THE PLACE AND ROLE OF CHEMICAL PASTURE RENOVATION IN SOUTHERN HAWKE'S BAY

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Summary

The role of browntop (*Agrostis tenuis*) as a pasture species is emphasized and the chemical methods used to kill or suppress the plant in favour of clovers (*Trifolium* spp.) and desirable grass species in southern Hawke's Bay discussed. Farmer experience with pasture renovation with paraquat and reasons for success and failure are explained. The future for pasture renovation is in the writer's opinion limited.

BACKGROUND

BROWNTOP (*Agrostis tenuis*) is the most prevalent grass in southern Hawke's Bay, adapting well to both soils and climate.

It is a very aggressive plant, not only on the light friable yellow-brown loams of the broad inland valleys where rainfall ranges from 45 to 60 in. per annum, but also on the central and coastal hilly yellow grey earths under an uneven 40 to 45 in. rainfall.

Throughout the district, unimproved pastures generally consist of matted browntop associated with sweet vernal (*Anthoxanthum odoratum*), dogstail (*Cynosurus cristatus*) and moss with some danthonia (*Notodanthonia* spp.) on the drier faces and Chewings fescue (*Festuca rubra* var. *falla*) and Yorkshire fog (*Holcus lanatus*) on the shady and wetter slopes. The clovers, perennial ryegrass (*Lolium perenne*) and cocksfoot (*Dactylis glomerata*) will be mainly present on stock camps and around gateways. Most improved hill country pastures contain a high proportion of browntop, generally over 60% of the sward content, even on well topdressed country carrying 4 to 5 ewe equivalents per acre.

Where stock pressure cannot be maintained, especially in the summer in the high rainfall areas, browntop can get away to unpalatable rank growth which soon smothers clovers and better grasses. On improved sown grassland, the main problem is the ingress of browntop, and resulting deterioration of the sward.

Against this background, there has been in the 1960s the development and application of chemical techniques in pasture improvement, techniques which the writer's predecessor in office, L. W. Blackmore, developed and applied with great thoroughness and zeal.

EARLY SUCCESSES WITH CHEMICAL PLOUGHING AND CHEMICAL PASTURE RENOVATION

Blackmore early showed that 2,2-DPA amitrole mixtures could change low-producing, tight browntop dominant swards to vigorous ryegrass/white clover (*Trifolium repens*) pasture within 8 months even on hard argillite country—a technique commonly called chemical ploughing. On a demonstration area of 6 acres of quite steep hill country near Pahiataua,

he established an improved pasture which, within three years, carried nine ewes and lambs per acre and which today is still a high-producing ryegrass/white clover paddock on a comparatively low stocked farm.

A 40 acre area was successfully chemically ploughed by air on hard country at Horoeke in 1961 on what was then a 1½ ewe per acre sward described as browntop-dominant with some danthonia, Chewings fescue, dogtail and a little white, subterranean (*Trifolium subterraneum*) and suckling clovers (*T. dubium*). Early establishment of oversown perennial ryegrass, cocksfoot, white and subterranean clovers was slow owing to a dry autumn. In spite of a severe drought the next summer and autumn, the sward has developed into a good hill country pasture for that area. Today ryegrass, white clover and subterranean clover predominate over the easier slopes and down the gullies and only on the dry, shallow, shale faces is the sward like the original; even here a deficiency of molybdenum is possibly inhibiting clover growth. While accurate stock figures are not available, it is very evident that the paddock has increased at least four-fold in productivity and is comparable to like paddocks of easier contour which have been grassed down conventionally. Certainly this farmer has not done more chemical work, preferring to carry on cultivating his easier country.

Nor was the technique pursued elsewhere in the district as at this time Blackmore was developing the pasture renovation practice, based on paraquat. This had advantages over chemical ploughing, namely, lower chemical and seed cost, no residual toxicity, and because of that much less dependence for success on rainfall following treatment.

Chemical pasture renovation developed rapidly from 1963. Estimates of the acreage treated in the three counties of Dannevirke, Woodville and Pahiatua were:

1963	....	....	....	....	100 acres
1964	....	....	....	....	160 acres
1965	....	....	....	....	1600 acres
1966	....	....	....	....	1200 acres
1967	....	....	....	....	700 acres
1968	....	....	....	....	250 acres

In 1963 and 1964, renovation was developed on a trial and demonstration basis with co-operating farmers. Then, because of outstanding results on most of the treated pastures by way of stock carrying and performance, the technique really took on the following season. The writer came to Dannevirke in January 1965 to be caught up in a mad rush of advising farmers on management and technical aspects for successful renovation.

There was a very close co-operation between the Department of Agriculture, the mercantile firms and field representatives of Imperial Chemical Industries (N.Z.) Ltd. Very few jobs fell short of the exacting recipes laid down by Blackmore.

This has continued since, excepting that the Department has taken a comparatively minor role in advising on individual jobs, rather assessing and advising on the place of renovation in the light of the overall farm management situation.

What is of vital interest now are the reasons for the subsequent marked decline in pasture renovation as revealed in the yearly acreage estimates.

It seems clear now that half the area treated in 1965 was taken on by the farmers concerned as a gimmick, persuaded by the optimistic wave of

enthusiasm engendered from field days, meetings, magazine and newspaper articles. Then, in 1966, most farmers who had obtained encouraging results carried on, a good many dropped the idea, others took it up.

The further drop in 1967 and 1968 can, however, largely be attributed to very unfavourable seasons. Abundant summer and autumn rains in 1967 brought excessive growth over the whole district, and most farmers found this impossible to control, let alone prepare paddocks for renovation. This year drought conditions prevailed from January to mid-April. A few paddocks were then treated about the end of April. In this period, too, the unfavourable economic situation has undoubtedly acted as a deterrent. Several aerial hill country jobs were certainly put off because of shortage of finance.

RESULTS ASSESSED

Very few renovation jobs actually failed at the establishment stage. One or two were early reported by Blackmore as having been adversely affected by porina (*Wiseana* spp.). Two failed for undetermined reasons. Generally, however, the story was the same — early clover recovery, good establishment of oversown grasses, and subsequent vigorous growth the first season. In all these cases, the carrying capacity of the treated pastures increased markedly, and ewes and lambs performed better.

Some outstanding results can be reported. On one 5 acre paddock on a flat terrace at Ormondville, on a 100 acre fat lamb farm, the feed was getting away from 17 ewes and lambs to the acre through the first spring flush. Then, in spite of a heavy infestation of musky storksbill (*Erodium moschatum*) and winged thistle (*Carduus tenuiflorus*) the next summer, the paddock maintained high productivity and now supports 5½ to 6 ewes per acre, where previously 4 were all that could be set-grazed in the spring. Like most of these jobs, unfortunately, accurate assessment is impossible where stock are mobbed through paddocks between weaning and lambing. This 2 ewe per acre increase has been almost universally quoted by farmers for the first few years after renovation. The invasion of annual and biennial thistles and other weeds following renovation presents some difficulties, but they are in the main an eyesore and nuisance rather than a permanent problem.

The majority of renovation was done on flat to rolling fat lamb country. Most of these properties have since seriously reverted, in many cases back to the original sward composition and productivity. Seven fat lamb pastures in which the pre-renovation pasture composition was recorded by Blackmore have been specifically checked and, after only three years, the analyses shows little improvement, if any, on all of them.

All the farmers concerned were disappointed with the end result, but each felt that he had not lost financially owing to the initial benefit. Of the seven, one farmer has gone back to cultivation, though admitting the risk factor due to likely wind erosion of worked ground. Two are continuing renovation, feeling that they can improve the technique with greater water coverage and better follow-up management, one whose pastures have partly reverted to creeping fog (*Holcus mollis*) and brown-top is happy to come back over the same ground if need be. The others were oncers, having only one or two poor paddocks worth renovating.

The important factor that emerges is that, as one would expect, follow-up grazing management is of paramount importance. In all these cases, winter carrying capacity of the farm is between 4 and 5 ewes equivalents

on country where 7 has been proved practical. At the lower stocking rate, even under good management, pastures get away in the summer. In these circumstances, renovated pastures are deteriorating very much more than conventionally established ones. The reason for this seems to be that a small percentage of browntop or Yorkshire fog is left, even where desiccation has been excellent. This nucleus is there to reinfest the sward. Small clumps neglected by the stock then stool out and cover the ground in two or three seasons.

This reinfestation of browntop has occurred to some extent on all the renovation jobs examined, and is not necessarily undesirable, as well-controlled browntop and Yorkshire fog can contribute fairly valuable feed if stocking pressure is maintained.

On the hill country, seven aerial renovation jobs have been done, on one farm for three consecutive seasons, and on another for four, on paddocks ranging from 30 to 100 acres. There have been surprisingly few problems in getting the job done. Costs have ranged between \$18 and \$20 an acre for chemical, flying and seed charges. Although the kill of browntop and Yorkshire fog has been much less than by ground means on every farm, good establishment of oversown species resulted and stocking performance greatly improved. Again, a general lift in carrying of two ewes per acre can be quoted on country previously with difficulty supporting 2 to 3 ewe equivalents. Some reversion has occurred on the earlier jobs, but, with the good grazing management through mob stocking which each farmer has practised, the pastures are holding with generally 10 to 20% more white clover and 20 to 40% more ryegrass than before. Introduced cocksfoot has also held well. It must fairly be reported, however, that two of the paddocks on one farm at Weber were not so good right from the start as the initial grazing preparation was inadequate. However, the farmer is still quite happy with the improvement.

An exceedingly interesting renovation story is being unfolded on the property of N. Abraham at Mako Mako, near Pahiatua. Detail will not be given here as he has given his own version at the 1967 Massey Sheep Farmers' Meeting. Suffice to say that he is successfully renovating 100 acres a year by air to produce clover-dominant Grasslands 'Ariki' ryegrass (*Lolium perenne*) pastures for large mobs of bought-in aged "gummy" ewes. Even here, however, 9,000 ewes on the 930 acre property cannot control the summer growth in this high rainfall area, and paddocks treated early with paraquat are tending to revert, as he has had difficulty in holding the previously treated paddocks while grazing out those to be treated.

Finally, a look at the dairy scene. Only limited areas of dairy pasture have been treated, as most dairy farmers in the district are following the premise of heavy fertilizer and high stocking. Outstanding pasture improvement has resulted from this, together with block grazing wintering techniques where cows are circulated round the farm through the winter on a daily roster of up to 200 cows per acre — everything gets eaten.

Renovation on dairy pasture is difficult because of the problem of preparing the pasture to a close, even sward. Sheep have been brought in to do this and without exception very good results have been obtained. One leading dairy farmer with 1½ milking cows an acre is renovating to introduce Ariki ryegrass and cocksfoot. In some cases, where the fertility breakthrough is proving difficult, especially where dairying is replacing sheep, renovating with paraquat is proving a great aid in dealing with the tight sward.

In all the known cases, renovated dairy pastures are holding very well. This is because, under intensive dairy management, browntop and

Yorkshire fog just do not have a chance owing to regular smothering and defoliation.

THE OUTLOOK FOR RENOVATION

One must admit disappointment that renovation has not lived up to expectations. There is no doubt that many farmers tried it out without any real thoughts to later management. Chemical pasture renovation does have definite limitations in practice. There is no place for it on low stocked or poorly managed farms. On top producing farms, whether sheep or dairy, the only place for the practice is to introduce new or improved species at low cost.

This leaves perhaps 50 to 60% of farms where renovation still offers an alternative method of improving pasture quickly, provided that management can be altered also. Certainly, on the downland, renovation is cheap and for the average manager is a ready way of maintaining productive pastures. The main limitation here is the problem of preparing the pasture for treatment. Successful desiccation with paraquat is only possible on the short recovery growth of 1 to 2 in. following complete baring of the sward. Except in dry seasons, preparation must start in the spring, to keep the pasture well controlled through the summer, before the final chewing out. This is very difficult over much more than 10% of any farm. Allowing a three to four year productive life of renovated pastures, the farmer would need to treat one-third to one-quarter of the farm each season. On average, he would expect one adverse season in five to throw the programme out of gear.

The same argument might be used against clover farming — that is, the use of light applications of paraquat in the spring to suppress grasses in favour of clover.

This leads to the suggestion that renovation in future will be best limited to upgrading old paddocks which are not pulling their weight, and cannot be improved readily by conventional means.

On hill country, cost is the paramount question, and, while results have been encouraging because of the better grazing control that can generally be brought to bear, other alternatives such as heavy topdressing can be quite effective in getting the same end result although the process may be slower.

On low fertility sites, whether poor hill country or stony flats not suited to cultivation, another look at chemical ploughing using 2,2-DPA amitrole seems warranted. There is no doubt the early work gave outstanding results.

For renovation to really succeed, another chemical is needed — one with the advantages of paraquat, but which will translocate in the plant so that there is not the need for the exacting sward preparation.

Heavier stocking, subdivision and improved management seem likely to solve most of the pasture deterioration and stock ill-thrift problems in the district.

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