EFFECT OF TIME OF SOWING ON IRRIGATED PASTURES IN SOUTH-EASTERN QUEENSLAND

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SUMMARY

Irrigated pastures can be established from February, April or June plantings but April and June gave the most consistent results. Total emergence of the sown species was the most satisfactory from April and June plantings (30 and 40 plants per sq. ft. respectively.) February plantings were only fairly satisfactory (23 plants per sq. ft.) while September plantings gave very poor emergence (12 plants per sq. ft.).

Weeds were troublesome in September and February plantings, the average numbers emerging over the three years being approximately 24 and 27 plants per sq. ft. respectively. Only moderate amounts emerged in April (13 plants per sq. ft.) and June plantings (8 plants per sq. ft.). The planting mixture containing the larger amount of ryegrass tended to suppress the early growth of weeds.

Details of growth rates and botanical composition at the first harvest and trends in composition over a full year from the planting time for the 1956 season are given. The green yield for the year was significantly higher in the February planting. A marked difference in composition developed between February and September plots on the one hand and April and June plots on the other, the former plots reverting essentially to a simple white clover and paspalum pasture while the latter plots retained fairly high proportions of the other sown grass species with ryegrass as the dominant grass.

When additional factors such as soil preparation and weed problems are considered, the best recommendation is that the final soil preparation for planting should be done as soon after the beginning of April as weather and soil conditions permit, with planting taking place well before September.

I. INTRODUCTION

During the past decade interest in irrigated pastures based on white clover has increased considerably in south-eastern Queensland following the early success obtained at the Irrigation Research Station conducted at Gatton by the State Bureau of Investigation of Land and Water Resources. Much of this early work was general in scope, and the experiment described here was undertaken to study more closely the influence of time of sowing on the early stages of establishment of irrigated pastures in this area.

II. EXPERIMENTAL DETAILS

A trial was conducted at Gatton Research Station (formerly the Irrigation Research Station, Gatton) to compare irrigated pasture establishment at four times of sowing (namely the last week of February, April, June and

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September respectively or as soon as possible thereafter if rain intervened), using two mixtures differing in the proportions of H1 ryegrass, phalaris and cocksfoot as follows:—

—	Mixture A (lb/ac)	Mixture B (lb/ac)
Phalaris (*Phalaris tuberosa* L.)	3	2
Cocksfoot (*Dactylis glomerata* L.), Danish strain	3	2
H1 ryegrass (*Lolium* sp.)	2	4
Paspalum (*Paspalum dilatatum* Poir.)	8	8
White clover (*Trifolium repens* L.), Irrigation strain	2	2
Red clover (*Trifolium pratense* L.), Montgomery strain	½	½

A randomized block design was used with three replications of the eight treatments. Plot size was 27 ft square. Sowings were carried out in 1955, 1956 and 1957.

The soil was a deep dark-brown clay alluvial with limestone concretions at about 36 in. deep. Irrigation was given as required for good germination and continued growth, each set of plots sown at the one time being jointly spray-irrigated with one rose-type spray nozzle in each plot at the end of a length of ¾ in. rubber hose.

Plant density counts were made in 1 sq. ft. quadrats at 10 pegged locations in each plot and the counts averaged. The first count was made 4-6 weeks after planting and the second about 6 weeks later.

Botanical composition and green yield determinations were made by hand-sorting a subsample and weighing the green material from two random quadrats clipped in each plot. In the case of the 1956 plots the composition and yield determinations were continued to compare the trends in botanical composition throughout the year following planting. No grazing of these plots took place, the plots being mown with a motor scythe after each series of determinations and mown material removed.

III. GERMINATION AND ESTABLISHMENT

(a) Total Sown Species

Density counts showing a total sown species are summarized in Table 1.

June and April plantings were the most consistently satisfactory so far as emergence and persistence of the total sown species plant numbers are concerned. February plantings were fairly satisfactory, while emergence of sown species planted in September was poor in each of the three years of the trial.

(b) Weeds

Density counts showing weed species are summarized in Table 2.

TABLE 1

PLANT DENSITIES OF SOWN SPECIES
(Average Seedling Numbers per sq. ft.)

Planting Time	1955		1956		1957	
	1st Count	2nd Count	1st Count	2nd Count	1st Count	2nd Count
February	22·7	20·4	28·3	30·2	14·4	18·4
April	21·4	20·5	31·8	35·1	40·6	39·2
June	47·9	56·0	28·6	17·7	..	45·7
September	10·8	11·4	12·1	16·1	6·1	8·1
Necessary differences for significance 5%	6·8	8·0	5·9	5·7	4·8	8·6
Necessary differences for significance 1%	9·5	11·1	8·1	7·9	6·8	12·0

TABLE 2

WEED DENSITIES
(Average Plant Numbers per sq. ft.)

Planting Time	1955		1956		1957	
	1st Count	2nd Count	1st Count	2nd Count	1st Count	2nd Count
February	23·6	3·5	11·6	8·4	44·6	24·6
April	9·5	5·2	18·1	11·8	10·6	4·3
June	2·6	1·9	13·1	7·0	..	7·9
September	26·9	10·7	10·0	10·0	34·6	31·8
Necessary differences for significance 5%	12·0	3·4	7·5	6·3	11·9	7·2
Necessary differences for significance 1%	16·7	4·7	10·3	8·7	17·0	10·0

The largest numbers of weeds emerging occurred in the September and February plantings. The weeds concerned in these plantings were principally the following summer-growing ones:—nut-grass (*Cyperus rotundus* L.), barnyard grass (*Echinochloa crus-galli* (L.) Beauv.), pigweed (*Portulaca oleracea* L.) and wireweed (*Polygonum aviculare* L.).

The weed germinations in April and June plantings were not high and in 1956 and 1957 they were significantly lower than the germinations in the February and September plantings. In the former sowings the weeds concerned were principally winter-growing ones such as stagger-weed (*Stachys arvensis* L.), deadnettle (*Lamium amplexicaule* L.), milk thistle (*Sonchus oleraceus* L.) and yellow-weed (*Galinsoga parviflora* Cav.). These contributed only small amounts of green matter to the first harvests.

Reference to Figure 1 shows that in general weed numbers declined between the two counting times. This decline tended to be quite large in February plantings, while in the September plantings it was relatively small. April and June plantings showed moderate declines in weed seedling numbers.

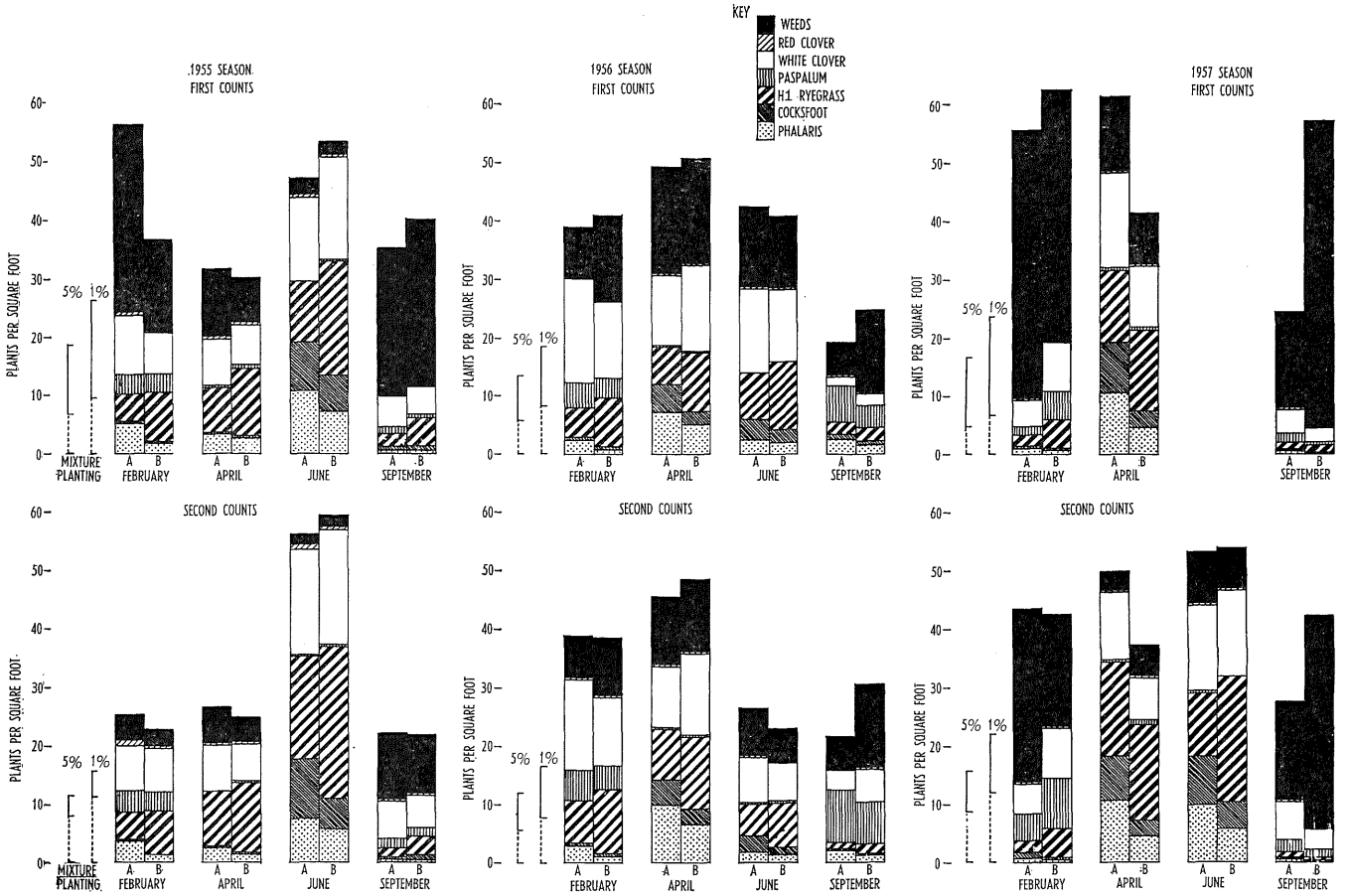

Fig. 1.—Histograms showing average plant densities. Necessary differences for significance are shown as vertical lines beside the appropriate year: the dotted lines pertain to the total sown species numbers while the unbroken lines pertain to the weed numbers.

(c) Individual Sown Species

The plant density counts of the individual sown species are shown diagrammatically in Figure 1.

In general, better emergence of phalaris, cocksfoot and H1 ryegrass was obtained from April and June plantings than from February plantings, while emergence of these grasses in September plantings was very poor. However, paspalum emergence was much better in February and September plantings than in April and June plantings. The June plantings particularly had only very few plants present, while in the case of the April-planted plots there were generally sufficient plants to allow this grass to contribute a fair proportion of green matter to the growth during the first summer.

Germination of white clover was good in February, April and June plantings; while germination was poorer in September, there were nevertheless sufficient seedlings present to allow a slow spread over the summer to give a complete stand after some months.

IV. PASTURE GROWTH

(a) Early Growth

Figure 2 shows the average green-weight growth rates of the various species up to the time suitable for the first grazing of the plots.

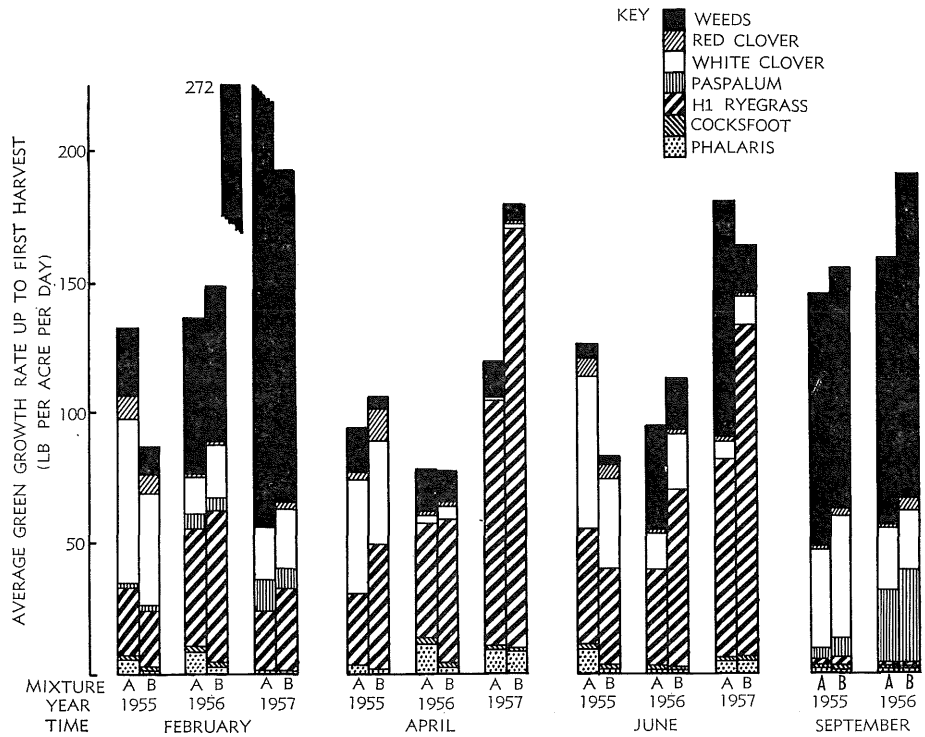

Fig. 2.—Average weekly green growth rates and botanical compositions up to first harvest.

Of the planted species, H1 ryegrass generally made the fastest growth initially in February, April and June plantings. In the April and June plantings the plots were consistently dominated by this grass over this period. The plot planted in June 1957, as shown in Figure 3, is typical.

Fig. 3.—A plot sown in June 1957 and photographed on October 9, 1957, showing the early dominance of H1 ryegrass which was usual for the April and June plantings.

Growth of the other planted species varied. Phalaris, cocksfoot and paspalum grew only slowly over this period, their growth tending to be suppressed by the vigorous growth of H1 ryegrass (April and June plantings), by weed growth (September plantings), or by both (February plantings). White clover generally made fairly good growth early except when H1 ryegrass was particularly vigorous (April and June 1957).

Weed growth was troublesome in the September plots and to a lesser extent in the February plots. Figure 4 shows the miscellaneous weeds which were active in a plot planted in September 1957.

(b) Growth in First Year

Growth rates averaged over the first year from the sowing date are shown in Table 3 for the 1956 series of sowings. The February planting gave a significantly higher average growth rate than the other three plantings. Particularly

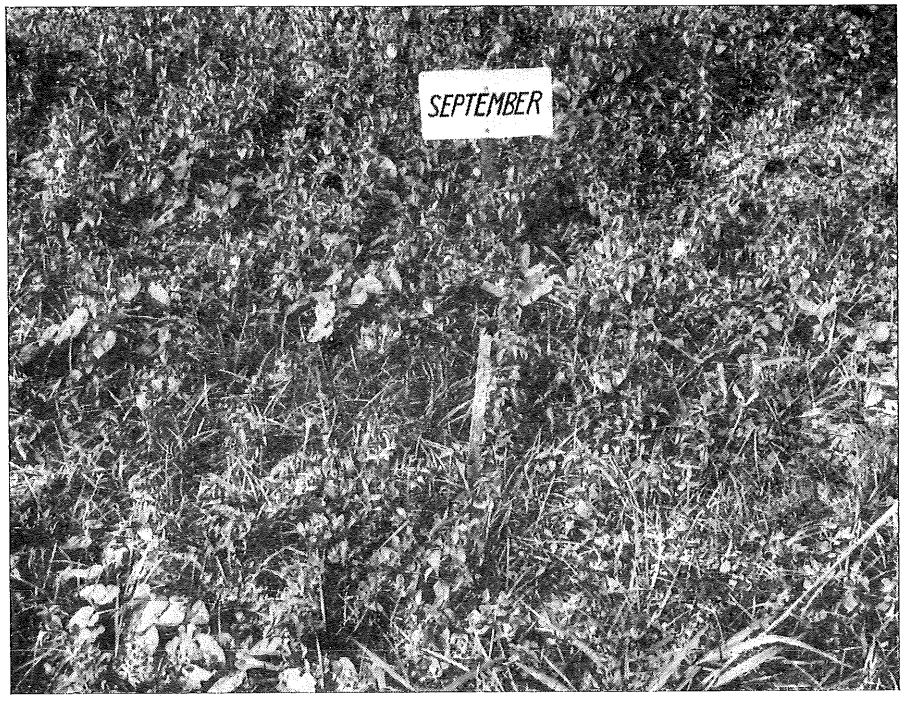

Fig. 4.—A plot sown in September 1957 and photographed on November 13, 1957. Weeds were very prolific; a few paspalum and white clover plants are the only sown species easily distinguished.

favourable weather conditions in the weeks following planting allowed the sown species to establish well before the winter period, and in the following months the temperate species were able to take full advantage of their optimum growth period (spring and early summer) while the paspalum was also able to take full advantage of its optimum growth period (late summer).

TABLE 3

AVERAGE GREEN WEIGHT GROWTH RATES FOR 1956 PLANTINGS

(lb per acre per day)

Planting Time	Mixture A	Mixture B	Means
February	234	250	242
April	128	141	134
June	160	163	161
September	157	176	166
Means	170	182	176
Necessary difference for significance	5%		28·8
	1%		41·6

February >> June, September > April.

Figure 5 shows the trends in composition of the green material harvested periodically from the 1956 sowings during the 12 months after the respective sowing dates.

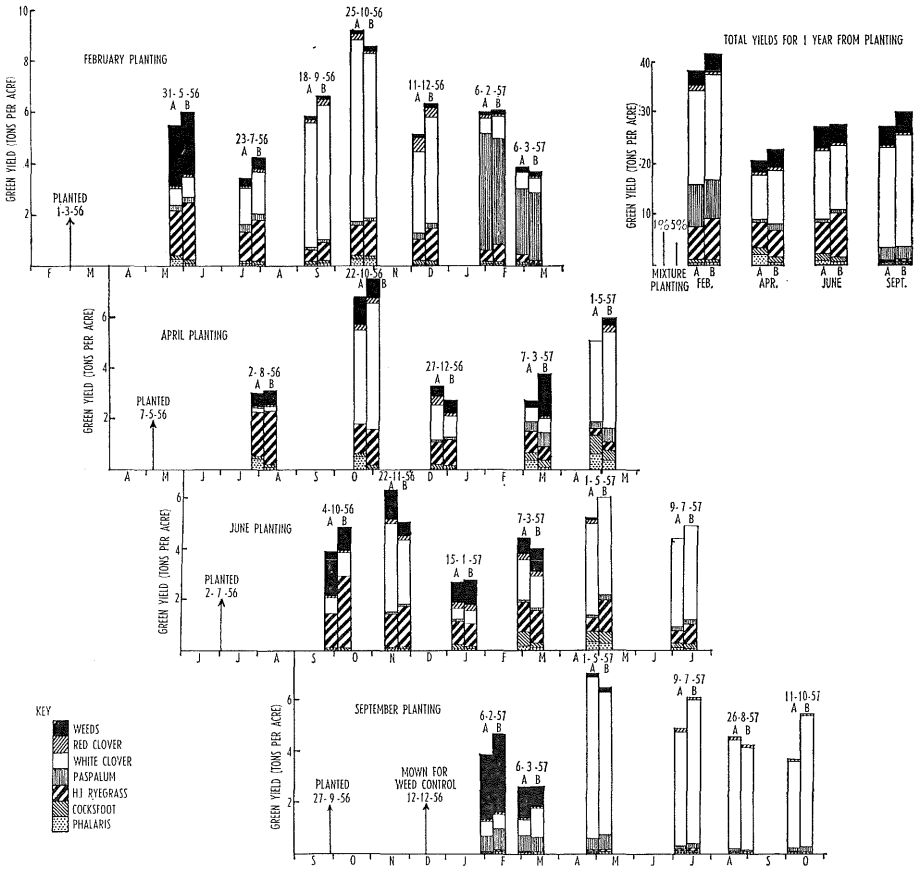

Fig. 5.—Green yields and botanical compositions for one year from planting in 1956.

The diagram for February shows that the initial weed growth and ryegrass growth declined as the white clover growth gradually built up to clover dominance in the September/December period. This then gave way to paspalum dominance in January and February. Figure 6 shows that in June 1957 this had reverted to white clover dominance.

In the April plots the growth of ryegrass decreased after the first harvest, allowing white clover to dominate the plots during spring. As there were only a few paspalum plants present, the growth was somewhat slow over summer, but during autumn the growth rate increased, the pasture at that time being a well-balanced mixture of all the planted grasses, dominated slightly by white clover. Figure 7 shows a plot planted in April 1956 as at June 1957.

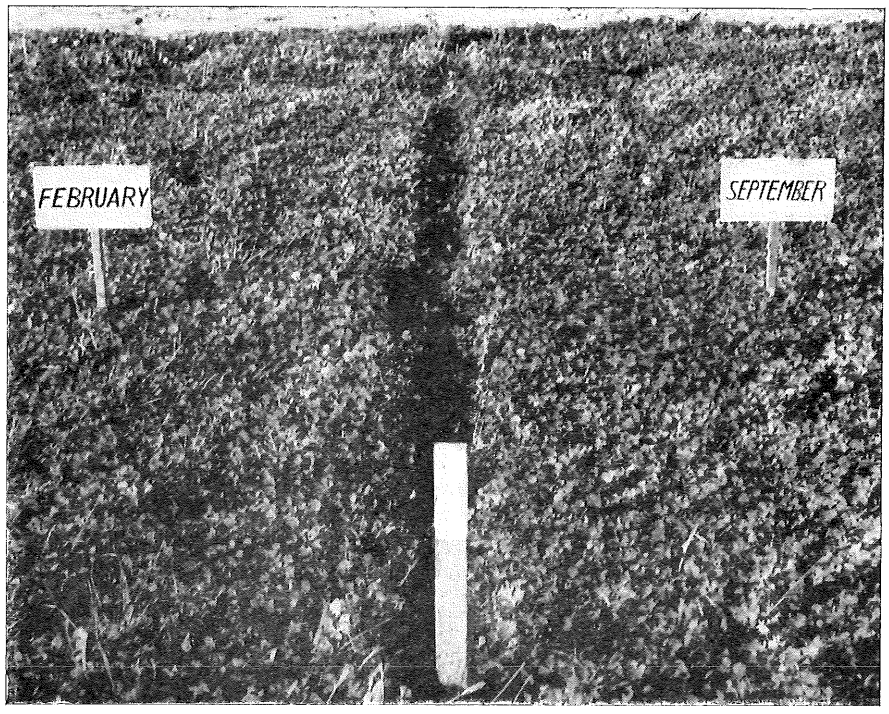

Fig. 6.—Plots planted in February and September 1956 and photographed in June 1957. Both of these plots at that time were mainly simple mixtures of paspalum and white clover; the February plot had trace amounts of other grasses present.

The June-planted plots showed the same trends as the April-planted plots, except that paspalum was present only in trace amounts (Figure 7).

The September plots were dominated by weed growth until February 1957. During autumn, white clover growth increased greatly as the growth of the summer weeds and paspalum slowed down, and white clover then dominated these plots until September, with only traces of the other sown species contributing to the pasture growth (Figure 6).

An interesting feature of these observations made over 12 months from the respective planting dates is the final composition which each set of plantings assumed. In the cases of the April and June plots (Figure 7), the pasture by the second winter was essentially a mixture of white clover and H1 ryegrass, although some cocksfoot and phalaris and traces of paspalum were present. However, the February and September plantings throughout the first summer and autumn were simple mixtures of white clover and paspalum with only very small amounts of the other sown species present (Figure 6).

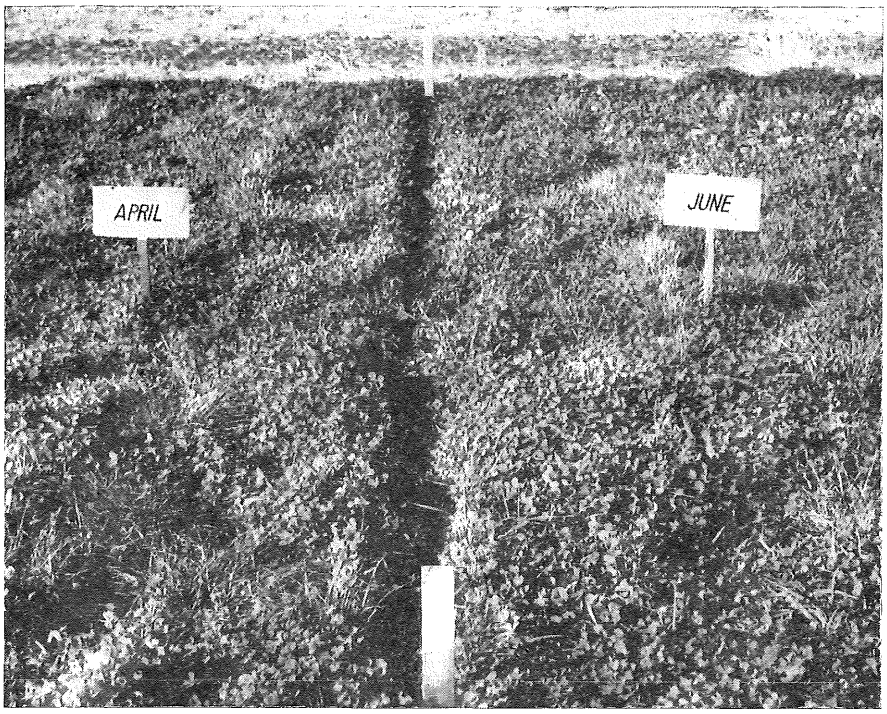

Fig. 7.—Plots planted in April and June 1956 and photographed in June 1957. These plots were essentially mixtures of H1 ryegrass and white clover, together with small amounts of phalaris and cocksfoot and, in the case of the April plot, some paspalum.

V. PLANTING MIXTURE

The two planting mixtures did not give significant differences in total sown species seedlings or weed seedlings. However, there did appear to be a suppression of the growth of weeds up to the first harvest time in the high H1 ryegrass planting mixture (Mixture B), particularly in the June planting and to a lesser extent in the April and February plantings. This effect can be seen diagrammatically in Figure 2. From the point of view of weed suppression, the higher proportion of H1 ryegrass in the planting mixture would be preferable.

The numbers of seedlings of phalaris and cocksfoot that emerged in Mixture B plots were of course less than those that emerged in Mixture A plots, but these numbers were still quite satisfactory in the April and June plantings.

VI. PRACTICAL ASPECTS

Important practical aspects which need to be considered are concerned with weather. Where the pastures are to be irrigated by the border strip method, the final grading and check banking are preferably done just prior to planting. In south-eastern Queensland, February plantings and to a lesser extent April ones also are difficult in that rain is very likely to interrupt soil preparation.

On the other hand, plantings in February and April are often favoured by light showers and cloudy weather following planting, thus reducing the necessity for frequent irrigation during germination. No similar help from the weather conditions can be expected for either a June or a September planting. The numbers of irrigations given in the two months after the various planting times are given in Table 4.

TABLE 4

NUMBER OF IRRIGATIONS GIVEN IN TWO MONTHS FOLLOWING PLANTING DATE

(Each approximately 1½ in. by the spray method)

Planting	February	April	June	September
1955	3	2	4	8
1956	1	2	5	7
1957	6	3	4	10
Average of 3 years	3·3	2·3	4·3	8·3

VII. CONCLUSIONS

At Gatton, quite satisfactory establishment of irrigated pasture can be obtained from February, April or June plantings, but April and June plantings give the most consistent results.

When practical matters such as soil preparation, weed incidence and irrigation needs are considered as well, probably the best system to follow would be to aim to do the final soil preparation for planting as soon as possible after the beginning of April. Plantings in September were failures in each of the three years so far as early establishment is concerned.

April and June plantings gave quite a good proportion of pasture species established, except that paspalum plants were only few from April plantings and almost completely absent from June plantings. However, the few paspalum plants present in April plantings are sufficient to contribute quite a good proportion of green matter to the yields in late summer and autumn. If planting is delayed until June, it would be better to omit paspalum from the planting mixture and if required sod-seed or top-sow this grass later on.

The seed mixture containing 4 lb of H1 rye-grass with 2 lb each of phalaris and cocksfoot gave better control of weed growth than did the mixture with 2 lb of H1 ryegrass and 3 lb each of phalaris and cocksfoot. Use of the higher proportion of H1 ryegrass in the sowing mixture would be preferable for planting in the April-June period.

VIII. ACKNOWLEDGEMENTS

I desire to acknowledge the assistance received from officers stationed at the Gatton Research Station in the conduct of this trial. Other officers of the Department of Agriculture and Stock also helped considerably, especially the Chief Biometrician, Mr. P. B. McGovern, in carrying out the statistical analyses required.

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