Economics of pastures versus grain or forage crops

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Abstract

The relative profitability of livestock and cropping fluctuates with livestock and grain prices. In recent years, high beef prices and low grain prices have meant that well managed pastures have been more profitable than grain crops, particularly where grain yields are restricted by soil constraints. However, over the last 15 months, world grain prices have doubled and the economics of pastures versus grain and forage crops have changed.

While grain production is likely to regain predominance as the most profitable farming enterprise on the better farming land of the Darling Downs, pastures are still likely to produce profits comparable with grain on a per hectare basis, where soil type or land degradation limits grain potential to modest yields. Nitrogen benefits and improvements to soil health are likely to provide a bonus.

Pastures appear to be a more profitable and sustainable option than forage crops for cultivation on sloping lands of the Darling Downs and the western Downs. Livestock producers should seriously consider the benefits of pastures versus forage cropping and put a value on soil structure, erosion and fertility decline.

Introduction

Many farms in southern Queensland have a mix of cropping and livestock. In recent years, an increasing amount of cultivation land has been planted to pasture, in response to high beef prices and low grain prices. Farmers rarely calculate whether pastures are more profitable than grain crops, but there is a need to do so when making decisions on planting alternatives. Since pastures are a long-term management change, it is also necessary to examine the possible future prices for crops and livestock.

Over the last 15 months, world grain prices have doubled and the economics of pastures versus grain and forage crops have changed. The increasing use of grain for ethanol has increased demand and reduced stocks of grain.

Forage crops are the other competitor for use of cultivated land. Pastures can often produce as much livestock feed as forage crops with lower costs. Farmers need to consider problems associated with growing forage crops, *i.e*., soil structural degradation and fertility decline, while pastures can build soil organic matter, structure and fertility. The contribution of nitrogen by pastures and improvements in soil structure can make a cropping phase following pasture more profitable.

Rising grain prices

It is necessary to have a view on grain prices before considering the planting of pasture for 3 or more years on cultivated land. The dramatic rise in grain prices over the last year needs to be considered in determining the optimum mix of enterprises on a farm.

Over the last 12 months, world grain prices have doubled, with the price of corn rising from $US2.10/bu ($A110/t) to $US4.30 ($A217/t). The increasing use of grains for fuel has increased the demand for grain, and the export parity price for sorghum is now in the vicinity of $210/tonne.

According to market analysts, the pricing of corn and soybeans is now being determined on the basis of grain as a fuel, not as a feed grain. The building program of ethanol plants means that more grain will be used for ethanol

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over the next 2 years and the worldwide shortfall of coarse grains, estimated by the USDA to be 40 Mt in 2006–07, is likely to increase rather than decrease.

According to Renewable Fuels Association (2007), there are currently 113 grain ethanol biorefineries in the USA, with the capacity to produce more than 5.5 billion gallons (20 billion litres) of ethanol annually. An additional 85 construction projects are underway that will add more than 6.2 billion gallons (23 billion litres) of new ethanol production capacity in the next 18 months.

A total of 11.7 billion gallons will require 107 Mt of corn, and produce 32 Mt of distillers grains, resulting in a net use of approximately 75 Mt of corn. This huge increase in the demand for corn, continuing over the next 18 months, suggests grain prices will not decline in the foreseeable future. If grain prices stay high, livestock prices will also rise over the next few years to remain somewhat in equilibrium with grain prices. This is because a large amount of beef is produced from grain, particularly in the USA. An ongoing watch is needed on the relative prices of beef and grain.

Economic comparisons of crops and pasture

Comparisons can be made for the alternative use of cultivated land, by calculating the potential income and subtracting the estimated costs of production. It is important to include the costs of running livestock as a cost in lieu of harvesting a grain crop. These may be considerable if livestock are brought on to the property specifically for fattening on forage. In the example below, it is assumed the livestock are already on the property and only 50% of the freight and selling costs are included.

Overhead costs of machinery, labour and administration need to be considered. Pastures have lower costs for machinery depreciation and labour. In some cases it may be possible to convert the whole farm to pasture, eliminate machinery costs and earn extra income off-farm.

With these changes in labour, machinery and overhead costs, it is better to examine the income potential and costs on a whole-farm basis, rather than on a per hectare basis. A whole-farm profit target can be used for this and downloaded from www.grdc.com.au/growers/res_summ/hor6/index.htm.

However, for a farm where no large changes in labour or machinery are envisaged, the profit on a per hectare basis is a good starting point.

Realistic assumptions for fodder crop production need to be made, bearing in mind dry years when yields are much lower and/or length of grazing is shorter. On old cultivation land, soil nitrogen levels are commonly low and it may be necessary to use nitrogen fertiliser for optimum yield of grain and forage crops. Grass pastures have a similar need for N (Meyers and Robbins 1991) and should be compared on the same basis,

Table 1. Profits from grain, forage crop and pasture on the northern Darling Downs.

	Grain sorghum	Forage sorghum[3]	Lucerne: 3 years[4]	Grazing oats[5]	Dolichos lablab[6]	Pasture: 5 years[7]
Produce (kg/ha)	3200	308	204	275	200	234
Price ($/t or kg)	210	2.00	2.00	2.00	2.00	2.00
Return ($/ha)	672	616	408	550	400	468
Fuel & repairs	96	96	40	96	96	40
Fallow spray	55	25	10	25	25	10
Seed cost	30	60	16	44	60	20
Fertiliser	72	72	12	60	18	62
Herbicide	30	0	14	12	0	14
Harvest, misc.[1]	60	158	56	100	100	62
Growing costs	343	411	148	337	299	208
O'head costs[2]	186	186	120	186	186	120
Profit ($/ha)	**$143**	**$19**	**$140**	**$27**	**–$85**	**$140**

[1] Livestock costs: 50% of freight and selling costs of $40, health and deaths $12, fencing and water $30/ha.
[2] Overheads, northern Downs: Labour $72 (pasture 50%), Machinery $60 (Pasture 50%), Admin $54.
[3] Forage sorghum: 4 steers/ha for 110 days @ 0.7 kg/d = 308 kg LWG/ha.
[4] Lucerne: 0.8 steers/ha for 320 days @ 0.8 kg/d = 204 kg LWG/ha.
[5] Grazing oats: 2.5 steers/ha for 100 days (av. year) @ 1 kg/d = 250 kg LWG/ha.
[6] Lablab: 2.5 steers/ha for 100 days (av. year) @ 0.8 kg/d = 200 kg LWG/ha.
[7] Pasture: 1 steer/ha for 360 days @ 0.65 kg/d = 234 kg LWG/ha.

with the use of nitrogen fertiliser, unless a suitable legume can be included to provide enough nitrogen for the grass.

This analysis shows that, even at high prices for grain, pasture can produce comparable profits from grazing steers on land, which is not so good for growing grain. On soils with good water holding capacity, an average sorghum yield of about 4.5 t/ha should be achieved, compared with the sorghum yield of 3.2 t/ha used in this example, while farmers on the plains of the Darling Downs and the alluvial flats of the southern Downs achieve average yields in the vicinity of 6 t/ha. On the Darling Downs, sorghum has potential for better profits than winter crop because it generally has higher yield potential.

It should be noted that breeding cows are likely to be around 50% less profitable than fattening steers. It is difficult to establish the profit from dairy cows, because pasture quality becomes important on a year-round basis. There are, however, other options, such as supplementing pasture in winter with cottonseed or other protein supplements, and feed budgets need to be made on a whole-farm basis for such comparisons.

Forage oats and sorghum need to be fertilised well and the grazing managed well for good beef production per hectare. Rotational grazing and adjusting stock numbers to avoid under-utilisation and trampling help to make the most of the feed produced. One factor, which impacts on the value of forage sorghum, is that, in a summer with plenty of rain, the sorghum may be just replacing grass and the value of the grazing may be less than indicated.

Pastures more soil-friendly than forage

Grazing of fodder crops impacts on soil health. Compaction from grazing usually means the land needs to be cultivated and, coupled with poor stubble cover left after a forage crop, can affect the yield of the next crop.

The cropping season may be longer, reducing the chance of recharging soil moisture. For example, grain sorghum planted in September might be sprayed out in early January, while forage may go on much longer, using more moisture and making it difficult to go back to winter crop.

Every millimetre of soil-stored water is worth money. It is common for soil-stored water to produce 15 kg of grain per millimetre. If forage sorghum continued for another month beyond grain sorghum and used an extra 50 mm of soil moisture, this could cause a $75 per hectare reduction in the profit from the next crop.

Zero-tillage is an important means of providing protection from soil erosion and halting the on-going decline in soil organic matter. Zero-tillage systems can improve moisture storage and the yield of grain crops, but the compaction from grazing animals and a lack of stubble cover may mean that no extra water is stored in a forage cropping system. In fact, tillage may improve the infiltration of water in the absence of stubble cover, a result demonstrated in the Billa Billa fallow management trial (Thomas 1997).

Land degradation can be worse for oats than forage sorghum, because the land is unprotected over the main summer storm season. Low soil cover after grazing, combined with compaction from cattle, can lead to more runoff and soil erosion. Wheat after oats will generally yield less than wheat after wheat.

Sometimes farmers change old cultivation from grain to growing oats for grazing, because the paddock is ‘worn out’. This can result in a faster rundown of organic matter and fertility, with more erosion and less organic input. Pasture on the other hand is likely to build soil structure and fertility. With lower overhead costs, pasture can make more profit per hectare than a forage crop. A lucerne pasture can produce almost as much beef per hectare as oats in a year, at a lower cost (see Table 1) and will improve soil health, rather than cause further decline.

Lucerne has benefits and some problems

Lucerne can be used as a short-term pasture with potentially greater profit than most forage crops. One of the benefits of lucerne is a significant gain in soil nitrogen during the growth of a lucerne pasture. Secondly, the quality of the pasture is relatively high. Thirdly, lucerne can respond to rain at any time of the year and will therefore make good use of any rainfall in winter.

There are, however, some drawbacks with lucerne, the first of which is to manage bloat in cattle. Secondly, cattle will graze lucerne with a high utilisation rate and there may be less forage reserve than with a grass pasture. This means the feed supply runs out more quickly in a dry season.

A third problem involves the killing of lucerne and the return from pasture to crop or other land use. The storage of moisture in soil after lucerne is usually less than after a grain crop, but this may be due as much to a poor kill of the lucerne and a lack of ground cover as it is to the deep depletion of moisture by the lucerne plant. A lot of the soils on the slopes of the northern and western Downs have a limited depth, where depletion of moisture beyond the normal crop rooting depth is not an issue.

On deep clay soils, a grain crop in the first year following lucerne may be lower in yield, but in the second or third year after lucerne, wheat or other grains should yield more and cost less, owing to the extra nitrogen left behind by lucerne. Grain protein may be higher (Lloyd *et al*. 1991).

If soil structure is a major issue, longer-term (4–5 years) grass-medic pastures might be a better option than lucerne. However, grass is more difficult to establish. Lucerne might be hard to kill at the end of the rotation, but it is easier and more reliable to establish.

Lablab

Lablab provides higher quality feed than sorghum, but less of it. It is not as well suited to early planting (in September) and time to grazing is likely to be longer. There is a nitrogen bonus, however, for the next crop, with an extra 40 kg of N, worth $50/ha, likely in an average year.

Nitrogen has a value

Grass is not a sustainable pasture. Productivity will eventually run down without an input of nitrogen (Meyers and Robbins 1991). The production from a grass-medic pasture after several years can be 3 times that from a grass-only sward (Lloyd and Hilder 1985). Lucerne and medic not only provide a significant contribution of feed from winter rainfall, but also can boost grass production during summer through their nitrogen input. Over 6 years, the estimated nitrogen contribution from annual medic at Toowoomba was 71 kg/ha/yr (Lloyd and Hilder 1985). Even when there is a series of dry winters, the occasional good year can provide a large input of nitrogen to keep the pasture going.

Crop production on old cultivation requires nitrogen inputs for optimum yield and profit. Legumes or legume-based ley pastures can reduce the need for fertiliser and improve grain protein levels, beyond that expected from the addition of nitrogen fertiliser.

An example of the effect of these benefits is to improve the profit from wheat grown after lucerne on the western Downs. A 3-year rotation of lucerne with 3 years of wheat (averaging $207/ha profit) could be almost as profitable as continuous wheat ($242/ha profit — see Table 2). The ley pasture could have additional benefits from the rotation, such as control of root diseases and nematode pests of wheat. The yield estimate shown for wheat after lucerne in Table 2 allows

Table 2. Comparisons of wheat and pasture alternatives on the western Downs and the profit from wheat after a lucerne ley pasture.

	Wheat	Grazing oats [3]	Lucerne: 3 years [4]	Wheat after lucerne	Pasture: 5 years [5]
Yield (kg/ha)	2600	198	144	2600	152
Price ($/t or kg)	235	2.00	2.00	245	2.00
Return ($/ha)	611	396	288	637	304
Fuel & repairs	54	65	28	54	28
Fallow spray	45	35	13	45	13
Seed cost	26	45	14	26	20
Fertiliser	74	12	12	18	12
Herbicide	11	0	15	11	0
Harvest, misc.[1]	44	88	40	44	43
Growing costs	254	245	122	198	116
O'head costs[2]	115	115	75	115	75
Profit ($/ha)	**242**	**36**	**91**	**324**	**113**

[1] Livestock costs: 50% of freight & selling costs of $44, health & deaths $12, fencing and water $20/ha.
[2] Overheads: Labour $40 (pasture 50%), Machinery $40 (pasture 50%), Admin $35.
[3] Grazing oats: 2 steers/ha for 90 days (av. year) @1.1 kg/d = 198 kg LWG/ha.
[4] Lucerne: 0.6 steers/ha for 300 days @ 0.8 kg/d = 144 kg LWG/ha.
[5] Pasture: 0.65 steers/ha for 360 days @ 0.65 kg/d = 152 kg LWG/ha.

for a reduction in yield of the first wheat crop after lucerne, but a gain in yield in the subsequent 2 years due to less root disease.

In the above comparison, grazing oats is once again less profitable than pasture, whether it is a lucerne ley or a grass-legume pasture. It also has more detrimental effects on soil health, with more compaction, less stubble cover and a likely decline in soil organic matter compared with an increase with pasture.

Machinery and scale of profitable grain production

Improvements in grain yields and reductions in costs have been required on an ongoing basis for farmers to remain profitable over time. Labour and machinery need to be used over a significant area of cropping, with an area in excess of 500 hectares on the Darling Downs, to generate reasonable surplus.

Farm machinery capable of zero-tillage, tramlining, moisture seeking and the flexible application of fertiliser is necessary to conduct sustainable and profitable cropping programs.

If the area of cultivated land is small and capital for new machinery is limited, possible options are to convert cultivation to pasture or to use contractors for most of the cropping operations.

If there are major changes in labour, machinery and overhead costs, it is important to examine the effects of these changes in income potential and costs on a whole-farm basis, rather than on a per hectare basis.

Conclusions

Grain prices have improved considerably in recent months and are unlikely to retreat for the foreseeable future. On the better farming land across southern Queensland, grain production is likely to regain predominance as the most profitable farming enterprise.

Pastures are still likely to produce profits comparable with grain on a per hectare basis, where soil problems or the accumulated effects of land degradation limit grain potential to modest yields. Nitrogen benefits and improvements to soil health can provide an additional bonus from pasture rotations.

Pastures can generally be more profitable and sustainable than forage crops for cultivation on sloping lands of the Darling Downs and the western Downs. Livestock producers should seriously consider the benefits of pastures versus forage cropping.

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Forage crops and grasses 1353. Agriculture and animal husbandry in India are interwoven with the intricate fabric of. the society in cultural, religious and economical ways as mixed farming and livestock.Â fodder and fodder from common property resources like forests, permanent pastures. and grazing lands. At present, the country faces a net deficit of 61.1% green fodder, 21.9% dry crop. Winter crops in most of these regions are still in good condition, but more rain is needed to sustain a posi-tive yield outlook. However, the very dry upper soil layers are having a negative impact on sowing and emergence of spring and summer crops.Â crops present early development stages and very favourable biomass accumulation (Macroregiunea Patru). Eastern regions are suffering from a prolonged rainfall deficit: crop water demand has been met up to now but more rain is needed.Â 3 Pastures in Europe â€“ regional monitoring. More rain needed to sustain high pasture productivity. The Pasture Productivity Index (PPI1) for the period 1 March to 10 April presents above-average values in most of Europe, reflecting a predominance of favourable conditions. Economics of Grazing Systems Versus Row Crop Enterprises. K.C. Moore and J.R. Gerrish1. Abstract. With the eventual release of CRP lands, conservation compliance costs and environmental concerns, producers are looking for alternatives to cropping marginal agricultural land. Intensive rotational grazing systems offer the potential for greater utilization of forages in a livestock grazing operation, but the costs of developing such an enterprise can be substantial.Â Management intensive grazing offers the potential for better utilization of grazed forage crops via rotational grazing of livestock through a series of pasture subdivisions. While the costs of fencing and watering systems can be substantial, they open up the potential for much greater returns to grazing enterprises. The economic impact of pasture ley crops on crop production systems Integrating pasture ley crops into a crop production system has been proven to have significant merit, which often reflects in short- and long-term economic returns.Â Economics of pastures versus grain or forage crops. Tropical Grasslands 41, 229 - 233. Publication: October 2017.