

Farm Management of Kikuyu for Production and Profit

Northland Kikuyu
Action Group

The role of mulching

This is a summary of the results of trial work carried out to date by Wayne Andrewes for the Northland Kikuyu Action Group on options for management of kikuyu grass to maximise farm production.

Kikuyu grass is a subtropical grass well-established throughout Northland and is moving southwards to other warm regions. Around 40% of Northland pastures are now kikuyu-dominant, which means that in summer and autumn vigorous kikuyu growth can suppress other pasture plants such as ryegrass and clover, resulting in low nutritive value of pasture in winter and spring. In colder weather in winter and spring kikuyu has very low growth rates, which means it contributes very little towards livestock feeding.

Kikuyu is a controversial plant. Love it or hate it, once established kikuyu has to be carefully managed to achieve maximum production.

A kikuyu pasture is a complex of plants of different ages and maturity. Old plants are drought-resilient and able to withstand insect attack. Other benefits include lower facial eczema risk to grazing livestock. The fast rate of growth in January and February means that livestock can actually produce better on kikuyu than ryegrass during that period, providing kikuyu pasture is well-managed for leaf and stem growth.

Kikuyu is an extremely competitive pasture plant throughout Northland. It is easy to see how it dominates other species by growing over the top, and shading them.

What is not so obvious is the extent of its root

system. The combination of a dense stoloniferous mat above the ground and the distribution of large rhizomes with extensive fibrous roots is one reason kikuyu is twice as efficient as ryegrass in utilizing rainfall; another is that it is a C4 grass with a different metabolism to ryegrass.

Kikuyu Action Group

The Northland Kikuyu Action Group (KAG) of farmers, advisors and researchers, formed in 1999, has conducted trials and commissioned research to provide a "tool box" of options for farmers to improve the management of kikuyu-dominant pasture, and improve results, according to their farm policies and circumstances.

One recommendation currently in the toolbox is mulching. This is the control achieved over kikuyu in late summer and early autumn by mulching machines so that annual or permanent ryegrass can be sown into a kikuyu dominant pasture to provide for winter and spring production. A key objective is to increase the quality of pasture (metabolisable energy, ME) during winter and spring, when kikuyu itself is not productive.

Work is also continuing into the best methods of kikuyu eradication where economics and farm terrain permit. It is recognised that eradication of kikuyu is not practical for all Northland farmers for a variety of reasons, including slope and cost. Also, a project focussing on management options for sheep and beef farmers, including the role of the breeding cow in kikuyu management, is underway. KAG considers that farmers need that "toolbox" of management options to make the best use of their kikuyu resource.



Kikuyu pasture growth and quality, vs ryegrass

Kikuyu grows leaf, stem and stolons above the ground and rhizomes below. Roots emerge from the stolons and another "plant" can readily establish from a piece of cut stolon. It is an aggressive coloniser, with stolons moving 25mm a day in the right conditions. Below the ground, rhizomes are also moving outwards.

To understand kikuyu management, farmers must put aside what they currently accept as best practice for ryegrass management. Temperate ryegrass grows from tillers throughout the year, it is weakest in a drought, susceptible to insect attack and harbours the spores which cause facial eczema in livestock.

Ryegrass quality does not change as much during the year, in comparison to kikuyu, even during the seed production phase. Farmers can make good quality hay from seeded ryegrass. Ryegrass can be put onto a long rotation in autumn without losing quality, but kikuyu cannot.



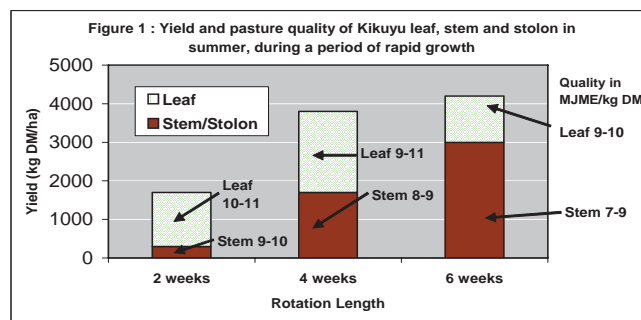
The stark contrast between ryegrass and kikuyu root systems.

For ryegrass the emphasis of feed availability is on producing more dry matter, or the quantity of feed grown. By comparison, because the value of kikuyu for farmers varies widely during its growth phases, to maximise production from a kikuyu-dominant pasture a farmer must understand how to manage quality. Keeping kikuyu in a leafy growing state to maximise quality is far more important than managing it for extra dry matter yield. Kikuyu declines in quality as it accumulates more dry matter. The faster it grows the quicker it loses quality. On farms with low stocking rates (and the Northland dairy farm average is only 2.2 cows/ha) old kikuyu needs to be mulched. Forcing stock to eat old kikuyu will cause losses in

condition and live weight.

Rather than assessing a kikuyu-dominant pasture in terms of kg DM/ha (which will over-estimate the potential production off the pasture), it is more useful to use the pasture quality, as measured by ME – or metabolisable energy.

An understanding of the changing yield and pasture quality of kikuyu leaf, stem and stolon is vital to maximising production from kikuyu. Figure 1 shows changes in yield and quality of kikuyu grass during late summer in Northland.



When properly managed, kikuyu adds to pasture productivity in January and February. It has a high leaf-to-stem ratio, and young leaf and stem has good levels of metabolisable energy from 10 to 11 MJ ME/kgDM (mega joules of metabolisable energy per kilogram of dry matter). Kikuyu over four weeks of age is "old" - especially when the sward is growing rapidly. By six weeks the leaf will be just 9 to 10 MJ ME which is barely productive for milk or growth. By this time the stem is around 8 MJ ME and cattle will only eat the leaf. Because kikuyu fibre takes longer to digest, kikuyu stem of this age is less valuable than hay, so for cattle it is barely maintenance feed. Old stolon is only 7 MJ ME, has poor digestibility and its overall nutritive value is so poor that cattle forced to eat it will lose weight. This is the reason mechanical control of kikuyu is recommended, rather than grazing control.

In December and January kikuyu produces a high ratio of leaf-to-stem/stolon (70:30). This ratio declines during the season and can reverse (30:70) in autumn. Based on farmer experience, best milk production is from fast-growing green leaf (10-11 MJ ME/kgDM). Stem/stolon can be milked off only when it is green and growing (>9-10 MJ ME). Quality declines rapidly in the stem/stolon after two to three weeks of growth (8-9 MJ ME). When kikuyu is on a long rotation the feed

quality of the stolon is as low as 7MJ ME. Cattle may not maintain themselves on this low quality feed, and will lose weight no matter how much kikuyu they eat. As kikuyu ages it lays down more fibre which is difficult for cows to digest. It may take as long as three weeks for kikuyu stolon to pass through the rumen, compared with one week for ryegrass. This may lead to kikuyu impaction, which is life-threatening to the animal.

Poor pasture utilisation

Because Kikuyu is stoloniferous it is more complex than ryegrass. The tip of the stolon will have young leaves with high ME value but further down the stolon the leaves are older and of lower ME. If a farmer is on a 21-day rotation and the cows do not eat all the kikuyu on the next grazing, the unutilised parts are six weeks old and only the newly grown leaf is productive at the next grazing. This is how a mat develops, because the cows leave the older leaves at each grazing. That mat must be attacked, preferably by mechanical means, if the quality of the pastures is to be recovered. Otherwise over time the kikuyu mat will reach the depth of gumboots and climb the fences and the soil underneath will become sour and unproductive. Without intervention, that old kikuyu mat is a very poor environment in which to attempt annual ryegrass establishment. It is essential to avoid a build-up of old summer kikuyu and to get rid of kikuyu trash before sowing.

Paddocks that remain kikuyu-dominant in winter may grow as little as 0-10 kg DM/ha/day winter, compared to ryegrass swards which will grow 15-25 kg DM/ha/day under the same conditions. Although growth will improve in spring, there will be a decline around late October/November as the annuals, such as poa, that grow after kikuyu dominance, flower and die back. Relative to ryegrass the period of poor growth will last to December. This will reduce the feed supply required to ensure cows breed well and achieve peak milk production. It is one reason why modern, later flowering annuals or perennials are recommended as these grow

through until January, when kikuyu takes over for its summer duties.

Kikuyu pasture management

Kikuyu Action Group (KAG) trials were carried out by an independent science provider on high-fertility, flat land dairy farms. Trials were based on large plots within paddocks subjected to normal dairy grazing management. Results were obtained from farms near Whangarei, Dargaville, Kerikeri and Kaitaia.

The trials compared different methods of controlling vigorous kikuyu in the late summer and early autumn, followed by sowing of annuals to boost winter and spring pasture production.

KAG has had the satisfaction of seeing a huge increase in productivity on farms where whole-farm kikuyu mulching has been adopted. Two farm examples of the positive changes in milk production and cow numbers using mulching and annuals are given below.

J Gluckman & J Vivian 50:50 Warkworth 85% Kikuyu dominant

The Rodney District average ranged from 470 to 594 kg MS/ha during these seasons. All kikuyu pasture was mulched once or twice a year. Annuals sown in April. Friesian-x calving late July. Some cows, all young stock grazing off. 80-100 kg N/ha Supplements fed: baleage and hay. Farm has high fertility 35-45 Olsen P. Contour: 80% rolling-steep hills. Warkworth clay 20% alluvial flats

Season	Kg MS	Cows	ha	Kg MS/ha	
04/05	72,000	230	95	720	Mulch + Annuals
03/04	58,500	230	90	650	Mulch + Annuals
02/03	60,741	210	90	674	Mulch + Annuals
01/02	53,400	190	83	643	Mulch
00/01	51,000	190	83	614	Mulch
99/00	41,300	190	85	486	No mulch
98/99	37,313	190	85	439	No mulch
Maximum improvement				281 kg MS/ha	



Murray Jagger mulching on his Whangarei Heads dairy farm.

A similar trend was shown on Murray Jagger's Whangarei Heads property, where all his kikuyu is mulched two or three times a year, annuals are sown in April and his production has been built up to 738 kgMS/ha compared with the Whangarei district average of 550-614 kgMS/ha. However, this situation was compounded by taking over a lease of 53 ha of low fertility rank kikuyu – and highlights the impact this had on his whole farm production.

Mulching versus mowing

Until the availability of PTO mulchers, Northland farmers' options for control or eradication of kikuyu were limited to use of stock pressure and mowing or topping. A mower can be used to control kikuyu, especially if cut before a mat develops. Mowers are faster over the ground take less horsepower to drive than the modern mulchers. But the trash from a mower does not break down as quickly as that from a mulcher when old kikuyu is cut. The combination of kikuyu stolons and rhizomes means that topping above 3 cm has very little effect on kikuyu. Mulching or (if a mower can be set low enough) mowing close to ground level has a big impact on stolons and causes kikuyu to draw on root reserves. Mulching during the period when kikuyu growth is slowing down due to cooler soil temperatures in autumn weakens kikuyu's competitive advantage and ability to winter leaving an opportunity for ryegrass production.

The most important use of a mulcher on a kikuyu-

dominant farm is in autumn when annual ryegrass or any other seed is being drilled into kikuyu which is then mulched close to ground level (1 to 2 cm). For the rest of the year a mower can control kikuyu, unless kikuyu has been allowed to get out of control. Then a mulcher has the advantage of chopping up kikuyu so it will break down more rapidly than the long lengths left behind after mowing.

A mulcher has around 20 offset blades mounted on a horizontally rotating drum. Individual blades are swinging and cutting vertically, compared to the horizontal motion of mower blades. Using a hydraulic top link, and adjusting the height of the drums means many mulchers can be set so the blades cut to ground level.

Kikuyu grows horizontally mainly via stolons. A vertical cutting action does more damage to stolons than the horizontal action of a mower.

It is very important to clean up a paddock before mulching it and to avoid risk areas where things like water pipes, wire and old stumps or trunks may be buried under the kikuyu.



A guide to the height of pasture remaining after mulching.

Wide mulchers (2.4 m) are appropriate on flat land. A wide mulcher covers more land on each pass and therefore, provided the tractor has 100 to 120 HP to drive it, is faster than a narrow mulcher. The more undulating the land the better it is to use a narrower (1.8 m) mulcher, especially with a 80 HP tractor, first time around the farm. Overall on rolling hill country 2.2 m is a good compromise between speed and undulations and 2.4 m is the maximum. An adjustable roller and hydraulic top link are important for controlling the ground height of the mulcher.



Mulching at the ideal height.

There are a range of factors that will change the cutting height as conditions change. For example, after rain the mulcher skids will sink into the soil more than on hard ground. If the mulcher was set to cut low in dry conditions it may cut too low when the soil is wet (aim for a target of no more than 15% scalping), or conversely, if set low for wet conditions, will cut too high in dry conditions.

A solid mat of kikuyu will cause the mulcher to cut higher as the skids ride over the mat.

As a guide the height of the pasture remaining after mulching, this should be to the height of the clicker on a ball point pen. It is important to check the height setting on a mulcher as soon as you commence mulching.

Mulching kikuyu close to ground level achieves two important objectives.

1. Kikuyu stolons and some rhizomes are cut. This weakens kikuyu's ability to dominate other species, because the stolons are the main sources of energy for regrowth.

2. Mulching causes kikuyu trash to rot more quickly than mowing, because it is cut finely, and evenly distributed. A rear stabilising bar is a disadvantage because it collects trash. The mulcher must be able to cut to ground level. Many cannot.

It is essential that mulching and mowing is carried out every year, whenever old stolon shades out white clover and ryegrass.

Autumn kikuyu management begins in February when summer rain and warm humid conditions promote kikuyu growth. Mulching or mowing must commence before a mat develops in the paddocks that are targeted for sowing with ryegrass.

Mulching close to ground level is important when sowing seed. This reduces competition by restricting the regrowth of kikuyu. If kikuyu has been sprayed with glyphosate, mulching breaks down the dry matter and brings the sprayed dry matter into contact with the soil, where glyphosate can be denatured. It is easy to establish annuals into well-managed leafy kikuyu without a mat. April is the best month in the mid North, and late April to mid May in the Far North. The best and most consistent results to establish ryegrass have been to graze kikuyu (provided a summer mat has not developed), then drill with 22 kg/ha of a late flowering ryegrass followed by mulching close to ground level.



Successful sowing of annual ryegrass in a kikuyu-dominant paddock.

Is sowing annuals and mulching profitable?

KAG trial work shows there has been a production increase of over 200 kg/ha on four kikuyu-dominant dairy farms which have mulched and sown annuals.

Cost-benefit analysis

Income at a \$4.00 payout x 200kg MS/ha average increase = **\$800 per ha**

Costs 2 mulchings at \$110/ha \$220/ha
Drill at \$80/ha \$80/ha

Annual ryegrass 22 kg/ha at \$6/kg \$132/ha

Total costs = \$432 per ha

Profit = \$368 per ha

Note that the machinery cost above has been calculated as if contractors were used. For farmers who already have their own machinery and use it for other purposes the cost is less. Note also that where kikuyu dominance is 70% or more of the effective pasture area the additional profit is actually gained over the whole effective area.

Broadcast or drill?

In KAG research, broadcasting of annual ryegrass seed gave similar results to drilling when kikuyu was mulched close to ground level during a period of moist soil conditions which were good for establishment. However drilling was more reliable over all, especially under dry conditions, and when there is more competition or residual kikuyu trash. Most failure to establish ryegrass is caused by the failure to remove trash, whether sprayed with glyphosate or not. This is especially associated with dung patches.



Patchy results in winter ryegrass after kikuyu renovation trials on Jagger farms.

Controlling kikuyu using glyphosate

Spraying 1 to 3 litres of glyphosate/ha as a means of control when kikuyu growth is rampant is a new way of looking at kikuyu management. It works on the same principle as closing up for silage in spring, when pasture growth exceeds demand spraying out will reduce effective pasture area therefore increase grazing pressure (and control) on the unsprayed kikuyu areas of the farm. This approach will benefit pasture quality in areas that are not sprayed. Consider spraying a paddock out in late February and then review whether more paddocks need to be spray out in March. However, note that the label rate of glyphosate is 6 litres/ha, so farmers use lighter rates at their own risk.

Some farmers do not want to kill kikuyu. They want it to produce the next summer after an autumn

spray. Rates of 750 mls/ha to 1 litre achieve a reliable brown-out and kikuyu will regrow the following summer. Rates of 1.5 litres/ha to 3 litres/ha will achieve a significant kill and suppress kikuyu for up to two years. Even at 6 litres/ha there is significant regrowth of kikuyu in two years following a single autumn spray, however 6 litres does have a greater kill than lower rates. High rates of glyphosate are recommended when undertaking a cropping/regrassing programme.

A glasshouse experiment showed that it was possible for a residual effect from sprayed kikuyu to reduce the germination and growth of young ryegrass seeds and seedlings when kikuyu was sprayed with 6 litres/ha of Round-up Renew but not at 3 litres or 1.5 litres/ha.

For a longer-lasting effect on kikuyu, use a high rate of glyphosate, but don't sow ryegrass seed until the residual kikuyu trash has been removed.

How much kikuyu pasture should be renovated?

Between the end of February and mid-March,

assess the whole farm looking for the worst paddocks, those with high kikuyu dominance and low ryegrass content. Avoid spraying paddocks that flood or are too wet to graze on a regular basis in winter and spring. Do a feed budget to determine the area you can afford to spray:

If the leaf-to-stem/stolon ratio is 50%, a growth rate of 50kg DM/ha/day should be valued at only 25kgDM/ha/day for milking purposes. Saved/rank kikuyu will lose quality and is better removed by spraying then mowing or mulching to ground level.

Removal of sprayed kikuyu trash is essential or new grass establishment will be reduced. Mulchers are better than mowers if there is significant trash. Both must be set to cut to ground level.

The sprayed area is taken out of grazing for at least two to three months. Consider splitting the area for spraying into two. For example, half around mid March and half in early April in case rapid kikuyu growth stops due to dry or cold weather.

Any paddocks to be cropped are included in the total area taken out of grazing.



Wayne Andrewes addressing farmers on mulching techniques

Common mistakes

The biggest mistake is allowing a summer kikuyu mat to build up and then failing to remove it before sowing seed. The next big mistake is not sowing annual ryegrass by the end of April. This is caused by failing to start early. Mowing or mulching kikuyu should begin in February, at one paddock per day. You can always stop if a dry spell continues. If you don't do this a mat develops. If so, mulch two paddocks a day in March, especially the worst paddocks.

The usual reason farmers don't start early is because of concern that the farm will run out of feed. If summer kikuyu is not mown or mulched cattle only browse the leaf. The stem and stolon continue to grow and by April the feed quality of kikuyu will have dropped. There may be 3,000 kg DM/ha standing but only 1,000 kg of this will be better than maintenance. The rest is sub-maintenance. Cows will dry themselves off. When old kikuyu is mulched it does not break down easily. The success of sowing seed is cut by at least half. It takes time to mulch a 100 ha farm so if mulching starts on April 1 it has to continue into May. This is too late to get an early winter benefit from the annual seed sown. April has proven to be the best month for establishing seed in unsprayed kikuyu in the mid North and late April to late May in the Far North.

Summary

Kikuyu management priority on-farm boils down to this:

- Keep kikuyu leafy and do not allow stolon or stem to over-develop.
- Avoid kikuyu shading out other productive pasture species.
- A well-managed kikuyu-dominant pasture has a good content of white clover.
- Control summer and autumn kikuyu dominance – do not allow a mat of old kikuyu to develop.
- Drill late-flowering annuals at 20kg/ha in April/early May, to carry grass production into January, when the kikuyu takes over.
- Mulch to ground level. A mulcher cuts vertically and therefore does more damage to kikuyu stolons than a mower, which cuts horizontally.

Acknowledgements



Ministry of Agriculture and Forestry
Te Manatū Ahuwhenua, Ngāherehere

Thanks to all the farmers who contributed their time, land, stock and machinery. To Northland Seed and Supplies; D Boyt Machinery; RD1; Ballance Agri-Nutrients; Dexcel, AgResearch, PGG Wrightson Seeds and NuFarm. To Murray Jagger and all the other farmer members and non-farmers of KAG who have given their time and enthusiasm to attend KAG meetings. To the NZ Landcare Trust for project management and continuity. To the funders who made the work possible: AGMARDT, Sustainable Farming Fund, FITT fund, NRC, Northland Agricultural Field Days Committee, and C. Alma Baker. Especially to Hinerangi Trust without whose initial support back in 1999 work would not have started.

