

Pastures under adverse conditions - Too expensive?

The cost of establishing a good pasture -Part A

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We run 2-3,000 Merino ewes, 300 head of Angus cattle and crop about 2000ha of wheat, oats for hay and chickpeas north-west Condobolin, in the western edge of the wheat belt in central NSW. My wife and I also run a veterinary practice in Condobolin. I have established annual legume and lucerne pastures over the last 12 years. I have also tinkered with sowing perennial grasses and have an interest in native grass pastures.

Hayden Wass (Part B of this paper) and I have been asked to discuss the cost of establishing good pasture. We are both representatives of the western edge of the sheep zone so our comments pertain to this region only. Hayden and his family run a large and dynamic mixed farming operation near Nyngan, so his comments relate to his experiences. My operation is considerably more modest. Fortunately my neighbourhood contains an unusually high number of enthusiastic and competent farmers. Many of these are also members of our "Pastures Pay" group. My comments relate to my own experiences plus those of my colleagues.

First - what constitutes a good pasture in our area? A pasture has many roles and a good pasture for one enterprise may not suit another.

Pasture roles or requirements

Livestock nutrition

It is obvious that we require at least reasonable levels of protein, energy, digestibility and palatability, particularly at key times of the year. Equally desirable in our environment are pastures that provide quality dry feed between rains. Annual legumes for example provide high quality feed in a good spring, however they provide little feed for the summer and autumn. Self sown oats on the other hand provides quality dry feed long after rain.

Freedom from toxicity or stock injury

Virtually every major pasture species is capable of poisoning or injuring livestock or contaminating wool. Clearly those pasture components which do this least or in a manageable way are the most desirable.

Sustainability

Sustainability is a much abused word these days

but I can't think of a better one. To me sustainability means providing soil cover and protection against erosion. It also implies an ability to control the water table to prevent salinisation and re-cycling deep nitrogen so reducing acidification. Annual grasses such as ryegrass seem best at holding the soil while deep rooted perennials are considered the best at lowering the water table and recycling deeper nitrogen. Pastures must also be productive enough to be economically sustainable.

To enhance cropping

In the last few years cropping has been six times more profitable than livestock on our property. Therefore it is essential that pastures serve the needs of the following cropping phase. A complementary pasture should increase soil nitrogen, not harbour crop diseases and not contribute to a weed problem in the crop phase. Lucerne, in my opinion, is the best here while rye grass or barley grass are among the worst.

To be cost effective to establish and manage

Pasture Options in the Condobolin District

Native pastures

Native pastures occur here in either country which has never been cultivated or country which has been cropped infrequently. Native summer growing perennial grasses seem to re-colonise successfully when the cropping intensity is reduced. Native grasses without fertiliser have a well described low carrying capacity and low nutritive value. Animal performance is poor, especially in young stock. In my experience if grazed heavily or inappropriately they revert to bare ground interspersed with undesirable species such as *Stipa spp.* They also contain a number of injurious or toxic species (again such as *Stipa spp.* and Rockfern). Native pastures have the advantage of being low input (and low output).

Volunteer pastures

This is not uncommon in our district as often no pasture species are sown after the cropping phase (or the sowing rate of pasture species is so low as to be ineffectual). Our normal volunteer species are saffron thistle, wild oats, burr daisies, mustard, bar-

ley grass and ryegrass. The disadvantages of this option hardly need discussing in this forum.

Annual legumes

Excellent research at the Condobolin Research Station by Hugh Brownlea, Brendan Scott, Rick Young and extended by Paul Lukins (District Agronomist, NSW Agriculture) has shown the most successful annual legume species to be barrel medic, short season sub-clovers and Hykon rose clover. They have also demonstrated successful establishment methods, productivity and herbicide options. Many farmers have successfully followed these recommendations.

Annual legume pastures provide quality winter and spring feed and have no doubt improved wheat yield and quality. They don't however provide summer or autumn feed, don't protect the soil over summer or utilise deep nitrogen or moisture. Annual legume pastures also seem to deteriorate over a few years with poor regeneration and colonisation by weed species such as burr daisies and saffron thistles.

Lucerne pastures

Lucerne, usually associated with annual legumes, has been widely sown in our district in the past decade. I think there has been a trend to sowing lucerne across the farm rather than sowing a "lucerne paddock" for special uses. Lucerne provides quality feed in response to rain over most of the year and utilises subsoil water and I presume nitrogen. Lucerne is the pasture species which is most likely to enhance subsequent cereal crops, providing outstanding nitrogen build up and weed suppression without harbouring cereal root diseases.

Lucerne however has a few disadvantages. Firstly it seems to provide "feast or famine" feed, particularly in a thick stand. In a dry time it drops its leaves, provides little residual quality feed and offers little soil protection.

Perennial grass and legume pastures

I regard these as the most desirable pasture type especially for grazing. Perennial grass species, whether native such as *Digitaria spp.*, Queensland blue grass (*Dichanthium sericeum*), *Danthonia* species (whitetop or wallaby grass), Curlytop windmill grass (*Enteropogon acicularis*) or exotics such as Rhodes grass, Premier digit grass, Consol lovegrass or buffel grass plus lucerne and annual legumes form a complementary unit providing quality feed over much of the year. Soil protection is good provided overgrazing doesn't occur and water table control and deep nitrogen utilization should also occur.

However in my limited experience perennials are slow, difficult and expensive to establish. With the current profitability of cropping I feel it's not worth the time except on non-cropping country. Few local

farmers have attempted to sow perennial grasses as yet. We are fortunate to have Peter Weston in the district. Peter has pioneered the sowing of perennial pastures over large areas. As a more normal relationship between cropping and livestock returns come back we will increasingly benefit from Peter's expertise in this field (see paper from Peter Weston on page 88).

An alternative approach to establishing mixed pastures with perennial grasses has been employed by our neighbours and members of the our "Pastures Pay" group, Robert and Belinda Neal of "Lockerbie", Condobolin. Robert has impressive stands of native grasses such as *Digitaria brownii* (cotton panic) in association with annual legumes such as Nungarin sub-clover and Hykon rose clover. The Neals maintain this mix by a short cropping phase allowing regeneration of the *Digitaria* and other species. Conservative stocking rates seems to ensure the survival of these desirable species. This method has the benefit of being inexpensive although it could be argued that a cost may occur from the shortened cropping phase.

Direct drilling oats into legume pastures

Sod seeding oats has been used for decades and was popularised by Prof. Frank Crofts at Sydney University. Self sown oats is frequently used as a pasture species in our district. For farmers like me who have difficulty sowing perennial grass pastures, direct drilling oats into existing pastures should provide some of the theoretical advantages that perennial grass species provide. Direct drilling oats enables fertiliser to be incorporated, balances a legume pasture for livestock, protects the soil and provides quality nutrition well into summer. I suspect that the furrows left in the paddock would also encourage medic and clover regeneration and catch and favour germination of windborne native grass seeds. Direct drilling oats every 2 to 3 years however is more expensive than other options and has yet to be tested in our area.

Deciding on pasture options

I have attempted to tabulate and quantify this decision making process by putting a numerical value (1=worst to 3=best) on the ability of each pasture type to fulfil each role. Some of these roles will be more important than others depending on the enterprise priority of the farmers, so I have also allowed for grading the priority (1=lowest to 3=highest) a user may have for each pasture role. This assessment is presented in Table 1.

Using this entirely subjective scoring system to assess the most appropriate pasture type for different situations produced the following rankings:

Graziers

- (1) Direct drilled oats into lucerne pastures

Tables 1. Pasture types and their suitability to the Condobolin district.

	Nutrition			Sustainability		Crop		Cost Inputs	Score
	Quality	Duration	Toxicity injury	Soil protection	Acidity salinity	Soil fertility	Compat- ibility		
1. Graziers ranking									
Grade/priority	3	3	2	2	2	1	1	3	
Pasture type									
DD oats, perennials	3	3	3	3	3	2	2	1	43
Perennial grass, lucerne	2	2	3	3	3	2	2	2	40
Lucerne	3	1	2	1	3	3	3	2	36
Native	1	2	1	2	3	1	1	3	32
Annual legumes	3	1	2	1	1	2	2	2	30
Volunteer	2	1	1	2	1	1	1	3	28
2. Farmers ranking									
Grade/priority	1	1	1	1	1	3	3	1	
Pasture type									
DD oats, perennials	3	1	2	1	3	3	3	2	30
Perennial grass, lucerne	3	3	3	3	3	2	2	1	28
Native	1	2	1	2	3	1	1	3	18
Annual legumes	2	2	3	3	3	2	2	2	27
Volunteer	2	1	1	2	1	1	1	3	16
3. Sustainability ranking									
Grade/priority	2	2	1	3	3	1	1	2	
Pasture type									
DD oats, perennials	3	3	3	3	3	2	2	1	39
Perennial grass, lucerne	2	2	3	3	3	2	2	2	37
Lucerne	3	1	2	1	3	3	3	2	32
Native	1	2	1	2	3	1	1	3	30
Annual legumes	3	1	2	1	1	2	2	2	24
Volunteer	2	1	1	2	1	1	1	3	24

Key: The row above parts 1 to 3 titled Grade/Priority is my subjective assessment (1=worst, 3=best) of how important each of the pasture attributes is to each user. The figures in the columns below Pasture Types are my assessment of how each pasture type is ranked for the attribute above. The final score in the right hand column is the number obtained by multiplying the numbers in the rows under Pasture Types by the Grade/Priority number.

(II) Perennial grass and lucerne

(III) Lucerne

Farmers

(I) Lucerne

(II) Direct drilled oats into lucerne

(III) Perennial grass and lucerne

As you can see lucerne (with or without annual legumes) scores best according to my farmers set of priorities. This is the option the Wass family have elected for (see Part B of this paper).

Establishment techniques for lucerne and annual legumes

As mentioned previously the establishment techniques we use are those refined by Rick Young and Paul Lukins of NSW Agriculture. It should be stated that a range of techniques work quite well in our area. One of the most respected producers, Neil McDonald, commented that the most important step is to put pasture seed in the seed box.

The following are some of my experiences plus the shared experiences of our "Pastures Pay" group and what we have gleaned from NSW Agriculture trial work.

Paddock selection

I try to sow down paddocks that have had 2 to 3 years of crop with excellent broadleaf control. My aim is not to have to spray the undersown crop for broadleaves at all. I spray the first crops in the rotation even if the broadleaf population is low.

Weed control

I have used combinations of 2,4 D-B, diuron and other herbicides for broadleaf weed control in undersown crops. All come at a cost in monetary terms and in setting back the undersown pasture. I rely on expert advice on which herbicide option is best as new products or combinations regularly become available.

Cover crop

A debate exists as to whether to use a cover crop or not. It is sometimes said, especially by serious lu-

Table 4. Budget comparing costs and returns of undersowing a pasture versus sowing a pasture alone in the following year. Contact rates are used.

Month	Year 1 Undersown wheat 400 ha (Assume 1.2 t/ha at \$150/t)			Year 1 Wheat crop 400 ha (Assume 1.4 t/ha at \$150/t)		
	Operation	\$/ha	Total \$	Operation	\$/ha	Total \$
Jan/Feb	Spray	\$4.45	\$1,780	Spray	\$4.45	\$1,780
	Glyphosate (600 ml)	\$4.80	\$1,920	Glyphosate (600 ml)	\$4.80	\$1,920
	2,4-D (300 ml)	\$2.85	\$1,140	2,4-D (300 ml)	\$2.85	\$1,140
Mar/April	Scarify	\$16.01	\$6,404	Scarify	\$16.0	\$6,404
	Fuel	\$2.38	\$952	Fuel	\$2.38	\$952
	Grade seed	\$0.80	\$320	Grade seed	\$0.80	\$320
	Pasture seed (4 kg/ha)	\$16.00	\$6,400	Pasture seed	\$0.00	\$0
	Fertiliser (50 kg/ha)	\$22.40	\$8,960	Fertiliser (50 kg/ha)	\$22.00	\$8,920
May/June	Sow	\$17.50	\$7,000	Sow	\$17.50	\$7,000
	Fuel	\$2.38	\$952	Fuel	\$2.38	\$952
July/Aug				Spray	\$4.45	\$1,780
				MCPA LVE (500 ml)	\$4.50	\$1,800
Nov/Dec	Harvest	\$25.00	\$10,000	Harvest	\$25.00	\$10,000
	Fuel	\$1.36	\$544	Fuel	\$1.36	\$544
	Freight	\$12.00	\$4,800	Freight	\$14.00	\$5,600
Total cost	\$127.93	\$51,172		\$123.68	\$49,472	
Total income		\$72,000			\$84,000	
Gross margin		\$20,828			\$34,528	
Gross margin/ha		\$52.07			\$86.32	
	Year 2 No expenses occurred			Year 2		
	Operation	\$/ha	Total \$	Operation	\$/ha	Total \$
Jan/Feb				Spray	\$4.45	\$1,780
				Glyphosate (600 ml)	\$4.80	\$1,920
				2,4-D (300 ml)	\$2.85	\$1,140
Mar/April				Scarify	\$16.01	\$6,404
				Fuel	\$2.38	\$952
				Pasture seed (4 kg/ha)	\$16.00	\$6,400
				Fertiliser (50 kg/ha)	\$22.40	\$8,960
				Sow	\$17.50	\$7,000
May/June				Fuel	\$2.38	\$952
Total cost				\$76.77	\$30,708	
Total income					\$0	
Gross margin					-\$30,708	
Gross margin/ha					-\$76.77	

cerne growers, that the best thing to sow with lucerne is more lucerne. Parkes farming identity, Phillip Adams, recently commented that being a simple soul he likes to have only one crop in a paddock at a time. Bob Thompson, forthright West Wyalong District Agronomist, advocates sowing lucerne alone at a high sowing rate (4-5 kg/ha). I understand a number of successful growers in his region adopt this policy.

In our area and certainly amongst our pastures group, undersowing a cover crop is virtually the only option used. Wheat and barley are the most popular crops. Sowing rates of 15-25 kg/ha of the cover crop are used. Oats is generally regarded as being too competitive to use but I have successfully used oats grazed by cattle.

I like to sow pastures as early as possible in the growing season and this necessitates using suitable

early wheat varieties like Sunkota and Batavia.

Sowing method

Hayden Wass has outlined his technique for sowing pastures in his paper (Part B). I use a small seed box dropping seed behind a levelling bar and in front of harrows. I have also employed contractors with air seeders. Pasture seed is blown onto small dispersing plates and scattered in front of trailing harrows. This is less satisfactory but good results have been obtained. Local farming legend Garry Black sows lucerne seed together with the wheat. For Gerry in his lighter mallee soils this technique works very well.

Sowing rate

I sow between 1-2 kg/ha of lucerne. In country which has never had annual legumes I sow about 5 kg/ha of a mix of species. This mix usually includes

Paraggio, Sephi or Jemalong barrel medics, Nungarin or Dalkeith subclover, Hykon rose clover and in lighter country serradella.

I aim for 10 to 20 lucerne plants/m². I don't know what the optimum density should be. A high plant population is ideal for wheat growing but is nutritionally unbalanced (leading to bloat in cattle and redgut in sheep) and provides a "feast or famine" feed supply.

Grazing management

I hope for a wet summer to allow a young lucerne crop to flower. Failing this I lightly graze the stubble and for short periods if sheep are used. I am quite happy to leave cattle in lucerne paddocks for months. In the 1994 drought I lot fed cattle in a lucerne paddock for most of the year with no ill effects to the lucerne.

I rotationally graze lucerne but not in a particularly organised or disciplined fashion. I like to allow it to flower every year and judge the vigour of the plant population by how rapidly it responds to rain. If a paddock responds slowly compared with others I assume the root reserves are depleted and more care is required.

I once attempted to harvest lucerne seed after a wet summer. After spending wildly on *Heliothis* control and bees for pollination, a week of extreme heat fried the crop. I now speculate that if lucerne does set seed, perhaps grazing by cattle might produce regeneration from ingested seed passed in cow manure and buried by dung beetles?

I have finally arrived at the topic I was asked to

discuss: What is the cost of good pasture establishment? For the purpose of the argument I will discuss lucerne establishment, even though, as mentioned previously, it may not be the best option in all situations.

I have prepared two budgets to compare undersowing with sowing a pasture alone the next year. These are shown in Table 4. Contract rates have been used. Many will be able to do these operations cheaper. At the end of the second year my budgets show a return of \$20,828 for the undersown option and \$3,820 for the crop followed by the sown pasture. This is a difference of just over \$17,000. As I have never sown pastures alone I cannot say whether this method is sufficiently superior to recoup savings incurred in undersowing pasture.

Conclusions

Pasture development in the Condobolin district has evolved from native pasture through volunteer "pasture" after cropping to annual legumes and finally lucerne based pastures. In my opinion, lucerne based pastures are the most appropriate while the current disparity between livestock and cropping returns exist. The next step for most of us is to develop fully balanced pastures using perennial grasses along with annual legumes, lucerne and perhaps annual grasses.

In addition we need to become more skilled at pasture manipulation to alter or maintain botanical compost and pasture vigour. I have discussed the direct drilling of oats (plus pasture seed if necessary) into existing pastures as one option.