

SOME SUB-TROPICAL AND OTHER GRASSES IN NORTH-LAND

By E. H. ARNOLD, Assistant Fields Superintendent,
Department of Agriculture, Auckland.

Situated close to subtropical regions, Northland is subjected to the climatical high-pressure belt of the sub-tropics. The rainfall year is broadly divided into a dry summer season and a wet winter season, giving a contrast which 'decreases southward from Auckland City away from the high-pressure belt. Heavy rains of short duration and sometimes with little lasting effects occur during summer when sub-tropical lows suddenly come down over the area. Temperatures are generally and consistently higher than further south, and light frosts are infrequently experienced in certain localities.

PASPALUM DILATATUM (Paspalum)

Paspalum is a native of sub-tropical America. It was first introduced into New Zealand about 1892, and a few years later an Auckland seedsman sold packets containing about a dozen seeds for 1s._____

Paspalum is a strongly growing, 'deep-rooted perennial. Although growing in clumps, plants established, about 12in. or more apart will, owing to the development of short underground rhizomes, spread in a year or two and form a dense sward. The long and broad leaves, numerous and dense near the ground, -also grow regularly but somewhat sparsely along the flowering stalks, which may attain 3ft. in height. Paspalum has the ability to continue to produce leafage when flowering. Under suitable grazing management, in the growing season from October to April or May, ~~it produces a succession of very palatable and nutritious feed.~~ Paspalum will withstand a period of flooding. On soils which dry out in the summer and autumn paspalum roots penetrate deeply and the plants maintain a cover which keeps the soil moist. If the fertility and management are satisfactory, pas-

palum thrives when other pasture plants are dried up. Although not killed by the frosts experienced in the north, it has a definite dormant period, and once cold conditions set in it ceases growth. Paspalum proved to be a great coloniser and spread throughout the northern peninsula, invading the swamp lands and river flats as well as the better class hill country. For some years after its introduction management of paspalum was little understood and much controversy occurred. But its advent and spread in the north coincided with a tremendous increase in production from dairying and pastoral farming.

Over the years farmers quickly realised the need for its specialised management. A vigorous grower, it is very apt to smother out other desirable but slower growing species, and if not managed properly is liable to take complete possession. Mismanaged on moist, fertile soils it grows in 'the summer an abundance of rank, poor, unpalatable feed mostly indigestible to stock. On less fertile soils less summer feed is produced and root binding commences, resulting in a further falling off in production. On the poor soils paspalum quickly becomes sod-bound, giving practically no summer feed. On the drier soils danthonia, which tends to dominate it, will produce more feed. On the moister areas it will combine with browntop, but even here its production is extremely low.

For some years after its introduction the presence of logs and stumps, the unevenness of the surfaces of fields, and the large size of paddocks resulted in the summer; growth not being controlled. Pastures becoming pure paspalum could not carry sufficient stock in the winter to utilise the summer growth efficiently. As farms were improved by more adequate subdivision, as controlled grazing was introduced; and as surfaces of fields were levelled to enable the mower to be used frequently in the summer to top off the rank patches so were farmers able to produce a succession of good, leafy stock feed. Then in fields adequately topdressed with fertilisers and lime white clover, was able to be maintained along with the paspalum. This brought about a great improvement in the vigour of paspalum and the feeding value of the pasture, but the production in winter was still extremely low. With the low winter production, stock were extremely prone to digestive upsets, and particularly bloat when the white clover commenced growth in the spring and before the paspalum commenced to grow enough to

give a more balanced diet. With the introduction of perennial **ryegrass** and cocksfoot this lack of winter and spring feed was overcome and today the introduction of short-rotation **ryegrass** should further improve production at that time of the year. **Ryegrass** and white clover on land made capable of supporting these species, can be maintained indefinitely along with paspalum.

When they are well established **ryegrass** and white clover grow so vigorously in the winter and early spring that no paspalum is visible in the sward. As the seasons change the **ryegrass** diminishes and the paspalum takes up the running. Then the paspalum becomes dominant (no **ryegrass** is to be seen in the pasture) and the paspalum produces good stock feed with the white clover until the autumn, when **ryegrass** gradually shows up and becomes dominant. Along with the three main species varying amounts of timothy, cocksfoot, Yorkshire fog, *Lotus major*, etc., may often be found growing in season.

The pasture "par excellence" for Northland is the mixed sward of which the major constituents are **ryegrass**, paspalum, and white clover. Such a pasture is achieved and maintained only under fertile soil conditions and under the management by which paspalum is prevented from growing rank and dominating the sward to such an extent that the other desirable species are subdued.

It has been claimed by some authorities for some years that the good **ryegrass-paspalum-white clover** pasture can **outyield** any other pasture combination. For some years measurement trials have been ~~conducted at the Northern Wairoa Experimental and Demonstration Farm at Dargaville.~~ Although the results will be detailed by P. B. Lynch in a subsequent paper, it is worthy of mention that this pasture combination produced during the 1952-53 season **19,030lb.** of dry matter per acre.

With adequate topdressing, controlled grazing, and topping with the mower, many thousands of acres of dairying and fat lamb **producing** land now are growing pastures similar to that at Dargaville. But there are more than 10 times as many paddocks ~~containing paspalum that are not yet utilising this grass~~ to anywhere near the extent that is possible.

Paspalum provided it is associated with the other species and is cut while in the leafy stage makes good hay or silage. On highly fertile areas some farmers

take two good cuts in one season from ryegrass-white clover-paspalum **swards**.

The improvement or renovation of pastures containing paspalum confronts many farmers. The aim is of course to turn poor, sod-bound paspalum into a high-producing mixed sward. Autumn ploughing in narrow furrows, not too closely packed together, the surface worked down sufficiently, and a mixture of perennial and short-rotational ryegrasses with white clover will most rapidly give the desired results. Alternatively, but not quite so effectively, the area can be **disced** or severely harrowed to form a seed-bed among the paspalum for surface sowing of grass and clover seed. Where cultivation is not possible heavy stocking (hoof cultivation) combined with feeding out of suitable seedy ryegrass-white clover hay will prove beneficial. Adequate **fertilising** and liming is essential to raise the fertility to allow any method of renovation to be successful. Unless good management follows, it is definite that the sward will again revert to an inferior pasture.

Paspalum is a desirable constituent in Northland pastures. It is of inferior value unless combined into a mixed sward. A more general recognition that **paspalum** can be controlled and can combine with other useful species will greatly extend the production from pastures far beyond that obtained at present. As one well-known agriculturist, P. S. Syme, has stated: "Paspalum requires the judicious use of the curb as well as the spur. The decision rests not with the grass but with the man."

PASPALUM URVILLEI (Vasey-grass)

Native of tropical America. A very tall, tufted perennial, growing 3ft. or more high with **flowering** stems often up to 5 or 6ft. Found fairly extensively in waste places and roadsides at Kaitaia and **Dargaville**, the roadside. on Waipu flats, and odd places elsewhere. It does not grow in fields under grazing conditions suitable for *P. dilatatum*; it produces an abundance of large and apparently succulent leaves. Would require special management conditions.

PASPALUM DISTICHUM (Water couch or **Mercer** grass)

A native of North and tropical America. Found extensively in warm countries and the South Sea Islands. Has long, stout underground rootstocks with

leaves much smaller than *Paspalum dilatatum*. Grows well in swamps which are submerged in winter but dry out in summer and also in low-lying depressions; Period of growth December to April. Occasionally found in Northland.

P A S P A L U M V A G I N A T U M

Common in warm countries. A somewhat smaller plant than the above, with narrower and often in-rolled leaves. Found in dry places, on sandy areas, roadsides, and clay tennis courts. Tolerates slightly salty conditions. Is aggressive in the growing period, but has a long winter dormant period. Prone to become a nuisance at gateways where fertility accumulates.

P A S P A L U M S C R O B I C U L A T U M

Found in most warm countries (tropics of Old World), has been recorded (but possibly incorrectly) as indigenous.

A smooth, erect, tussocky, dark-brownish-green perennial growing 12 to 20in. high with flowering heads to 3ft.

Scattered in odd waste places (Kaihu Valley and Opua). Not grazed by stock; no economic value.

P E N N I S E T U M C L A N D E S T I N U M (Kikuyu grass)

A native of East Africa and has been introduced to most warm temperate and sub-tropical areas of the world. It received its common name from the kikuyu tribe in Kenya, where it provides a good deal of pasture. In 1920 cuttings from Rhodesia were planted at Albany near Auckland. As these grew so vigorously, plants were forwarded to the Puwera Experimental Farm near Whangarei for large-scale investigations. As at first kikuyu gave signs of considerable promise, farmers obtained cuttings to try it out on their own farms, thus spreading the grass rapidly over the warmer and northern areas of the Auckland Province.

Kikuyu is a rapid growing perennial spreading vigorously by stout, fleshy surface and **underground** runners on which extensive rooting systems grow from every-one of the--numerous-nodes.-The-leaves are flat and spreading, soft, and slightly hairy. On good, moist soils kikuyu grows to 3ft. high, but on poor and dry soils seldom above 12in. The bright green of the foliage in the growing **season** and the pale yellowish

appearance in winter readily distinguish areas of this grass. Flowers, which are most inconspicuous (hence the name *clandestinum*), have been observed from October to June only on short, well-grazed, or poorly growing areas. The first indication that viable seed is produced in New Zealand was in May 1946, when seedlings were found growing in cowpats. Careful washing of the roots revealed the seed coat still attached. Seed has since been collected, but seedlings have been found only in cowpats, the seed to germinate having first passed through the grazing animal.

Kikuyu is a vigorous twitch and from original plantings has encroached into and smothered good pastures of paspalum, ryegrass, and white clover. Loose stems are caught in the cloven hooves or carried at the side of jaws of cattle and transplanted elsewhere in muddy ground at gateways, on roadways, and around water troughs and milking sheds. Kikuyu is not only an aggressive weed on good land, but has certain limitations. Like that of all other grasses when allowed to grow rank, the feed produced by kikuyu is less nutritious and less palatable to stock. On poor and untopdressed soils the little growth produced is also unpalatable. During the colder weather little feed is produced, and although the plant is not killed out by frosts, growth is cut back and ceases. Feed already present and which would be of value in the winter is when frosted not eaten by stock unless they are starved on to it. The grass is a troublesome weed when it invades cultivation paddocks, plantations, orchards, and gardens.

The value of the feed produced is high. Investigations overseas showed that the growth when not allowed to become too rank contains more nutrients than similar growth of paspalum and green oats, and its palatability is ahead of that of both cocksfoot and timothy. Kikuyu gives best results when it is periodically well grazed down so that short, fresh growth is available to be fed off. Under such conditions the feed is particularly palatable and, as with all grasses, stock prefer the young growth rather than the more mature feed. To all close-grazing animals-horses, sheep, and calves-it has proved of value. It has proved to be particularly valuable for ewes with lambs; the latter have grown more rapidly and reached heavier weights than lambs alongside on what is considered good fat lamb pasture. Some farmers use kikuyu pastures successfully for grazing dairy cows.

In Northland it has a longer growing season than paspalum, and when not affected by frosts an appreciable amount of winter feed is produced, **more than** that provided by paspalum under similar conditions. If rank growth is not left to be frosted, a rapid recovery is made whenever a rise in temperature occurs, long before paspalum commences to move. Good-quality hay and silage much relished by stock can be made from kikuyu provided prior management prevents a thick, tangled mat of undergrowth forming to choke the mower knife. The thick stems make it slightly more 'difficult to dry out for hay than other grasses. Some farmers consider its annual production of feed greater than that of paspalum,

Kikuyu stands severe trampling by stock. It is of particular value in dry summers, being an excellent drought resister (even more so than paspalum) and maintaining a fresh growth long after paspalum commences to wilt. A rapid regrowth immediately follows rain. It will cover slips on hill country, prevents stream erosion, and holds dam walls and road embankments. It is of particular value for binding raw sand country after the lupin phase and in its ability to produce feed on such areas. On rough, stony areas which fill up with weed growth it will establish and produce some feed. By its smothering habits kikuyu will gradually kill out fern, blackberry, and young manuka, as well as many other weeds.

Twenty-eight years ago A. G. Elliott reported that to obtain maximum returns from kikuyu it must be topdressed. All grasses require adequate nitrogen supplied by clovers in the sward, the result of topdressing with phosphates, and where necessary lime and potash. Over 90. per cent of kikuyu pastures are sod-bound, overgrown, and without clovers. Yet on farms where kikuyu is well managed, adequately topdressed, and intensively grazed *Lotus major*, white clover, and even ryegrass grow in combination with it. By grazing down a sod-bound kikuyu pasture, discing it severely, and applying lime and fertilisers clovers and ryegrass can be oversown and introduced into the sward.

— In South Africa and Australia the history of kikuyu is similar to that in New Zealand. First, the introduction under experimental conditions, where it showed promise, then the widespread distribution to farmers who received it with wide-open arms. **Then** a period of neglect or indifference, when it proved a

menace, resulting in a demand for its eradication or control. Its spread was unnecessarily accelerated by farmers not taking the proverbial "stitch in time." How often has a farmer found a single new plant establishing in some favourable propagating area—a gateway or around a water trough—and walked on? Cultivation where possible can eradicate kikuyu, but is not likely to be adopted being a long, tedious, constant, and costly job.

Since 1945 trials have been conducted using almost all available weedicides. It was early shown that kikuyu could be completely eradicated by a dressing of 5cwt. per acre of sodium chlorate or "Atlacide" mixed with 5cwt. of lime applied from late October to the end of January. Spot retreatments are almost always necessary. The soil will be rendered temporarily sterile, but after some months and when heavy rains have fallen the surface can be worked up and sown. More recently TCA (sodium salt of tri-chloro-acetic acid) applied during March and April at 501b. per acre to either short-grazed kikuyu or on to the upturned ploughed sod has given a good measure of eradication, but must be followed by spot retreatments. This is as effective as the sodium chlorate treatment, but, as it kills through the roots, the TCA should be applied only when the soil is neither too dry nor too wet after application. TCA effects are far less lasting on the soil than those of sodium chlorate.

Kikuyu grass is here to stay, and is spreading far and wide. Eradication is possible, but at a prohibitive cost. Most areas are left as an uncontrolled menace, but quite a number of farmers are successfully using this grass to their advantage. Kikuyu requires a soil maintained at a high level of fertility by adequate liming and topdressing and the introduction and maintenance of clovers in the sward. Regular controlled grazing management, at times with the aid of the electric fence, is essential. Autumn and early winter growth is best eaten off before frosts occur. Most kikuyu areas, instead of being left a liability, can be made into an asset.

PENNISETUM VILLOSUM (Feather top)

Native of Central Africa. Grows densely to 12 to 18in. with flowers at 24in. A garden escape established on roadside at Kiripaka and waste places at Whangarei. The harsh leaves are unpalatable to stock. Of no economic value.

PENNISETUM MACROURUM (Giant veldt grass)

Native of South Africa. A broad-leaved grass to 18in. with flowering stems to 3ft. Spreads vigorously by short, stout rhizomes. An escape from a garden at Te Kopuru spreading along the roadside toward Aratapu. A weed grass of potential danger.

STENOTAPHRUM SECUNDATUM (Buffalo grass)

A native of the tropics and found on warm sea coasts the world over. Spreads by coarse, stout, leafy, creeping stems with blunt, flat grey-green leaves often reddish-brown tinged from the edges. Extremely drought resistant and sensitive to frosts. Naturalised on varied soils throughout Northland. Forms large patches. Useful for binding sands, for holding sloping embankments, especially stopbanks on tidal reclamations, and when regularly mown forms a coarse but very springy lawn turf. Propagated by sods or root cuttings. Of no value in pastures on good land and can be eradicated by cultivation or extensive topdressing and heavy stocking under controlled grazing management.

AXONOPUS AFFINZS (Carpet grass)

Common in the West Indies and southern States of U.S.A. Forms a dense, close turf of short, broad, dark green and reddish green leaves; possesses long rooting stolons. Very drought resistant, but with moisture grows much less vigorously than paspalum. Will withstand only very light frosts. May have, a limited value on coastal sands or very poor soils. Grows in quite a few localities. Known as Wilson's grass in the upper Northern Wairoa and forms an excellent showground sward on poor Te Kopuru sand soil at Mititai (Northern Wairoa).

CYNODON DACTYLON (Indian doub or Bermuda grass)

A native of India and is common in southern U.S.A. and the West Indies. A perennial producing abundant creeping stems which freely root at the numerous nodes. ~~Withstands considerable heat and drought, but requires ample moisture and high fertility for but a moderate production of leaf.~~ Susceptible to cold and has a long dormant period. It dominates during its short growing period. Does quite well on poor soils, especially loose sands on which it will form

and maintain a dense, firm, matted, low turf. Found locally in many places. Has little or no value on farms, but may have a place on sporting areas.

ZIZANIA LATIFOLIA (Manchurian rice grass)

This native of Asia, though not a sub-tropical grass, is found naturalised only in the Northern Wairoa, where it was introduced in ships' ballast. This very tall grass, growing 6ft. to 10ft. high, has a strong, deep rooting system with far-reaching rhizomes. Although flowering irregularly, in some seasons it produces quite a fair amount of seed. The grass grows from low tide level in continuous belts up to 2 chains wide and in smaller patches along the river from Naumai to Tangiteroria and has spread into side streams and up drainage canals.

Growing most vigorously in the soft mud of the tidal banks of the river, it spreads up water courses and drains, blocks flood gates, and destroys stopbanks. The strong growth from spreading rhizomes grows into and through stopbanks, which in the summer open up to allow water to seep through. During the winter the stopbanks under the dense canopy of growth become saturated and slump. The foundation of the drainage system is destroyed and the grass enroaches rapidly into the wet, soft areas created. Wherever Manchurian rice grass grows it produces and intensifies wet, soft soil conditions, which are then more favourable for its enroachment on to good pasture land. At Awakino Point the grass on a wide face spread through a stopbank over a drain and then 21ft. out into a field, all in 4 years. Shade trees inhibit its growth and stop its spread. Wide belts of New Zealand flax growing on the river 'side of stopbanks also hold up its development, and kikuyu grass is to be observed holding and smothering Manchurian rice grass.

Sodium chlorate and TCA (sodium salt of trichloro-acetic-acid) applied in trials to eradicate Manchurian rice grass affected the growth, but costs of such quantities of either to give complete eradication would be completely prohibitive.

By exploiting aggressive smother plants, trials at the Dargaville Demonstration Farm have shown that rice grass can be prevented from approaching on to stopbanks and into drains and from blocking flood gates and outlet drains. The strip of rice grass left between the holding belt of vegetation and the water

is of no consequence. Plantings of giant or bamboo reed (*Arundo donax*), New Zealand flax, pampas grass, and bamboo (*Arundinaria macrosperma*) in 5-row belts were made between an advancing face of rice grass and a stopbank and also among cut-down rice grass already grown on to a stopbank. *Arundo donax* established most quickly to overtop the rice grass and has proved effective on both areas. New Zealand flax, much slower to develop, is next in order of value; pampas grass established more slowly still, due to the wet conditions which appear too much for the bamboo. *Arundo donax* planted in a single row along each side of an outlet drain has smothered out the rice grass and covers a weed-free drain requiring a minimum of cleaning.