GRAZING SYSTEMS FOR WEED CONTROL:

YORKSHIRE FOG, FRIEND OR FOE? - A FARMER'S PERSPECTIVE

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"Stillwater", Yarra, via Collector, NSW, 2580

Abstract. Yorkshire fog is a plant which colonises destabilised pastures in wetter areas and, because of its unacceptability to stock, can become dominant if not managed correctly. However, by maintaining it in the vegetative stage by slashing or heavy grazing, Yorkshire fog can provide good quality feed. Graziers have the choice of attempting to remove fog from pastures or managing it to turn it into a useful pasture plant. Experience on our property suggests that the former is likely to be uneconomic, if not futile. Correct management on the other hand has the potential to allow the utilisation of a previously underused pasture resource.

Stillwater is a 520 ha family grazing property located between Goulburn and Collector on the Southern Tablelands of NSW. Soils are derived from sedimentary rocks and are naturally low in nitrogen, phosphorus and sulphur. The soil is acid to depth with $pH_{(CaCl2)}$ ranging from 4.0 to 4.5. Water-logging is common in low lying areas during the winter. Rainfall averages around 750 mm per annum. Since our arrival in 1983, winter has been the most reliable rainfall period with erratic autumns and usually reliable springs.

At the time we took over the property, pastures were in a post-drought phase consisting largely of cluster clover (*T. glomeratum*) subclover, vulpia, sorrel and smaller amounts of soft brome (*Bromus molliformis*), barley grass, perennial rye, phalaris, cocksfoot and, of course, Yorkshire fog (*Microlaena*, *Danthonia* and *Elymus* were also present, but we didn't see them in those days). Since then, Yorkshire fog has spread to become the dominant species over 80 ha of our better country and is still spreading.

Yorkshire fog - The plant

Yorkshire fog (*Holcus lanatus*) is a soft hairy perennial of European origin, growing between 20 and 80 cm tall. The soft hairs on the leaves give the plant a grey/green appearance. The seed heads are a characteristic milky-white tinged with pink or red (Burbidge, 1966). It is a cool-season species growing from the autumn break to early summer. Flowering at "Stillwater" occurs around the same time as perennial ryegrass and about three to four weeks ahead of phalaris. Seeding is prolific with some plants producing over 200,000 seeds per annum (Simpson, 1990).

Traditionally, Yorkshire fog has been regarded as a minor weed of wet and undergrazed areas. I believe fog, like vulpia, only becomes a weed following some environmental destabilisation. Destabilisation can be natural, through say drought or flood, or it can be induced through management practices such as over- or under-grazing, cultivation and so on. In the case of fog on "Stillwater", I think several factors are involved:

- Pastures were significantly destabilised during the 1978-82 drought, leading to the temporary dominance of species like cluster clover, vulpia and sorrel. These pastures were not stable and were ripe for invasion by other species.
- A succession of wet winters and mediocre springs during the mid 1980s could well have favoured fog at the expense of other species, particularly annual grasses and clover.
- The property was understocked during the years immediately following the drought.

This set of factors was common to much of the Southern Tablelands in the mid-1980s, and I think set the scene for the rapid increase in Yorkshire fog since that time.

Yorkshire fog - The problem

There is only one problem with Yorkshire fog; *stock don't like it*! The moment a small number of plants appear in the pasture, stock will avoid them, particularly in pastures grazed by sheep. This leads to a classic under- and over-grazing situation where more palatable species, and clover in particular, are heavily grazed to their detriment, whilst fog is avoided. It is not uncommon in set stocked paddocks on "Stillwater", to have Yorkshire fog producing the equivalent of 3000 kg/ha green surrounded by subclover that has been eaten into the ground (<500 kg/ha). If this goes unchecked (which it often does), it leads inevitably to clover decline, and prepares the ground for the continued spread of fog.

Under-grazing also leads to build-up of a considerable thatch of dry material. This seems to further exacerbate things by suppressing clover germination, either through the release of substances toxic to clover (allelopathy) or simply through the shading of germinating seedlings.

When flowering starts things only get worse! No livestock will touch it. It causes eye irritation in cattle as they seek more palatable species under the fog and, on "Stillwater", cattle selectively graze flowering vulpia and avoid fog. This ensures maximum seed production to fill the gaps that start occurring in the overgrazed subclover, ryegrass and vulpia sward.

The inevitable result of all this is that many Tablelands graziers appear to be caught in a downward spiral with Yorkshire fog relentlessly occupying their better grazing country.

Yorkshire fog - The promise

We first became aware of another side of Yorkshire fog in 1989 when we fenced out a six ha area of creek flat that was dominated by rank fog. A mob of 200 odd wethers quickly indicated they would rather die than eat what we were offering. They were replaced in Spring with cows and calves for a month, followed by 15 heifers for five months. The effective stocking rate was around 20 dse/ha for the period. The heifers were removed prior to calving, in good condition.

The dry autumn/winter of 1990 reaffirmed our suspicion that Yorkshire fog might have some benefit. Fog-dominated flats were kept closely cropped by hungry cattle. We also noted that when kept short and green, sheep would eat it as well, provided they had little other choice. In short, we have found that:

- Cattle will graze Yorkshire fog if given little choice.
- Sheep will graze it if given little choice and it is kept short and green.

How good is Yorkshire fog?

Agronomic qualities

At "Stillwater", the following agronomic qualities stand out:

- Yorkshire fog appears well-suited to acid, low fertility soils, particularly those prone to water logging. At present, there is no other introduced pasture species for this environment on the Tablelands.
- It appears to tolerate moderate levels of salinity.
- It is moderately drought tolerant and will thrive on sheltered eastern fall country away from valley floors. It doesn't appear to grow on exposed western slopes.
- Its free-seeding nature and ability to regenerate from seed is at least equal to ryegrass, and certainly better than cocksfoot or fescue.

Productivity

New Zealand research has shown that Yorkshire fog can equal the production of ryegrass when temperatures range from 3-15°C, and outyield it when temperatures increase to 7-23°C (quoted by Simpson, 1990). A palatable strain of Yorkshire fog has been developed in New Zealand and released under the name Massy Basyn. Experiments at Glen Innes have shown that Massy Basyn provided more feed after sowing than fescue (Demeter) or phalaris (Australian and Sirosa). During the first two years of the trial, wool production per head was similar for all three grasses. In the third year more wool was grown on the phalaris pastures. The researchers concluded, however, that choice of grass species was a relatively unimportant factor in grazing production. (Robinson *et al.*, 1980).

Nutritional value

The nutritional qualities of Yorkshire fog were tested at "Stillwater" over a growing season (Table 1). These figures can be compared with the minimum livestock requirements listed in Table 2. These figures

Table 1. Nutritional Value of Yorkshire Fog, at "Stillwater", Yarra, 1993-94.

Sampling Date	Developmental stage		Crude protein (%)	Metabolisable energy (Mj/kg)	Digestible dry matter (%)
23/9/93	Late vegetative		16.9	10.2	67.9
4/11/93	Flowering		7.3	8.9	59.1
23/12/93	Late flowering	- unslashed	7.2	7.6	50.8
		- slashed	14.1	8.7	58.1
24/3/94	MVR[1]	- unslashed	5.8	6.1	40.9
		- slashed	23.7	10.6	70.4

[1] Mature vegetative regrowth

Table 2. Minimum Critical Nutritional Requirements for Sheep and Cattle.

	Protein (%)	Metabolisable energy (Mj/kg)	Digestible dry matter (%)
Survival	7-8	7	50
Pregnancy	9	8	60
Lactation	12	9.5	70
Growth	12-14	10	70

demonstrate that while fog is kept in the vegetative phase, it is capable of running all classes of stock. However, as soon as it reaches flowering, it won't even maintain dry animals because of its poor digestibility.

We have found that the effects of flowering can be largely overcome by slashing as the plant is running to head. As Table 1 shows, protein levels stayed high in slashed fog and, with a small amount of supplementation, you can continue to fatten stock well into late summer. Most importantly, sheep grazed the slashed areas throughout summer whilst avoiding unslashed areas.

In the vegetative state, fog has given some very satisfactory weight gains at "Stillwater". Murray Grey heifers averaged a gain of 1.59 kg/day on fog-dominated pastures in October/early November 1993. Other more palatable species comprised only a minor component of their diet due to heavy grazing by sheep prior to the introduction of the cattle.

Silage

Yorkshire fog makes palatable silage of reasonable quality provided it is cut prior to flowering. At Roslyn, near Crookwell, Andrew and John Nixon have made Yorkshire fog silage testing at 50% dry matter, 12.8% crude protein and 9.0 Mj/kg metabolisable energy (see Nixon, this proceedings). Andrew and John have also found that two consecutive years silage-making on Yorkshire fog-dominated pastures will lead to a pasture with a much better balance between fog and other perennial grasses.

Agroforestry

In New Zealand, Yorkshire fog is one of the few pasture species that will grow well in Radiata pine agroforests. In these situations, it is an excellent companion species to Maku lotus (Percival, 1984).

In summary, Yorkshire fog has many features in common with more favoured pasture species. The key features of fog compared with other species are shown in Table 3.

Management options

As pasture managers, we have two main options for dealing with Yorkshire fog:

1. We can replace it with more palatable species; or,
2. We can attempt to devise ways of turning fog into a useful pasture species.

Replacing Yorkshire fog

Yorkshire fog has been effectively controlled using split applications of Roundup® or Gramoxone® at 1-2 litres per hectare, with the first spray applied two to four weeks after the autumn break. A single spray of Roundup® at 3 litres/ha will also kill the plant (Simpson, 1990). However, local experience indicates that replacing fog may not be an easy procedure.

Fog-dominated country that has been spray-topped in spring, grazed and autumn sown using a conventional seed bed has become reinfested with fog within a two to four year period. This indicates that spray-topping or cropping for a two to three year period may be necessary to reduce the large seed reserves before attempting a pasture sowing program. Once a new pasture is established, it will need to be managed very carefully to prevent the gradual reinfestation of fog. This may include some form of block or controlled grazing to ensure all species on offer are evenly grazed.

Economics

If we allow for spray-topping over a two year period prior to direct drilling with pasture, the cost of establishment will be around $180/ha (McGowen, 1993). To this must be added the cost of lost grazing. Well-grazed fog should be capable of carrying 9-10 DSE/ha. If the paddock is out of action for six months and each dse is earning $20, then you will lose $100/ha. Thus, the cost of getting out of fog and into something else will cost around $280/ha.

From experience at "Stillwater", the new pasture may run at most around 2 DSE/ha more than the old fog pasture. Assuming the same return of $20/dse, it will take seven years to start making a profit on the exercise, *by which time, your pasture will have probably been overrun by Yorkshire fog*!

Managing Yorkshire fog

If the replacement option is considered uneconomic, then a suitable management program needs to be devised or fog will continue to be poorly utilised, other useful species will decline and animal production will suffer. Any management program should include two basic principles:

Table 3. Key features of major pasture species.

Pasture species	Persistence	Ease of establishment	Weed control ability	Production				Fertility needs	Tolerance to:		
				Su	Au	W	Sp		Water-logging	Salinity	Acidity
Phalaris (a)	xxx	xxxx	xxx								
(b)	xxxxx	xx	xxxxx	x	xxx	xx	xxx	xxxxx	xxxxx	xx	xx
Ryegrass	xx	xxxxx	x	xx	xxx	xxxx	xxxx	xxxxx	xxxx	xxx	xxxx
Cocksfoot	xxx	xxxx	xxxx	xx	xx	xx	xxxx	x	xx	x	xxxxx
Fescue	xx	xx	xxx	xxxx	xxx	xxx	xxxx	xxx	xxxxx	xx	xxxxx
Yorkshire fog (c)	xx	xx	x								
(d)	xxxx	xxxxx	xxx	x	xxx	xxx	xxxx	x	xxxxx	xxx	xxxxx

(a) Represents erect forms of phalaris, *eg.* sirosa and sirolan.

(b) Represents Australian phalaris and its derivates.

(c) Represents possible persistence, establishment and weed control when Yorkshire fog is managed using slashing, mob stocking and/or control grazing.

(d) Represents pastures under set stocking. Other features may be similar regardless of grazing management.

1. Restriction of choice of feed on offer - this means heavy grazing for short periods.
2. Restriction of flowering in late spring to maintain pasture palatability and quality over summer.

At "Stillwater", we are attempting to develop a program based on these principles as follows:

- *Late spring:* Slash as fog starts to run to head. (Area slashed depends on spring seasonal conditions, *ie.* flexible.)
- *Summer:* Graze slashed areas according to feed availability up to autumn break using lactating stock or weaners. In 1994, slashing followed by grazing did lead to the death of some fog plants.
- *Autumn:* Lock up pastures after the break to allow development of fog and more palatable species, especially subclover and ryegrass.
- *Late autumn/ winter:* Control graze with cattle or sheep when the pasture reaches around 1500 kg/ha. This can be achieved through strip grazing or mob stocking, depending on facilities. We have found that the more heavily Yorkshire fog is grazed in spring, the longer flowering can be delayed, thus extending the quality of the pasture and delaying slashing.

Conclusions

Beattie (1993) cites studies which indicate that Yorkshire fog is very susceptible to treading, especially by sheep. Any program which increases stocking pressure (especially during stress periods) may well lead to a decline in fog dominance and a return to a more balanced pasture. Alternatively, with sound management, I believe Yorkshire fog has the potential to be a useful addition to the suite of pastures available on the Tablelands. Either way, you win!

Acknowledgments

I would like to acknowledge the assistance of numerous staff in the Goulburn office of NSW Agriculture and, in particular, the enthusiastic support of Peter Simpson in the preparation of this paper.

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