‘The grazier’s guide to pastures’ - Readers’ Note

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13. MATCHING PASTURES AND LIVESTOCK REQUIREMENTS

Pastures are normally converted to dollars by grazing. One of the aims of farm management is to try to match seasonal pasture growth with the animal enterprise requirements.

Figure 13.1 shows the potential yearly pasture growth from a well fertilised pasture grown on the tablelands together with the requirements for four different livestock enterprises. These are fine wool wethers, autumn lambing 1st cross ewes, spring lambing 1st cross ewes and a beef cattle breeding enterprise. The stocking rates per hectare selected for the enterprises are 15, 9, 12 and 1.75 respectively to provide a similar total yearly consumption for each enterprise.

It can be seen that pasture production peaks in spring with a large surplus. But in summer and winter there is a deficit for all enterprises. Where this occurs, saving feed and carrying it forward into the times of shortage can make it up e.g. carrying feed over from autumn into winter by locking-up paddocks, rationing intake or providing supplementary feed.

The only other way, sometimes used in combination with one of the other strategies, is to allow animals to utilise their fat reserves and lose weight. This option is best suited to dry stock. It is common for the weight of wethers to fluctuate over the year representing changes in feed offer i.e. wethers gain weight in spring but then lose this weight the following autumn/winter.

The wether enterprise, has the same feed requirement each month, resulting in a huge potential wastage in spring. Of the two lambing enterprises, the requirements of the spring lambing ewes more closely match the pasture feed supply, at a higher stocking rate, than that of the autumn lambing ewes.

Where there is a surplus this can, either be saved as hay or silage, consumed by stock which fatten and then lose weight later when feed supply is deficient or remain as a store of low quality, dead standing feed in the paddock.

High quality feed is needed for different animal classes at different times of the year. This requires a mix of pasture types or forages over the property to meet these requirements. For example, young weaner sheep require high quality green feed to gain weight over summer. This green feed will not be supplied if all the pastures over the farm are the same and composed of winter growing/summer dormant annuals and perennials. A summer growing pasture or forage crop is required or there will be a need for grain supplements. Similarly, over winter there is often insufficient feed available for fattening of weaner cattle and this feed gap can be filled using a late summer sown, winter forage crop.

The PROGRAZE series of workshops, which cover this topic in more detail, are an invaluable aid in providing farmers with skills and knowledge which they can apply to their whole farm management.

Fig 13.1 Pasture growth and enterprise requirements
**Animal Health Issues**

With increasing stocking rates and higher quality pastures, the risk of livestock health problems may increase. Stock and production losses do sometimes occur but good management will minimise the risk of disorders occurring.

Occasionally, animal health disorders arise from particular plant species. For example, bloat risk is very high at certain times from high legume content pastures, pure lucerne can cause redgut in sheep, phalaris can cause staggers. These risks need to be fully understood when planning pasture sowing. Advice from a veterinarian and/or adviser should be sought when planning pasture improvement.

**Further Information**


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14. **WEED AND PEST CONTROL**

**The Importance of Weed Control**

Weed competition is a major cause of pasture establishment failure and subsequently can cause a loss of pasture production. Pasture weed control is vital prior to sowing because there are few herbicide options in seedling pastures.

Once established a healthy perennial grass based pasture will control most weeds. However, there will always be some weeds in pastures and while some are invasive and take over considerable areas of the paddock e.g. thistles and Paterson’s curse, many simply respond to the prevailing conditions and will decline naturally with different conditions.

Cultivation, cropping, slashing, herbicides, pasture manipulation and intensive grazing can all be effectively used to control weeds. Using one or a combination of these control methods in a planned program has the potential to increase pasture production and can greatly reduce weed infestations prior to and following pasture sowing.

Herbicides are an important tool in pasture weed control, but selection and correct use of the herbicide is crucial. *Always read herbicide labels before use.*

**Weed Control in Pastures**

**a. Before Establishment**

- Good weed control is essential when establishing perennial grass pastures and/or lucerne, as seedlings are extremely susceptible to weed competition.
  
  Inspect paddocks at least twelve months before sowing to determine what weeds are likely to be problems and take effective control measures to reduce these anticipated weed infestations.

- Good seedbed preparation involves cultivation and/or herbicides to remove both grass and broadleaf weeds before sowing. Herbicide use prior to sowing is often more effective than cultivations.

- Some weeds can be more effectively controlled with less damage to the non-target pasture by combining sub lethal herbicide rates and grazing (the spray-graze technique).

- Difficult or hard to control weeds and/or heavy weed infestations may require control programs that start up to two years before the pasture sowing. There are three weed types in these situations:

  1. **Perennial Grasses** - e.g. couch, bent grass, tussocks etc. Depending on the weed, control programs will vary and may require the use of combinations of herbicides and cultivation or multiple spraying. Seek correct identification and advice on the best control program for your situation.

  2. **Annual Grasses** - such as ryegrass, barley grass, and vulpi a can be effectively controlled by preventing seed set in the spring before sowing. This can be done by a chemical or mechanical fallow, or by spray topping. Hay, silage making, slashing or heavy grazing can also assist control by reducing seed set or removing seed. Cropping in conjunction with selective herbicides can effectively control annual ryegrass in most crops but not in oats.

  3. **Broadleaf Weeds** - such as thistles, amsinckia, Paterson’s curse and sorrel need to be reduced by herbicides, cropping and fallowing prior to pasture establishment. Spring sowing can be used to avoid competition from the winter growing annual weeds such as Paterson’s curse which often have large reserves of hard seed in the soil despite pre-sowing control.

**b. In Seedling Pastures**

**Grass/Clover Pastures**

No herbicides are available to remove annual grass weeds from seedling grass/clover pastures. Fortunately broadleaf weeds, such as, thistles, wireweed, mustards, and Paterson’s curse, can be selectively removed with various herbicides but these herbicides must be used while weeds are small.

**Lucerne**

Pre-emergent herbicides are strongly recommended when sowing lucerne alone or with other legumes to control annual ryegrass and some broadleaf weeds. Several herbicides can selectively control some grasses in seedling lucerne. Broadleaf weed control is similar to that for mixed pastures, with some additional herbicides.

**c. In Established Pastures**

Where possible weeds in established pastures should be managed and eaten rather than sprayed.

Weeds, in established pastures, can be classified into three broad types:
• **Survivors** - these colonise when fertility is low or declining. Examples are bent grass and onion grass. Increasing the fertility and at the same time the grazing pressure is often all that is required to bring them under control.

• **Competitors** - these often respond to high fertility e.g. thistles and barley grass. Manage the pasture to encourage competition from the perennial pasture. Selective fertilising to avoid sheep camps, rotational grazing, mob stocking, spray topping and spray grazing are techniques that can be employed.

• **Opportunists** - these colonise bare ground and so maintaining an adequate ground cover from a vigorous perennial pasture will usually keep these weeds under control. Sorrel, Paterson’s curse and vulpia are common examples. The type of grazing animal can also result in either control or an increase in some weeds. In the case of Paterson’s curse, cattle avoid grazing this weed whereas sheep tend to keep it under control.

With good management, slashing, hay or silage making at the right time and crash grazing can help control some weeds.

A well-established competitive grass/clover pasture should not initially have annual weed problems. If annual grasses start to increase in density they should be dealt with while the pasture is still strong. Techniques such as spray topping, winter cleaning or using soil residual herbicides can be effective. However any of these techniques can temporarily reduce pasture production and affect the seed set of useful species such as clover and perennial ryegrass. These effects on the non-target pasture species can be greatly reduced if the pasture has a high level of soil nutrients or is topdressed at this time.

A number of herbicides will give effective and cheap control of most common broadleaf weeds in grass/clover pastures.

Using sub lethal rates of hormone herbicides followed by heavy grazing is an effective method of controlling some broadleaf weeds. This technique is referred to as ‘spray grazing’ and relies on increasing the palatability of the weeds. **Warning**: **Take care with spray grazing as certain broadleaf weeds can be toxic to certain types of stock.**

**Established Lucerne** - control of annual grass and broadleaf weeds is commonly obtained using a mixture of a knockdown and residual herbicide in late winter. Specific weeds can be controlled using various herbicides for broadleaf or grass weeds.

**Herbicide Resistance**

Repeated use of the same herbicide or herbicides with the same mode of action increases the chance of herbicide resistance developing in weed populations. Good weed control programs should include the use of non-chemical control options and the full range of chemical options (different techniques and herbicide groups) where appropriate, to reduce the risk of herbicide resistance developing.

**Control of Pasture Pests**

As with weeds, insects and mite pests are a major cause of pasture establishment failure. In established pastures the necessity for control of these pests will depend on the pest population and level of damage occurring or likely to occur. Control of pests is often best achieved through a range of methods, such as grazing management, pesticides, cultivation and plant tolerance. Check latest integrated pest control techniques with your local NSW Agriculture agronomist.

Several pasture pests can affect pastures in the region. Some of the more common ones are listed below:

**Red-legged earth mite** suck sub clover leaves dry.

**Earth Mites**

Blue oat mite and red-legged earth mite commonly occur in mixed populations in the Tablelands. These tiny pests (the size of a pinhead), can destroy newly sown pastures and severely damage established pastures.

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Mites hatch on autumn or early winter rains and in some years build up to plague proportions. They prefer dark conditions and are greatest in ungrazed pasture. Heavy grazing of adjacent paddocks or border spraying may be necessary to protect newly sown pastures from invasion.

Regular close inspections of establishing pastures, especially lucerne, should be made. Even bare fallows can be heavily infested with mites and plants can be killed as they emerge. In these situations plant damage is not obvious and is often not seen. Damage on mature plants is characterised by silvery or whitish appearance of the leaves.

Spraying is effective and cheap but not all registered chemicals control both mites. Specific products work better in certain situations e.g. those that are systemic work better on green plants, while others act well as bare ground sprays.

Spraying mites in spring before pasture sowing (along with spray fallowing) can greatly reduce potential mite problems the following year. Spraying just prior to pasture sowing will help to protect seedlings against mites. Seed can also be treated to protect against mites but if heavy infestations occur, seed treatment is often ineffective.

**Aphids**

Seedling lucerne can be severely damaged by spotted lucerne aphids and spraying may be necessary. Damage to sub clover by spotted alfalfa aphid is unlikely on most varieties.

Blue-green lucerne aphid can cause severe damage to sub clover and young lucerne. Populations of two or more aphids per growing point may require spraying.

Cutting or quick/heavy grazing of lucerne or clovers can also effectively reduce aphid populations and damage.

**Sitona Weevil**

These weevils eat the foliage and stems of lucerne and clovers. Heavy infestations can completely defoliate established plants and may kill seedlings or young plants. Spraying can be necessary.

**Pasture Scarabs (cockchafers)**

There are two types of scarabs - those that feed above ground on leaf and those that eat the roots. Pasture scarabs can develop into large infestations and cause serious damage especially to seedling pastures. Established phalaris is tolerant to root feeding scarab attack, most other introduced grasses are affected, especially ryegrass and cocksfoot. Control of the root feeding scarabs is difficult, as they cannot be controlled without cultivation. Insecticides can effectively control the leaf eating black-headed cockchafers.

**White Fringed Weevil**

The soil dwelling larvae of the white fringed weevil can seriously damage seedling and established lucerne plants. Control of this root feeding insect is difficult. The main means of control is cultivation and crop rotation for two years using cereals free of broadleaf plants and legumes.

**Points to Remember**

- Plan weed and pest control at least 12 months ahead of pasture sowing.
- Don’t rely solely on herbicides/insecticides, investigate other pest control options.
- Seek the latest information on chemicals and always read the labels.

**Further Information**

See current editions of the NSW Agriculture booklets: *Weed Control in Lucerne and Pastures* *Insect and Mite Control in Pastures* (both published biennially.)
15. ECONOMICS OF SOWING PASTURES

Sowing new pastures is of little value if livestock production is not increased to utilise the extra feed produced.

Is Sowing an Introduced Pasture Economic?

A quick way to answer this is to compare the cost of buying more land with the expected value from sowing pastures based on increased carrying capacity. For example, if land is worth $500/ha and runs 6 dse (dry sheep equivalents)/ha, the cost/dse area is $83. Thus, if it costs $200/ha to establish a perennial pasture, carrying capacity must rise by at least 2.5 dse/ha or, the pasture must have a special use and increase options in the whole farm context.

A more thorough way to evaluate the economics of sowing pastures is to prepare a cash flow development budget. This is simply a comparison of extra costs versus extra income, tabled for a number of years and taking account of varying stocking rates. Usually the stocking rate is zero in the first year, rising to the full rate by the fourth year. Interest charges on borrowed money, the cost to apply the necessary fertiliser and the cost of purchasing the extra stock must all be taken into account.

Table 15.1 is an example of this type of budget and is based on a gross margin of $15/dse.

Fig 15.1 summarises this and compares the result when the gross margin is only $12/dse.

The Critical Factors

If as is common, pastures need to be re-sown after about 10 years, it may not be economic to sow pasture. The longer the pasture remains productive the greater the cumulative net return and the lower the pasture overhead costs.

What determines whether you can pay for pasture sowing is:

• the number of years a pasture can persist and remain productive, and
• your gross margin as it relates to carrying capacity, e.g. gross margin/dse. Unless this is about $15/dse and the stocking rate can be raised by 3-4 dse/ha or more, it won't pay.

Examine livestock husbandry aspects first if gross margins/dse are low.

Remember, under-grazing to achieve long-term persistence of pastures will reduce profits and can result in agronomic disadvantages such as the loss of legumes.

Economics of 'Sub and Super'

Broadcasting subterranean and sometimes white clover seed with superphosphate onto native pastures has been a successful method to non-destructively improve the amount and quality of feed and has been used since the 1950’s. It is a relatively low cost technique and as pointed out in Chapter 7, several of the more desirable native perennial grasses will respond positively.

In this region where annual rainfall ranges from 600-850 mm, native grass based pastures, composed of red
Table 15.1 Pasture Development Budget

**PASTURE SOWING FARM DEVELOPMENT BUDGET**

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<td><strong>Cost of establishment per ha</strong></td>
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<td><strong>extra cost of fertiliser per ha</strong></td>
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<td><strong>Based on a recommended fertiliser rate of 125 kg/ha every year.</strong></td>
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<td><strong>Normal fertiliser regime set at 125 kg/ha every third year.</strong></td>
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**BALANCE**

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*Based on a recommended fertiliser of 125 kg/ha every year compared to normal practice- 125 kg/ha only every third year.*
grass or the year long green species, wallaby grass and microlaena, combined with annual legumes and grasses have the potential to carry 10–14 dse/ha with moderate levels of fertiliser.

The fertiliser required depends on the enterprise and the existing fertility level. For instance, 125 kg/ha per annum of single superphosphate was required for a fine-wool wether enterprise after 25 years without topdressing. After five years of this annual application, 125 kg/ha every second year now appears to be sufficient.

However, with a similar soil, pasture and fertiliser history a second cross prime lamb enterprise has required 250 kg/ha of single superphosphate every year. Assuming it costs $30/ha to purchase and spread 125 kg/ha of single superphosphate, including the use of Mo super every fourth year, then an increased carrying capacity greater than 2 dse/ha will be worthwhile. Experience suggests this is an easily achievable increase from most native pastures.

There is scant information comparing the economics of native pasture versus a conventionally sown perennial pasture. However, one comparison of the effects of several pasture development options on beef production and operating profit was carried out at Kamaruka in the Bega Valley from 1981–1985. An 80 hectare block of native pasture (mainly kangaroo grass and microlaena) was split into four paddocks and the following treatments imposed:

• Native pasture (no legume or fertiliser)
• Native pasture plus superphosphate (no legume)
• Native pasture plus superphosphate plus subterranean and while clovers; and
• A sown pasture based on phalaris, cocksfoot and clovers with fertiliser

After the five years of the trial, the native pasture with fertiliser and clover produced nearly as much cattle live-weight gain as the sown introduced pasture. However, it gave the highest net profit over the five years because the cost of the sown pasture was 50% greater than the ‘sub and super’ option.

Note: the fertilised native pasture without a responsive legume produced little more beef than the unfertilised native pasture.

Points to Remember

• Growing extra feed won’t be profitable unless you run or fatten more stock.
• The longer a pasture persists and remains productive the more profitable the pasture development program will be.
• There is a need to balance grazing by stock for livestock production with grazing to ensure long-term pasture persistence.
16. CROPPING IN THE REGION

Cropping enterprises are generally limited in size owing to terrain, soil type, fertility and existing vegetation. The limited areas used for more intensive cropping are those with high fertility, deeper more arable soils, with a low risk of erosion, acidity and/or salinity hazards.

Winter crops are the major types grown. Mainstream summer crops are generally unsuitable, owing to the short growing season and low summer rainfall. Crops grown can be classified as:

**Forage Crops**
The major types grown include oats, spring and winter wheats, triticale, cereal rye and brassicas. Summer forages are minor components in the grazing systems but include brassicas, millet and forage sorghum.

Whether to sow a forage is largely influenced by seasonal 'gaps' in production of good quality pasture. The main feed deficit in the region occurs during winter due to low temperatures and lack of highly productive perennial pastures. Varieties of cereals are available that are dual purpose i.e. can be sown in early autumn for grazing, then 'locked up' in late winter for grain or hay.

Forage brassicas sown in spring offer good weed and root disease control for a following crop or pasture sowing. They provide an ideal seedbed for autumn/winter direct drilling of the subsequent crop or pasture.

Grazing management for all forage crops should ensure that stock are removed when there is still sufficient leaf material remaining to allow quicker regrowth. Under very wet conditions stock should be removed to avoid crop and soil damage.

**'Grain Only' Winter Crops**
These crops consist mainly of oats, wheat, triticale, cereal rye and to a lesser extent canola, field peas, lupins and barley. They are occasionally used as cover crops for under-sown pasture (see cover crops in chapter 10) but crop seed rates need to be reduced.

**'Grain Only' Summer Crops**
This is mainly limited to buckwheat. Crops are generally sown after December rain.

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**Successful Cropping Practices**
The decision to undertake any cropping enterprise must begin by assessing the type and quality of existing pasture (native or introduced) and if the crop is being grown as a forage after identifying where the 'feed gap' is.

Sustainable crop production on the tablelands is obtained via:

- Selection of suitable crop species/varieties. For example in many areas only acid tolerant species can be grown.
- Rotation of crops with pastures having a strong legume base.
- Direct drilling or minimum tillage of winter crops. **Note:** direct drilling of summer crops has a poor success record, with at least one cultivation required for successful crop establishment.

Generally the greatest challenges to cropping are soil acidity, fertility and susceptibility to erosion. Salinity is an emerging problem in many situations, and this hazard also needs to be carefully assessed.

Preparation for early sown winter crops or summer cropping should begin with a spring fallow to conserve moisture and soil nutrients. Judicious use of herbicides and/or livestock will control weeds, enabling cultivation to be kept to a minimum, thus preserving soil structure and minimising erosion. Cultivation, where necessary, should be done as close as possible to sowing, or if done earlier, the soil left in a 'rough' condition.

Annual grass weeds such as vulpia, barley grass, soft brome and ryegrass host root diseases that affect wheat and to a lesser extent, triticale and barley. Oats, canola, lupin, cowpea, forage brassicas, sorghum, millet and sudan grass hybrids are unaffected, with cereal rye rarely affected. Wheat, therefore, should not follow a 'grassy' pasture phase, unless annual grasses are removed in the winter prior to sowing. An eight month grass free fallow period is needed for root diseases to break down in the soil.

**Points to Remember**

- For successful cropping the following is essential:
  1. A fallow period
  2. Correct choice of species/varieties
  3. Rotation with good legume pasture
  4. Minimal cultivation

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**Further Information**

McRae, FJ. *Winter Crop Variety Sowing Guide* (NSW Agriculture).
GLOSSARY

Allelopathic
Chemical residues from mature plants or their residues that inhibit the growth of new seedlings.

Annuals
Those species that regenerate from seed each year and must set seed each year to regenerate (e.g. barley grass, subterranean clover).

Arable
Land suitable for cultivation.

Aspect
The compass direction that a slope faces.

Biennial
Species that may last 2-3 years depending on seasonal conditions and management (e.g. red clover, some hybrid ryegrasses).

Botanical composition
Mixture of plant species in a pasture.

Cation exchange capacity
The capacity of the soil to hold and exchange positively charged minerals (cations) such as calcium, magnesium, potassium, sodium and aluminium. It is dependent on the amount of clay and organic matter present.

Degraded pastures
Pasture that has lost much of the perennial species and that has usually been invaded by annual species including weeds. Tends to have 30% or more bare ground at the end of summer.

Digestibility
A measure of the proportion of pasture or feed which, once consumed, can be used by the animal.

Dispersable soil
A soil with a high sodium content (also known as sodic soils) that is extremely prone to erosion by water.

dse
Dry Sheep Equivalent—is represented by amount of available pasture required to maintain an adult dry sheep at 45 kg live weight.

Gross margin
The income from an enterprise less the variable costs for the enterprise.

Herbage quality
Nutritive value of herbage, usually expressed as a digestibility percentage.

Introduced pastures
A pasture based on overseas species (e.g. phalaris, perennial ryegrass, white clover) that have been sown either in a prepared seedbed, direct drilled or aerially sown. Commonly called 'improved' pasture.

Legumes
Plants which have an ability to fix nitrogen in the soil. Clovers (Trifolium spp.) are the most common pasture legumes in this region. There are no native Australian clovers.

Native grasses
Grasses that occurred in Australia before European settlement.

Naturalised grasses
Grasses introduced from overseas and capable of distributing and regenerating themselves without human assistance (e.g. barley grass, couch grass, vulpia, bromes).

Natural capital resource
A term used to describe land capability potential in relation to climate, soils, topography, aspect and the plant species present.

Nitrate
The form of nitrogen present in the soil that is available for plants to use.

Non-arable
Land that cannot be safely cultivated.

Non-trafficable
Land that is too steep or rocky to drive over in a two-wheel drive vehicle.

Nutritive value
A measure of the nutrient status of a feed (energy, protein, minerals etc.)

Palatability
Relates to the preference (or priority) that grazing animals show when a range of species is offered. Palatability can vary according to locality, maturity, type of grazing animal and how much is available.

Panicle
A much branched seedhead.

Perennial
Those species that can live for many years (e.g. microlaena, phalaris, lucerne).

pH
A measure of a soils acidity or alkalinity. In this publication, all pH values are presented as those measured in calcium chloride (CaCl₂).

Photosynthesis
The production of organic material by plants using sunlight, carbon dioxide, water and soil minerals.

Radiation
The emission of rays from the sun to the earth's surface. Necessary for plant photosynthesis.
Rotational grazing
Stock are rotated across several paddocks with timeliness of moves based on a fixed time period or regrowth of pasture.

Rhizome
A root-like underground stem that can produce new roots and shoots.

Soil acidity
Acidity or alkalinity of a soil usually measured by pH (CaCl₂).

Soil salinity
A build up of salt in the surface soil usually as a result of a rising water table and ground water seepage.

Slope/erodibility
Steepness of land and susceptibility to erosion.

Spikelet
That part of a seedhead that contains the seed.

Stolons
Prostrate shoots that take root at nodes or joints in contact with soil, forming a new plant.

Stoloniferous
Describes plants that have stolons.

Subsoil
The various layers of soil below the top soil.

Temperate species
Plants that inhabit parts of the earth between the tropical and polar regions.

Top soil
The surface layer of soil (usually 7-15 cm thick) that contains most of the organic matter and essential plant nutrients.

Trafficable land
That which, while non-arable can be driven over. This type of country can be direct drilled.

Warm season grasses
Includes all grasses that only grow over summer and are partially or totally winter dormant (e.g. Themeda, Bothriochloa).

Year-long green
A term used to describe those native perennial grasses that have the capacity to grow all year round given sufficient rainfall.