TABLELAND PASTURES - WHERE ARE WE HEADED?

Michael R. Duncan
NSW Agriculture and Fisheries
P.O. Box 991
Armidale 2350

Any discussion on the future direction of pasture technology should initially make reference to past activity in the important areas of pasture establishment, utilisation and management. Against this background, problem areas can be discussed and a range of future options identified.

PASTURE IMPROVEMENT - A BRIEF HISTORY

Developments in pasture improvement in the tableland areas of N.S.W. were accelerated significantly by a number of factors following the end of World War II.

1. High wool prices during the 1950's.
2. Improved rabbit control (myxomatosis)
3. The increased use of aircraft for fertiliser and seed distribution.
4. A succession of relatively good seasons.

The use of aircraft to distribute superphosphate and legume seed to vast areas of inaccessible country particularly boosted animal production by improving winter growth and levelling out irregular seasonal pasture growth patterns. As soil fertility levels increased however, weeds often invaded, necessitating a "second phase" program of weed control and replacement with more stable perennial grasses (Campbell 1985) by aerial and ground methods.

In addition to aerial pasture establishment, large tracts of arable country were ploughed and sown to improved grasses and legumes. This method of pasture establishment although expensive, is generally regarded as a very reliable technique. It is not without problems however, including weed invasions, insect attack, diseases and the risk of soil erosion. Continuing research aims to resolve some of these problems, but clearly much more work is needed.

As a compromise to full seed bed preparation with the plough, sod seeding gained some acceptance, during the 1960's. This technique has not however gained universal acceptance by producers or advisers who recognize various shortcomings associated with deficient weed control. Despite this, sod seeding can produce useful results where the objective is to introduce a legume into a grass dominant pasture or a more comprehensive pasture mixture into native species. In recent years sod seeding has expanded with the use of a herbicide to control competition during the early establishment phase (McDonald and Duncan 1983). This technique certainly improves early seedling survival by reducing competition from existing vegetation, but a number of problems still remain, including post emergence weeds and damping off diseases.

Research at Glen Innes has documented high levels of production from the "winter green" native grasses and their capacity to sustain livestock production throughout the year in contrast to the frost sensitive summer growers (Robinson, 1983). The development of "improved" pastures based on native species however requires certain management practices that need further clarification and refinement through future research.

Irrespective of the pasture improvement technique employed, the following problems commonly occur and regularly cause partial or total failure of new sowings:

* weed invasion during the pasture seedling phase.
* insect and mite attack of newly germinated seedlings.
* damping off disease.
* inadequate nutrition for establishment and maintenance.
* faulty management.
* low soil pH.

FUTURE DIRECTIONS

1. Weed invasion and establishment of new pastures

Broadleaf and grass weeds of chief concern to tableland producers are summarised in Table 1.

Table 1. Some weeds of seedling pastures on the tablelands.

Common name	Botanical name
Thistles	Cirsium sp., Onopordum spp., Carthamus sp.
Wire weed	Polygonum aviculare
Horehound	Marrubium vulgare
Sorrel	Rumex acetosella
Mustard, turnip	various brassicas
Shepherd's purse	Capsella bursa-pastoris
Toad rush	Juncus bufonius
Rats tail fescue	Vulpia spp.
Soft brome	Bromus mollis
Barley grass	Hordeum leporinum
Wimmera Ryegrass	Lolium rigidum
Couch	Cynodon dactylon

This list could undoubtedly be expanded to take into account specific locality problems. In addition, some desirable species can also provide heavy competition to seedling pasture plants, especially subclover following an early substantial autumn break. Under these circumstances, suppression of clover seedlings will be necessary to enhance survival of other pasture species.

Two recent developments of significance to tableland pastures for weed control are spray grazing for broadleafed weed control and spray topping to reduce seed set of annual grasses. Both these techniques can be used prior to pasture sowing for such troublesome weeds as barley grass, vulpia, soft brome, thistles and certain other broadleaf plants.

Spray topping is likely to be used by more producers as the swing to direct drilling for pasture renovation and establishment gains momentum. Soil disturbance and weed seed burial is minimal with direct drilling, and this appears to enhance the abundance of annual grasses, especially vulpia, which is capable of germinating over several months from January to August. Spray topping can potentially reduce seed set and consequently lower the population of seedlings that germinate within six months of flowering. This results in an easier target for chemical control and may well also reduce the risk to newly emerged seedlings of damping-off disease. However, spray topping is not without some practical problems and will need refinement to be more acceptable to producers and reliable in reducing annual grass seed set.

In future producers will need to take greater account of likely weed invasion before sowing a pasture, and consider all options for pre and post sowing control. In this context, "old fashioned" methods of reducing weed populations like the use of annual fodder crops are still quite relevant and so a combination of new and old technology is preferable to discarding tried and proven techniques.

2. Disease and insect control in seedling pastures

Seedling losses in pastures during the early establishment phase on the Northern Tablelands can be extreme, particularly in areas dominated by vulpia (Scott, Duncan & Brown 1989). Glasshouse evaluation of a range of fungicides in 1987 produced markedly enhanced seedling survival. During 1988 a field trial was undertaken which further emphasised the likely negative effect of soil borne fungi on pasture seedlings. It is interesting to note that New Zeal[illegible] of fungicide treated seed under commercial conditions is planned for winter 1989 on the Northern Tablelands.

Insect control has long been recognized as important for early seedling survival. In addition, the recognition and control of mites and slugs during cold, soggy conditions immediately after sowing is important and should not be overlooked, particularly under direct drilling circumstances. Seed harvesting ants are capable of removing large quantities of seed (Campbell 1986) but preventative measures have been devised which largely nullify any activity. However, this technology has been slow to be accepted, particularly on the Northern Tablelands where large quantities of seed are regularly distributed by aircraft without treatment for ant theft. Producers should insist on ant treatment where conditions are likely to favour ant activity.

3. Seedling and established pasture nutrition

Adequate nutrition is a vital component of pasture establishment (Duncan 1987). Traditionally, superphosphate is used at the time of sowing pasture to correct phosphorus deficiencies. However, in many cases, a compound fertiliser would be a more effective choice, supplying phosphorus and sulphur with the bonus of nitrogen to boost early grass development.

Table 2. A comparison of fertilisers for pasture establishment

Product	Rate kg/ha	Phosphorus kg	Nitrogen kg	Sulphur kg	Cost* $/ha
Single super	116	10	-	14	20.04
Starter 12 (M.A.P.)	44	10	4.8	1.3	19.95
Starter 15	77	10	11.5	7.7	29.06
Double super	62	10	-	2.8	20.78

*Cost ex-works for bulk fertiliser.

It can be seen from Table 2 that compound fertilisers offer advantages over the "straight" products in terms of supplying extra nutrients, and on the basis of current costs, economics would favour a compound fertiliser in many cases.

The trend to more concentrated fertiliser products is also occurring in pasture maintenance, with triple superphosphate and Pasture P emerging as competitors for the long established single superphosphate markets. Table 3 provides a comparison of suitable pasture topdressing products.

Table 3. A comparison of fertilisers for pasture maintenance

Product	Phosphorus Content %	Sulphur Content %
Single Super	8.6	11.5
Pasture P	12.6	7
Triple Super	19.7	2
Gold Phos	18	10

For aerial application, the spreadability of a pasture topdressing product is important in overall efficiency and costing. Triple super was designed for use through conventional ground driven machinery and possesses a narrow range of particle sizes by comparison with the large range of particle sizes in single super - a traditionally aerially spread material. This results in a narrow swath width of triple super (effectively about 10 m) compared with 18-20 m swath width from single super when spread by aircraft. The narrow swath width of triple super and products derived from it such as Gold Phos can be effectively expanded by using a deflector (non-mechanical type) suspended under the aircraft.

The role of sulphur must not be neglected when considering the use of concentrated fertiliser for pasture maintenance. Recent research conducted by the University of New England at Armidale and NSW Agriculture & Fisheries at Walcha and Guyra has again demonstrated

pasture requirements for this element. After a substantial history of single super applications, sulphur could be neglected for up to 3 years, however pasture and animal production could well decline if sulphur was withheld for a longer period, hence the inclusion of extra sulphur into products like Gold Phos.

Cregan (1986) summarises the acid soil problem and the need for lime to alleviate cation imbalances that exist in very acid soils. Producers and advisers operating in acid soil areas should ascertain the need for lime well before contemplating a pasture sowing. In future, attention will also need to be directed to arresting the long term decline in soil pH throughout much of New South Wales.

4. The role of species development

Undoubtedly, the most important component of a mixed pasture is the legume (Reed & Cocks 1982). Current research at Glen Innes is attempting to identify the mechanisms for persistence of white clover so as to improve its perenniality in the Northern Tablelands. A run of dry seasons has emphasized the instability of white clover, the need for careful management of currently available cultivars during dry summers, and the need for more robust cultivars.

Developments in lucerne "post aphid" (1977) have resulted in cultivers of lucerne with a relatively wide range of growth patterns. Many long term lucerne growers still feel the old variety Hunter River has much to offer. However, its disease and insect susceptability is such that American varieties were preferred immediately after the aphid invasion. In recent years locally bred varieties like Aurora, have generally proved to be more productive and persistent. This demonstrates the need to produce "home-grown" cultivars rather than rely too heavily on overseas material with little or no adaptation to local conditions.

Significant gains in production can still be achieved with improved subclovers, seradella, white clover, lucerne, annual medics and red clover. By contrast, differences in animal production among alternative grasses are rarely more than 10% (Reed 1988). The four introduced temperate perennial grasses used in the traditional pasture areas of NSW all rely heavily on the accompanying legume for optimum animal performance and this is likely to be a continuing fact. There is scope however for "fine-tuning" e.g. lower alkaloid levels in phalaris, improving the drought persistence of perennial ryegrass (cv. Brumby?), improving seed retention of all the grasses to ensure regular supplies to growers, further evaluation of the short term diploid and tetraploid ryegrasses and so on. Much of this work can be undertaken at the local level and it would be difficult to justify significant injection of scarce research funds for this purpose. It is a matter for some concern that seed companies introduce significant quantities of imported grasses without local evaluation, promote them heavily on the basis of overseas performance, then switch to a different variety the following year if seed supply dictates. This practice certainly confuses the market and does not always reflect well on the individual companies.

5. Management of pastures

This is perhaps the least well understood area of pasture technology and consequently the one that occupies the least space in the various pasture publications. The exception is lucerne for which much research

has highlighted the need for adequate weed control, nutrition, rotational grazing and pest management. The management of perennial grass/legume pastures remains something of a mystery. The important components that advisers and producers need to consider are summarised below:

i) Maintenance of soil fertility

A regular program of phosphate monitoring to improve efficiency of topdressing is recommended, especially where introduced, fertility demanding species are present. In addition to the major elements, the need to correct trace element deficiencies should be stressed, in particular the requirement on most of the acid soils for molybdenum. It may be that previously recommended Mo rates are far too low. Excellent responses to rates of MoO_3 around 100 g/ha in tableland locations have been observed in recent years with no apparent copper deficiency symptoms seen in cattle. Research is needed to clarify this topic.

ii) Weed control

Mention has previously been made of spray grazing to control a range of broadleaf weeds, chiefly thistles and Patterson's curse. This technique has given excellent results using relatively low rates of MCPA or 2,4-D (amine) and should continue to be promoted to reduce weed invasion, vegetable fault and minimise damage to non target species especially the valuable legume component. Spray topping to reduce seed set of undesirable annual grasses was also mentioned previously. Where heavier rates of herbicide are needed and bare ground results, re-seeding of affected areas should follow in order to prevent re-invasion by weeds. Routine treatment of blackberry, briar, tussocks, horehound, nettles etc. should always be followed-up with sowing of suitable pasture seed.

The use of wiper, swiper and roller equipment represents yet another useful advance in pasture weed control. These devices offer landholders selective control of a range of hard to kill species like rushes, bracken, tussocky grasses etc. Provided hard grazing precedes the wiper/swiper/roller, minimal damage to desirable species will result while control of the target is achieved at low cost.

iii) Maintenance of ground cover

Management of perennial and annual grass and legume swards should always aim to maintain ground cover to minimise weed invasion and assist in the retention of the desirable species. However, very lenient grazing which allows tall, bulky growth is antagonistic to the legumes and will produce material of low digestibility. Ideally, mixed pastures should not be grazed below about 10 cm nor allowed to grow taller than about 25 cm. This of course is a rough rule of thumb and does not apply to special purpose hay crops of red clover or lucerne. Allowing a lucerne stand to progress to the full flowering stage once each year prior to the winter period is sound management and will usually strengthen the stand.

A final thought on ground cover; trees strategically located, (and in the case of eucalypts, in sufficient numbers to be a self supporting community) are a very definite advantage to pasture and animal production. The re-introduction of trees in the tablelands of NSW may well be the single greatest challenge for the next generation.

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