

## PASPALUM AS A PASTURE GRASS.

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*Paspalum dilatatum* is a sub-tropical grass. It thrives best in warm districts with a high rainfall. The main growth is made during the heat of the summer. The plant is of strong growth, deep-rooting, and perennial. Individual plants spread laterally to a considerable distance by the development and growth of short underground rhizomes. In this way plants established a foot or more apart can in a year or two cover the ground with a dense sward. The leaves are long and broad. They are produced at first from the numerous crowns of the plant and later appear at regular intervals along the flowering-stalks. The plant in the leafy stage is very palatable and nutritious. Even when flowering it continues to produce palatable leaves. When kept closely grazed or mown the crowns produce a succession of leaves ideal for grazing stock. *Paspalum* can grow in the shade and can thus invade and supplant clumps of rushes and tall fescue and other swamp growth: It smothers out blackberry and bracken fern if assisted in the early stages. It can survive fairly long periods of flooding and inundation. On loose soils the roots penetrate for many feet in search of moisture. On soils with a stiff subsoil or hard pan it is often affected by dry weather and tends to become root-bound. It has, however, often penetrated shallow pans and stiff soils, and, if well provided with plant-food, thrives when other pasture-plants are dried up. It cannot withstand severe winters where the ground is frozen, but otherwise it is not killed by fairly severe frosts. The colder the winter the slower it is to come away in the spring. *Paspalum* is rapidly becoming more and more acclimatized to frosts, and in many districts in the Auckland Province it is not now cut back by frosts of seven degrees and more.

### EARLY CONFLICTING VIEWS REGARDING VALUE OF PASPALUM.

From 1900 to 1920 or even later the merits and disadvantages of paspalum as a pasture-grass in the Auckland Province were discussed wherever farmers met. While some farmers acclaimed its virtues as a wonderful summer-feed producer on swamp land too wet in winter, or too dry in summer to grow rye-grass and cocksfoot, others would have none of it. The latter drained and cleared and ploughed and cropped and sowed to English grasses. While some on hill land planted and sowed paspalum, and in the early stages at least had green summer pastures, others pointed to the lack of growth in the winter and were satisfied with dry summer pastures, and later stressed the tendency to root-binding. Even the enthusiasts began to doubt the wisdom of the extensive spread of paspalum when its colonizing ability by seeding began to be realized: This was particularly so in North Auckland, where from the free seeding of hill-sown paspalum the better land in the valleys and flats was invaded. Through inability to stock the summer growth adequately the paspalum became rank. It crowded out all other species. When frosted growth or the dry harsh growth of summer had to

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be eaten in the winter indigestion and compaction in stock caused serious losses. In time, on the poorer hill land, paspalum became root-bound and unproductive. This was because it was starved. The difficulty of cultivating and cropping land once it was invaded by paspalum was also held against the grass. Despite these disadvantages enthusiasts continued to sow and introduce paspalum throughout the warmer northern and coastal parts of the Auckland Province, and as far south as Hawke's Bay and Taranaki. It found special favour in grassing, with little effort on the part of the farmer, river-flats and swamp land partially covered in logs, stumps, blackberry, rushes, and tall fescue, &c. Others, by not sowing and by rigorously grubbing out odd plants brought in by stock, endeavoured to keep it out.

Paspalum is a great colonizer where climatic conditions favour it, and particularly where for one reason or another other pasture species do not thrive. Gradually it has invaded the better class of hill country and the river-flats and swamp lands throughout the northern peninsula and coastal areas where the frosts are not too severe. It has also, through being sown or by colonizing, occupied considerable areas of the poorer hill land where, on account of fairly rapid root-binding and starvation of the paspalum, danthonia and brown-top would produce more feed. Fortunately danthonia is able to dominate paspalum on much of the drier hill country, and brown-top combines well with it on the moister slopes. Paspalum as a pasture-grass has limitations and disadvantages, but the fact remains that the introduction and spread of paspalum in North Auckland and the warmer parts of the Auckland Province generally has seen a tremendous increase in the production from dairying, sheep-farming, and cattle-raising. It can be claimed that the advantages have far outweighed the disadvantages.

#### **IMPORTANCE OF MANAGEMENT.**

The difficulties of control, management, and utilization of paspalum pastures have forced on farmers the development of management methods which have brought out more prominently the many excellent qualities of the grass. Faults attributed to paspalum, such as the smothering effect on other species, the shortage of winter and spring feed, the coarseness of the feed in late summer and autumn, root-binding and falling-off in production, have in recent years been more and more recognized as really faults in management. In the early stages, owing to the roughness of the land surface, the prevalence of logs, stumps, &c., and the size of paddocks, the rank summer growth could not be controlled. Other species were smothered out, the pastures became pure paspalum, and the winter carrying-capacity was far too low to allow for efficient stocking in the summer.

Farther south, where the establishment of pure paspalum swards for summer-feed production was advocated, paspalum has not made much progress. The low feed-production for six or more months of the year of such pastures far outweighed the advantage of good summer-feed production, particularly in districts where the summer was generally fairly well provided for.

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The outstanding feature in connection with the better management and utilization of paspalum is the realization on the part of the farmer that practically all the other pasture species he would like to have in his pastures can be established and maintained with paspalum. Further, the management necessary to do this is exactly what is required to get the most from the paspalum as a summer-feed producer.

PASPALUM WITH PERENNIAL RYE-GRASS AND WHITE CLOVER.

Perennial rye-grass and white clover on land capable of supporting these species, either sown in the original mixture with paspalum or introduced later by surface-sowing, have been maintained indefinitely. The growth period of the perennial rye-grass is much earlier than that of the paspalum. The rye-grass grows in the winter and early spring, and as it dries off the paspalum takes up the running. The white clover combines well with the paspalum, growing over and amongst the crowns and providing the paspalum with much-needed nitrogen. This combination can be achieved and maintained only under fertile conditions, and provided always that the paspalum is not allowed either by stocking or mowing to grow, rank and coarse season after season. When well managed, this is an excellent pasture, with a long production-period.

Because in northern districts the paspalum comes away early, cocksfoot is apt to find the competition too severe, but farther south cocksfoot and paspalum can be grown to advantage in the same field, the cocksfoot coming away earlier than the paspalum and growing on later into the winter. Where the perennial rye-grass and white clover cannot grow on account of flooding, or because of inability to mow or graze efficiently on swamp land, *Lotus major* combines well with the paspalum, but every effort should be made to provide conditions suitable to rye-grass and white clover.

With top-dressing, controlled grazing, and the use of the mower, many thousands of acres of dairying-land are now growing what is the ideal combination, perennial rye-grass in the winter and spring, so strong that no paspalum is to be seen, and, as the rye-grass goes off, white clover and paspalum throughout the rest of the year. There are still many more thousands of acres where this type of pasture should be the aim.

PASPALUM WITH SUBTERRANEAN CLOVER, ETC.

Where the fertility is not up to the rye-grass standard subterranean clover, which commences growth in the autumn and continues until the early summer, makes an excellent companion to paspalum, providing well for the period of low feed-production by the paspalum. On hill country brown-top and crested dogstail, *Lotus major* and *L. hispidus*, also combine well with paspalum, providing again that the paspalum is controlled.

A feature of the development of the idea of using paspalum as one of the species in a mixed pasture has been the use in recent years of true perennial strains of perennial rye-grass and white clover. The introduction of these strains to paspalum swards by ploughing, and more recently with, the development of suitable

implements by surface cultivation, is being successfully practised. Conversely, the establishment of paspalum in rye-grass and clover pastures by surface-sowing in the late spring or feeding out paspalum hay has also been extensively practised on farms which have hitherto kept paspalum out.

A more general recognition of the fact that paspalum can be controlled, that other useful species can combine with it, and that all-the-year-round pastures can be obtained by the use of paspalum together with other species is likely to extend the range of usefulness of paspalum far beyond its present limits.

#### TREATMENT OF ROOT-BOUND PASPALUM.

One of the most difficult problems in connection with the management of paspalum is the condition known as root-binding. Where paspalum has become, root-bound there is a decided falling-off in production. This condition is now recognized as being due to starvation. Although the root-bound paspalum is producing very little feed, it is safe to say that no other grass, with perhaps the exception of danthonia, would produce more under the circumstances. The renovation of such root-bound, paspalum swards wherever practicable can be achieved by ploughing in narrow lands, cultivation, and the sowing of other species: perennial rye-grass and white clover, subterranean clover and brown-top, or the lotus species are suitable according to the future policy with regard to top-dressing. The cultivation renews the vitality of the paspalum and provides plant-food for the growth of other species for a time at least. Considerable areas of root-bound paspalum have also been successfully renovated by the use of special cultivating-harrows and rye-grass and white clover introduced. The success of this method and the future production of the pasture depends on whether top-dressing is practised to a very large extent. Continued top-dressing after renovation prevents a recurrence of root-bound paspalum, which is very slow in responding to manuring. The tearing-open of the matted surface roots allows the grass to make use of the fertilizer much more quickly and effectively. Paspalum stands all the cultivation that can be given it, and frequent and regular cultivation with the disks or penetrating harrows is one of the main methods of keeping it thriving, and preventing root-binding. Top-dressing and winter stocking with heavy cattle will also prevent this condition. On steep hill-country where root-binding tends to be a bad feature closing paddocks for a summer or two and stocking heavily with grown cattle when the ground is wet has been adopted with satisfactory results.

#### CONTROL OF PASPALUM BY MOWING.

The controlling of the paspalum, particularly by the use of the mower, has demonstrated more clearly the wonderful summer butterfat-producing capacity of paspalum itself.

The rank, summer growth of paspalum, besides smothering out other species, is unpalatable and innutritious as autumn and winter feed. Wherever the mower can be used surplus summer growth should be put away as hay and silage. Paspalum hay is often

described as being coarse and unpalatable. Difficulty is often experienced in making silage from paspalum. The coarse rank material, mainly flowering-stems, does not pack well, and the silage over-heats. These are not faults of the grass but of the farmer. Paspalum for either hay or Silage should be cut before it comes into flower. For silage-making early cutting to get a mixture of other grasses and clovers with the paspalum, well before the latter comes into flower, is strongly advocated.

On good land a second, and even a third cut of leafy paspalum that will make excellent hay or silage can often be secured.

In stacking leafy paspalum hay it will be found that a very high centre must be kept in the stack, and provision made for topping-off the stack, as the material tends to settle rapidly after stacking. It is far better practice to take two leafy crops than one heavy coarse crop of inferior feeding-value. On pure paspalum pastures the early growth is often too long to get a crop. By running the mower over a paddock intended for hay, prior to closing, the growth can be made to come away much more evenly.

#### ARABLE CROPPING OF AREAS IN PASPALUM.

The impression is still prevalent that when once paspalum is established cultivation and cropping is out of the question. Old root-bound and neglected paspalum swards are admittedly difficult to plough and cultivate. The indifferent cultivation one often sees under such conditions serves only to stimulate the growth of paspalum, but it is not sufficient for a satisfactory crop even without the competition of the rejuvenated paspalum. Sufficiently early and thorough cultivation to prepare a satisfactory seed-bed for the crop also serves to keep the paspalum in check until the crop is grown.

Where paspalum has been kept in good order, ploughing and cultivation are not nearly so difficult, and satisfactory crops can be grown. The paspalum, which tends always to re-establish from seed and pieces of root, can be dealt with in the same way as other deep-rooting weeds. Up to 100 tons per acre of mangels and 80 to 90 bushels of maize have been grown on paspalum paddocks broken up for cropping. When seeded to grass again it is not necessary to resow the paspalum, since even after several years of cropping there is enough seed in the soil to give a good-take of paspalum.

#### SOWING PASPALUM.

Paspalum-seed germinates best in hot, moist weather; for this reason November and early December sowing was frequently advocated. Since paspalum should be established with companion species which are better sown in the autumn, the best practice is to include paspalum in the mixture and sow in the autumn: Paspalum can be established quickly, as a pure seeding if sown with millet or maize or even soft turnips in the early summer. When sown with other species in the autumn it is slow to establish. By sowing before the end of February or early in March a much better strike and quicker establishment of all species is obtained; and this early sowing specially favours paspalum. Seeds of paspalum,

will lie over the winter and germinate the following summer. When once scattered plants are established the thickening-up of the paspalum can be hastened to a great extent by letting the plants run to seed in the summer. On account of the dense sward, paspalum is difficult to establish with brown-top. From 4 lb. to 5 lb. of seed is sufficient in a mixture on ploughed land and 2 lb. to 3 lb. on burns.

#### PASPALUM-SEED.

The best seed is imported from Australia, where the seed crop ripens more evenly than it does here, and seed-harvesting methods are generally better. About 1920 the average germination of Australian seed coming to New Zealand was about 40 per cent. Samples of local seed ranged in germination from 0 per cent. to 20 per cent. or 25 per cent. At present local samples are being obtained ranging from 20 per cent. to as high as 50 per cent. At the same time, however, Australian samples up to 70 per cent. have been on the market. The necessity for buying and selling paspalum-seed on a germination basis should be apparent. The main difficulty with local seed, which is preferable on account of the acclimatization of the plants, is the uneven ripening, the loss occasioned by unfavourable harvesting weather, and the varied harvesting methods. Tests have shown that the germination of the pure paspalum-seed in local samples is practically as good as that of imported seed. In local seed, however, the amount of empty seed-covers and immature seed is often as high as 60 per cent. to 70 per cent., whereas in the best imported seed rubbish is reduced to 20 per cent. to 30 per cent.

#### CONCLUSION.

Though considerable progress has been made in recent years in the management and utilization of paspalum as a pasture-grass, much yet remains to be done before a considerable proportion of our farmers are taking full advantage of its possibilities as a wonderful summer-feed producer. The conserving of surplus summer growth when still palatable and nutritious, the combination of paspalum with other species with a different growing-period, and the maintenance of fertility to prevent starvation of the paspalum are the lines along which further progress with this grass will be made.

#### DISCUSSION.

*Mr. Lonsdale:* Paspalum has a wide range of usefulness, and, apart from North Auckland it is used in many other places and in conjunction with subterranean clover has no doubt raised the carrying-capacity of our coastal land very considerably. It is deep-rooting, and this enables it to bind the sandy areas and so form a good pasture. The main thing is control of that pasture, and with regard to its grazing-capacity, that has been proved on quite a large area from here northwards along the coast-lines. I have found we have no grass on which hoggets will winter so well as on paspalum. It has been used in the eradication of blackberry. Where blackberry is cut out and burnt and paspalum sown and top-dressed to get an establishment, it will eventually control the blackberry on certain lands. I have also seen it applied in the tall-fescue country, and where top-dressed I have seen paspalum take possession, and ultimately the tall fescue has gone out.

Mr. *Smallfield* : As Mr. Hamblyn pointed out, most of the prejudice against paspalum has disappeared since top-dressing started in the North, and the paspalum has been made successful on poor land by growing clover with it. In South Auckland it is not used as much as one would suppose it might be with its excellent summer growth. The reason is that paspalum for the best growth requires the soil a little wetter than is required for rye-grass and white clover, and it is on the wetter land of the farm that paspalum does the best. On quite a large area of land where rye-grass-white-clover does well paspalum in a dry season remains green but does not throw nearly as much feed as it does on swampy land that is wet, and in sowing down special paspalum fields it is the wetter part of the farm that ought to be sown in paspalum. There is another reason : this is the slow establishment of paspalum when sown in a rye-grass + white-clover mixture. In pasture heavily top-dressed and well managed the paspalum very slowly establishes, but when sown alone in November or December about 10 lb. of seed but no grass or clover, simply alone, sometimes sown with soft-turnip crop—the paspalum immediately establishes and rye-grass and white clover are worked in in the autumn when the paspalum plants are established. That seems to be quite an effective way to establish paspalum pastures in which the paspalum is to be dominant. I think we have not any exact information as to the feeding-value of paspalum when it is short or when it is rank. The difference between short feed and the long feed is not so marked as it is with rye-grass and cocksfoot.

Dr. *Hopkirk* : In the last three years there has been a very great increase of ergot on the seed of paspalum. This has apparently come about very suddenly, as no one seems to have recognised this parasite previously. The control of the seeding of paspalum is very badly required, because we are experiencing paspalum staggers in cattle caused by the ergot. Is there any method of controlling these pastures so that we can obviate paspalum staggers in cattle ? That the ergot is responsible has been proved in experimental work at Wallaceville Veterinary Laboratory.

Mr. *Callaghan* : My impression in North Auckland a few years ago was that the paspalum was distinctly palatable. A fair number of dairy-produce awards went to North Auckland factories, and a good many of the cows that supplied the milk for that produce had been grazed on paspalum pastures. At that time the management of paspalum seemed to be the main difficulty experienced in that province. The establishment of paspalum from seed seems to have made a very big advance. The introduction of clovers to paspalum swards was first tried on the hill country, and one of the first developments in subterranean clover was its inclusion in a hill-country mixture as an associate of paspalum.

Mr. *Holford* : Are there differences in strain, particularly relative to frost-resistance ? Some farmers in the north have indicated that where paspalum is dominant it is at times better to let it become sod-bound and then by top-dressing encourage rye-grass and white clover.

Mr. *Galpin* : There seems to be a definite place for paspalum on much of the West Coast country considerably farther south than Bulls.

Mr. *Montgomery* : In South Auckland a number of farmers have areas of paspalum which they cut and keep mainly as hay and silage areas and on which in the winter they feed out the hay and silage. They find that such areas stand up to the tramping very well, and that feeding out on paspalum areas allows them to spell other pastures with the object of having a substantial growth of rye-grass and white clover for the cows when calving takes place.

Mr. *A. G. Elliott* : Paspalum has been established to a limited extent on the hills in the Marlborough Sounds where top-dressing has not been practised, and in the absence of a suitable clover its development has been poor and it rapidly formed the undesirable mat condition. Paspalum is of special interest to North Taranaki pastures in coastal areas, particularly on account of the fact that pasture establishment is poor, resulting in an open sward, further deteriorated by the practice of cutting for hay and silage—here paspalum, well managed, in combination with other grasses, would have a definite place.

Mr. *Levy* : It is not as yet known whether it is possible to obtain frost-resistance without a considerable number of crops of seed to fix the characteristic. I think it a pretty moot point whether it is possible to get as much paspalum when it is associated with rye-grass and white clover as you would if the paspalum and white clover were sown separately and given a little laxer management in order

to get the maximum from the paspalum. In the Waikato particularly the area of buttercup is becoming enlarged each year as a result of winter poaching through not having a place on which to winter stock satisfactorily without poaching, and if the paspalum sward does what Mr. Montgomery claims I think that is very important. We have studied strain in paspalum to some extent, but there was not anything promising, so we abandoned the study for the time being.

*Mr. Hamblyn* : Rank paspalum is capable of giving satisfactory production. This is due to the fact that although producing flower-heads it still produces a fair amount of green leaf below the flower-heads. When paspalum is controlled, either by the mower or stock, the succession of fresh leaves from the crowns gives much higher production than is the case where the paspalum has been allowed to grow rank. I agree with Mr. Montgomery that where poaching due to the concentration of stock or winter feeding takes place special paddocks of paspalum, cut for hay and silage and used as areas on which to feed out during the winter, could be used in districts where paspalum may not otherwise be necessary. Ergot was first noticed in North Auckland as far back as 1925, but only odd plants were affected. During the past two very wet summers the incidence of ergot right through paspalum-growing areas has been remarkable, and during the past autumn very few paspalum seed-heads could be found that were not infected. It was interesting to find that in both the southern United States and Australia this ergot was known, and in the former country had caused trouble with ergot staggers. Whether the danger in North Auckland is likely to be as serious as was first expected is doubtful, as during the past autumn, although ergot was very much more prevalent, little or no trouble has been experienced.

The question as to whether varieties or strains of paspalum may be found which are more winter green or less subject to frost than others is of interest. Variation in regard to reaction to winter conditions has been demonstrated with types of perennial rye-grass of different origin. For instance, the best English perennial rye-grass is winter-dormant in New Zealand, whereas New Zealand perennial rye-grass grows relatively well under the same conditions.

*Mr. Cockayne* : The romance of paspalum interests me—unmanaged paspalum paid the foundations of the dairying industry of the North Auckland Peninsula.