Butterfly Pea – A Legume Success Story in Cropping Lands of Central Queensland

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ABSTRACT

The central Queensland region is a major producer of wheat, sorghum and beef. Changes in relative values of cereals and beef, together with a market demand to finish steers at a younger age, has induced farmers to invest more resources into their beef enterprises. Soil fertility decline is seen as a major constraint to cereal production and one that can be overcome by use of pasture phases in crop rotations. Within this environment, butterfly pea (*Clitoria ternatea*) has emerged as a well-adapted summer-growing legume for the heavy textured cropping soils of the region. It is being sown into existing or new permanent pastures and in pasture phases within cropping rotations to improve animal production and soil nitrogen status. Butterfly pea is relatively inexpensive to establish and can provide liveweight gain of between 0.75 and 1.3 kg/head/day. The combination of farmer, extension and research inputs has resulted in widespread adoption with > 12,000 ha being successfully established over the past 3 years.

KEY WORDS

Butterfly pea, phase farming, ley legumes, Central Queensland, crop rotation, animal production.

INTRODUCTION

Beef and grain are the two major dryland agricultural industries in central Queensland and contribute 25% of Queensland's beef production and 26% of the cropped area. The total cropped area exceeds 500,000 ha. The central Queensland region lies between 22 and 25^{o}S and has a semi-arid subtropical climate. The region has hot summers with mean daily maximum temperatures of 34-35?C. Winters are mild with 5 to 15 frosts per year and mean daily minimums temperatures of 5 - 7?C. Mean annual rainfall is 600 to 700mm with 70 – 80% falling during the summer period. However rainfall is extremely variable and evaporative demand is high. High intensity storms and soils with low infiltration rates result in potentially high run off and reduced effectiveness of rainfall. The climatic characteristics provide a high risk-cropping environment.

Within this environment, there has been a rapid increase in the area sown to improved legume-based pastures in recent years. There are two reasons for this. Firstly market specifications for beef cattle require that steers be marketed at an earlier age. Legume - grass pastures are recognised as a lower cost option than feed lots to meet beef marketing specification. Secondly, farmers have attempted to counter low commodity prices by seeking increased production per hectare while reducing overall costs. One of the cost reduction options for cereal farmers with beef enterprises has been to include a legume-based pasture in their cropping rotations. This provides forage to achieve high animal production and at the same time reduces nitrogen fertiliser costs as the pasture phase provides significant soil nitrogen for subsequent crops.

This paper reports on the rapid uptake of butterfly pea (*Clitoria ternatea*) in central Queensland, the soil types on which it is used, its management, utilisation and productivity.

MATERIALS AND METHODS

Butterfly pea has been commercially sown in central Queensland for over 6 years. In that time several on-farm trials have been conducted to determine optimum sowing rates, weed control measures and other appropriate management practices. Measurements of legume yield and animal performance have been

obtained from both on-farm trials and from commercial sowings. These data have been used as the basis for estimating both the costs of establishment of butterfly pea pastures and their economic returns.

Major soil types

Butterfly pea is being widely sown on two major soil types in central Queensland. The open downs soils are dark cracking clays, which support bluegrass (*Bothriochloa* and *Dichanthium* spp.). Scattered trees consist mainly of mountain Coolibah (*Eucalyptus orgadophila*) and red bloodwood (*Eucalyptus dichromophloia*) with black tea tree (*Melaleuca bracteata*) in the gullies. These soils are relatively low in nitrogen and phosphorus with zinc and sulphur levels often marginal. The soils vary in depth from 40 – 90cm. Long slopes and soils with low infiltration rates make soil erosion a major hazard. Brigalow soils are also dark cracking clay soils but are usually deeper and more fertile than open downs soils. Brigalow (*Acacia harpophylla*) grows either as a single dominant species or with a range of softwood species including (*A. cambagei*) and blackwood *(A. argyrodendron*) in the northern area and wilga (*Geijera parviflora*), belah (*Casuarina cristata*) and bonewood (*Macropteranthes leichardtii*) in the southern part.

Butterfly pea – the plant

Butterfly pea is a perennial, summer growing legume that regenerates from seed on clay soils. It is palatable and has high nutritive value, generally high leaf nitrogen and low acid digestible fibre (ADF) (2). It is well adapted to regions with an annual rainfall between 650 and 1250 mm and to clay soils. Butterfly pea cv. Milgarra was registered for release as a cultivar in November 1991 (1). Milgarra is a composite line developed by combining selected introduced and naturalised lines over 3 generations following the classification and field evaluation of introductions in north Queensland (4).

RESULTS

Leucaena (*Leucaena leucocephala*) / buffel (*Cenchrus ciliaris*) pastures are considered by cattleman to be the premium pastures in central Queensland for finishing steers. Leucaena grows best in deep fertile soils (high P) with good internal drainage and an estimated 50,000 hectares of leucaena based pastures have been established in the region (3). Despite rapid adoption of leucaena, butterfly pea is seen as having some attributes that make it preferable in some situations.

- Leucaena is very persistent and costly to remove. It is a plant for permanent pastures.
- Butterfly pea is a herbaceous plant and easy to remove to get back into cropping.
- Soils may be too shallow for leucaena. This is especially important on the shallow open downs soils.
- Butterfly pea has lower establishment costs (AUS$110/ha) than leucaena (AUS$210.00/ha)
- The high risk of failure in establishing leucaena because of its sensitivity to weed competition and sowing technique (3).
- Where the legume is being used in a crop rotation, the costs or removing leucaena are prohibitive
- Butterfly pea is faster to establish and has a much shorter time to the first grazing and production.

Butterfly pea management and adoption

Rapid adoption of butterfly pea has been achieved because of the effective partnership between farmers, extension specialists and researchers. To a large extent, this partnership has been led by a farmer and seed producer who initiated much of the production and establishment techniques that are currently being used. Some of the most important management recommendations that have been developed from these partnerships are:

- Seeding rates of 2 - 4 kg/ha for permanent pastures and 6 kg/ha for short-term phase pastures to achieve optimum plant densities of between 5 and 10 plants/m^2.
- Sow into moist soils at 2.5 - 6.5 cm and use presswheels or a roller to ensure good soil-to-seed contact.
- Narrow row spacings are preferred (15 – 30 cm)

- Use of pre-emergent herbicide (Spinnaker at 200 – 400 mL/ha) 2 to 8 weeks prior to sowing is almost essential to achieve successful control of weeds during establishment.
- Limited grazing during the establishment year will enable plants to set seed for regeneration and also enable them to develop a strong frame that can withstand grazing.

Dry matter production is very dependent upon season conditions but in the first year of growth yields can range from 500 to 4,000 kg/ha. In subsequent years dry matter production can range from 1,500 to 5,000 kg/ha in pure or near pure butterfly pea pasture. Animal production figures for steers grazing butterfly pea or butterfly pea - grass pastures range from between 0.75 to 1.3 kg/head/day. These production figures can translate to returns of ca. AUS$190.00/ha even if benefits to subsequent crops from improved soil nitrogen are ignored.

CONCLUSIONS

Based on the seed produced and sold over the past 3 years, it is estimated that about 12,000 ha are currently being grown and this is expected to increase by at least 5,000 ha each year for the next 3 years. However the area sown in the future will depend on seasonal conditions and the relative world market prices for cereals and beef. Nevertheless there is sufficient evidence to declare butterfly pea a success in central Queensland farming systems. Interestingly this success has many parallels with the on-going success of leucaena within the same region. The most striking is the well developed partnership between farmers, seed producers, extension specialists and researchers to provide information on establishment and other management issues to potential users of the legume.

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