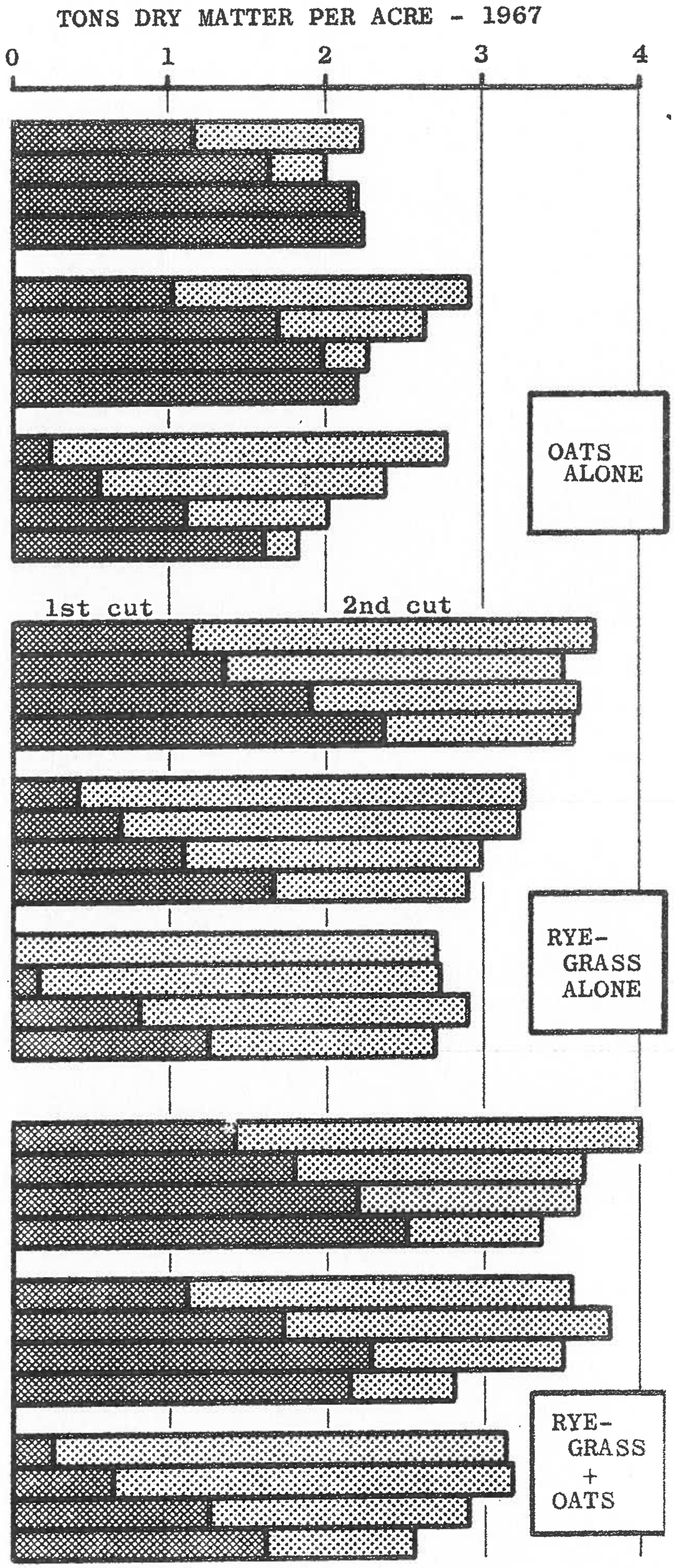
Figure 3. Response of oats alone, annual ryegrass alone, and ryegrass + oats together, to 3 dates of planting and 4 dates of mid-season harvest in 1967.

Date of: Plant	Date of: 1st cut	Approximate days between: Plant & 1st cut	Approximate days between: 1st cut & 2nd cut
17 MAY	18 July	60	75
	27 July	70	65
	4 Aug	80	55
	14 Aug	90	45
29 MAY	18 July	50	75
	27 July	60	65
	4 Aug	70	55
	14 Aug	80	45
16 JUNE	18 July	30	75
	27 July	40	65
	4 Aug	50	55
	14 Aug	60	45
17 MAY	18 July	60	75
	27 July	70	65
	4 Aug	80	55
	14 Aug	90	45
29 MAY	18 July	50	75
	27 July	60	65
	4 Aug	70	55
	14 Aug	80	45
16 JUNE	18 July	30	75
	27 July	40	65
	4 Aug	50	55
	14 Aug	60	45
17 MAY	18 July	60	75
	27 July	70	65
	4 Aug	80	55
	14 Aug	90	45
29 MAY	18 July	50	75
	27 July	60	65
	4 Aug	70	55
	14 Aug	80	45
16 JUNE	18 July	30	75
	27 July	40	65
	4 Aug	50	55
	14 Aug	60	45



WHICH RYEGRASS TO USE? COMMON? ANNUAL? PERENNIAL? A VARIETY? IF A VARIETY, WHICH ONE?

There are 2 general types or species of ryegrass. Annual ryegrass (Lolium multiflorum) produces stems that bear seed heads in both first-cutting and second-cutting crops. Perennial ryegrass (Lolium perenne) produces only leaves in the initial growth of the season and leaves with few or no heading stems in the regrowth. Perennial ryegrass is truly perennial only in areas with relatively mild winters. It is insufficiently winterhardy for the Matanuska Valley and so behaves as an annual here. Perennial ryegrass has survived winters on the Kenai Peninsula and Kodiak Island.

Ryegrass imported for use in Alaska, and available locally during recent years, has been seed of the annual type with no varietal designation. This seed was grown in Oregon. In some years the seed has been labelled "common" ryegrass which denotes a product consisting mainly of annual ryegrass but containing also a relatively insignificant percentage of perennial ryegrass.

EXPERIMENTAL PROCEDURES:

To evaluate the performance and productivity of a number of ryegrasses in Alaska from diverse sources, seed was obtained from N.V.H. Mommersteeg's, a seed firm in HOLLAND (abbreviated "Momm." in Figure 4), also from the Welsh Plant Breeding Station near Aberystwyth, WALES ("Aberyst." in Figure 4), and from Northrup, King and Co., a U.S. seed firm ("NK" in Figure 4). These were all compared with "Oregon annual" ryegrass that has been available to farmers through a local firm in recent years.

All ryegrass varieties and Rodney oats were planted in small plots at the Matanuska Experiment Farm on 23 May 1967. All ryegrasses were planted at 15 lbs/A and oats at 100 lbs/A. Preplant fertilizer, 8-32-16 at 400 lbs/A, was disked into the seedbed. Immediately after mid-season harvests, each plot was topdressed with 33-0-0 at 180 lbs/A. Two dates of mid-season harvest were compared on all varieties. Dates were 21 July and 2 August, approximately 60 and 70 days after planting, respectively. In essence, then, each plot was harvested twice per season but each grass variety was evaluated under 2 different dates of mid-season harvest. Regrowth on all plots was harvested 29 September.

RESULTS:

Caution is advised in the interpretation of findings derived from this variety comparison as the data presented are results from one year only. Average yields over 2 or more seasons will lend greater assurance to comparisons. However, it is not anticipated that the rankings apparent here will be altered appreciably with further testing.

Forage yields are presented graphically in Figure 4 for all varieties on both harvest schedules. Total yields for the 2 cuttings of the season (total length of graph bars) were affected little by date of mid-season harvest. One exception was the annual strain NK NO-8H that yielded substantially less for the year when harvested 2 August than when harvested 21 July. The distribution of yield in first vs second cutting was influenced considerably in all varieties by the different mid-season harvest dates (21 July vs 2 Aug.)

The annual ryegrasses and oats generally outyielded the perennials although certain of the perennial varieties surpassed the poorest annual varieties.

First-cutting yields of the 6 perennial varieties were very low with harvest 21 July, 59 days after planting. First-cutting yields of perennial ryegrasses more than doubled in the 12 days between the 2 mid-season harvest dates, 21 July and 2 August. First-cutting yields of the perennial varieties averaged only 0.27 ton/A on 21 July and 0.88 ton/A on 2 August.

The 10 annual varieties and NK "TETRABLEND" (a commercial blend of annual and perennial strains) yielded considerably more in first cuttings than the perennials. These 11 entries averaged 0.85 tons/A on 21 July and 1.53 tons/A on 2 August.

Marked differences in forage yield were evident among the annual varieties compared. Six varieties were outstanding with total season yields between 3.5 and 4.2 tons/A. These includedboth "WESTERWOLDS" entries, Mommersteeg's "TEWERA", Northrup, King's "NO-8H" and "TETRABLEND", and the commercial "OREGON ANNUAL" from a local seed supplier.

Oats produced a modest regrowth, near 1 ton/A, with first cutting 59 days after planting but regrew very little after the later mid-season harvest on 2 August, 71 days after planting.

Although yields of the perennial varieties were generally somewhat inferior in yield to the annuals, herbage of the perennials consisted entirely of dense growth of leaves. In contrast, herbage of the annuals consists mostly of stems bearing leaves and seed heads in both the first growth and in the regrowth.

Grazing animals readily consume the very leafy early initial growth and regrowth of annual ryegrass but later display an increasing rejection of the herbage in the field as it gradually becomes more stemmy. Dairy research specialists discovered that relatively stemmy annual ryegrass that is virtually rejected by cattle grazing in the

field finds good acceptance when harvested daily and fed as "green-chop" to the same animals in dry-lot. (See ACKNOWLEDGEMENT for source of information).

These observations lead to the speculation that perennial ryegrass may find better acceptance by grazing animals than annual ryegrass as the regrowth period lengthens. Certainly perennial ryegrass should be compared with the annual type for palatability at different stages of growth. The relatively smaller yields of perennial ryegrass might be, at least in part, compensated for if it were more acceptable to grazing animals over a longer period than annual ryegrass.

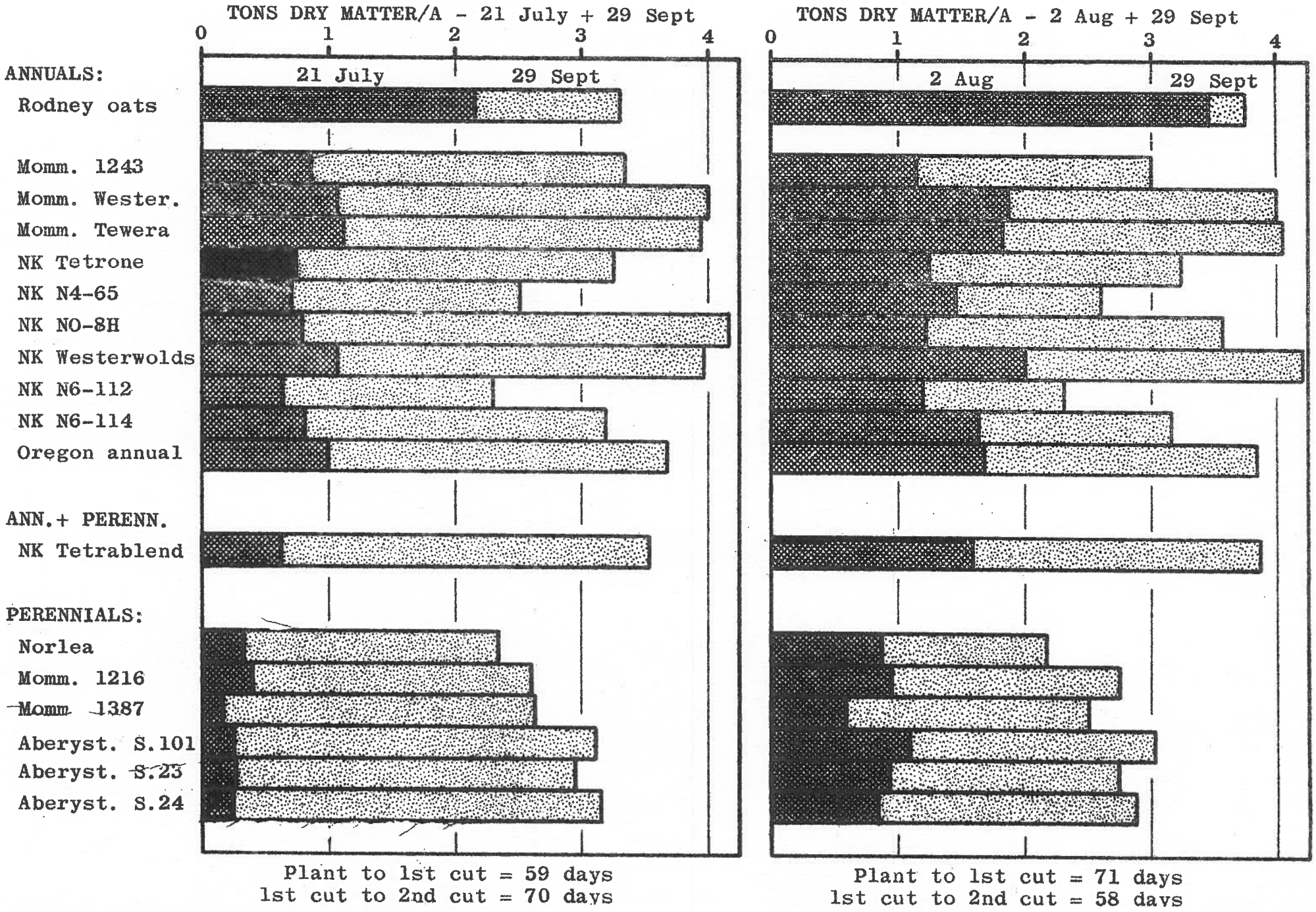
It has been noted in October that with increasingly severe frosts the erect growth of annual ryegrass stems and leaves becomes conspicuously more bleached and progressively less attractive from a forage standpoint than the very leafy, lower-growing, and obviously less affected perennial ryegrass. This slower deterioration of apparent forage quality of perennial ryegrass with October frosts could conceivably extend its utility period appreciably beyond that of annual ryegrass. Extension of the grazing season in autumn is an important consideration in this subarctic area of relatively long winters and short growing seasons. To speculate further, perhaps some merit will be found in use of a seed mixture (such as the NK TETRABLEND) that combines both annual and perennial types.

It is apparent from the few annual and perennial ryegrasses evaluated here that varieties differ substantially in yielding ability. Further varietal comparisons may well be justified inasmuch as there exist, on a worldwide basis, over 50 named varieties of annual ryegrass and over 80 varieties of perennial.

Seed cost necessarily is a factor that must be considered in a choice of ryegrass variety or strain to be used. Shipping costs on varieties from European sources may effectively remove them from consideration for use in Alaska regardless of performance characteristics. Annual or "common" ryegrass from the Pacific Northwest has been available for retail purchase in Alaska for 10-15¢/lb. More information is needed on costs of other ryegrass types and varieties from that seed production area.

Another factor to be considered along with seed cost might be termed "consistency" or "reliability" of product. Use of a named variety, especially if variety of seed is "certified", should impart consistent performance owing to unvarying genetic control. Ryegrass seed without a variety label but bearing a generalized designation, such as "common" or "annual", could be a relatively variable product from year to year, depending on the actual seed involved.

Table 4. Forage dry-matter yields of oats and annual and perennial ryegrasses in 1967 as influenced by 2 different dates of mid-season harvest.



Some characteristics of Rodney oats and ryegrass strains evaluated for forage on 2 harvest schedules during 1967 at the Matanuska Experiment Farm near Palmer, Alaska.

	Percent dry matter			Percent dry matter			
	On 7/21	on 9/27 (plots cut 7/21)	Estimated no. heads per 5'x16' plot	on 8/2	on 9/27 (plots cut 8/2)	Estimated no. heads per 5'x16' plot	Characteristics of regrowth in late September
ANNUALS:							
Rodney oats	19.0	23.7	800	24.5	20.7	400	
Ryegrasses:							
Momm. 1243	14.1	20.9	200	18.2	20.0	100	Broad leaves, few heads.
Momm. Wester.	17.6	25.0	5000	22.4	19.4	4000	Tall, stemmy, fairly leafy.
Momm. Tewera	16.1	21.1	7000	18.9	18.0	3000	Tall, stemmy, fairly leafy.
NK Tetrone	14.1	18.1	200	15.8	17.0	40	Broad leaves, few heads.
NK N4-65	22.3	30.1	4000	30.8	25.9	5000	Stemmy, short, non-leafy.
NK NO-8H	12.6	20.1	300	14.9	16.4	60	Very broad leaves, few heads.
NK Wester.	17.0	23.5	8000	21.4	18.4	4000	Tall, stemmy, fairly leafy.
NK N6-112	19.5	24.6	3000	23.6	20.1	3000	Tall, stemmy, non-leafy.
NK N6-114	17.1	23.5	5000	21.2	20.1	4000	Tall, stemmy, non-leafy.
Oregon annual	17.9	24.5	5000	24.8	20.3	3000	Tall, stemmy, some lodged.
ANN. + PERENN:							
NK Tetrablend	15.1	20.5	1000	17.3	19.3	1000	2 types: Tall headed stems + Shorter plants w/broad lvs.
PERENNIALS:							
Norlea	16.9	25.8	0	17.4	22.0	0	Fine leaves, very short.
Momm. 1216	17.3	21.3	0	16.8	19.8	20	Medium leaf width.
Momm. 1387	20.7	21.5	50	16.1	19.6	100	Fine leaves.
Aberyst. S.101	19.4	20.7	0	16.7	19.6	0	Fine leaves.
Aberyst. S.23	17.6	23.8	0	16.0	19.4	40	Fine leaves, very leafy.
Aberyst. S.24	18.5	21.9	200	16.7	18.3	200	Fine leaves.

GENERAL CONSIDERATIONS:

WHEN PLANTING, ryegrass requires a firm, well prepared seedbed for best establishment. Somewhat more care is required to obtain good establishment of ryegrass than is needed with larger seeded crops such as oats and peas. Plant ryegrass at about 15 pounds per acre in the grass attachment of the grain drill or in a packer-type seeder with corrugated rollers. Try to plant no deeper than 1 inch. Ryegrass seed will not emerge if planted too deep. Pull a packer-roller behind the grain drill. Another method of seeding ryegrass is with a cyclone-type broadcast seeder. If ryegrass seed is broadcast on the soil surface, a very light harrowing should precede packing to cover the seed slightly.

CAUTION: Ryegrass, except at very advanced stages of growth, is high in moisture content. Some hay or silage should be fed along with ryegrass forage because of a decided laxative effect on the animals when ryegrass is consumed as the only roughage.

Forage available at mid-season on spring-seeded ryegrass is best utilized as pasture, fed as green-crop, or ensiled. A recent mid-season cutting of ryegrass, put up as excellent-appearing, FIELD-CURED HAY, surprisingly WAS REJECTED by dairy cows and bulls in the Experiment Station herd. Similar crops of ryegrass, fed as green-chop or ensiled, have found good animal acceptance. (See ACKNOWLEDGMENT for source of this information).

FEW SPECIFIC RECOMMENDATIONS ON RYEGRASS USE HAVE BEEN SET FORTH IN THIS REPORT. INSTEAD AN EFFORT HAS BEEN MADE TO PRESENT FOR STUDY SEVERAL SETS OF EXPERIMENTAL RESULTS DERIVED WITH RYEGRASS AS WELL AS OATS AND PEAS DURING RECENT YEARS.

Insufficient information is available at this time on several aspects of ryegrass culture in our area. For instance, more must be learned about performance, palatability, and costs of the different types, and many varieties, of ryegrass available. Only then can recommendations be made on specific grass or grasses to be used based on sound experimental evidence and other factors involved. Research is continuing at your Experiment Station to find answers to this and other forage problems.

ACKNOWLEDGMENT

The assistance of Mr. Darel A. Smith with all experimental field studies discussed in this report is gratefully acknowledged.

All observations and experimental evidence on palatability and nutritive value of ryegrass alluded to in this report were derived by Experiment Station dairy science staff members Dr. A. L. Brundage and W. J. Sweetman.

Some of the observations on palatability and nutritive value of ryegrass appeared in the following previously published reports:

Brundage, A. L., W. J. Sweetman, L. J. Klebesadel, N. E. Michaelson, and C. I. Branton. 1963. Grasses and alfalfa for annual forage and pasture in south-central Alaska. Jour. of Dairy Science. Vol. 46. pp. 1260-65.

Brundage, A. L., and C. I. Branton. 1967. Ryegrass and orchardgrass-alfalfa for annual forage and pasture in south-central Alaska. Jour. of Dairy Science. Vol. 50. pp. 856-62.