The impact of a farming systems approach on adoption of Butterfly Pea in Central Queensland

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ABSTRACT

In 1997 the Central Queensland Sustainable Farming Systems Project team recognised butterfly pea (Clitoria ternatea) as a promising phase legume for cropping systems in the region and decided to support its development. One of the strengths of the farming systems approach to R,D&E is its capacity to coordinate and integrate a range of R,D&E initiatives towards a particular objective. This was done with butterfly pea. It involved research into establishment and weed control, grazing trials, economic analysis, video production and distribution, field days, agronomic and technical support and developmental plantings by farmers within the farming systems network. Plantings of butterfly pea have increased from 500 ha in 1996-97 to 30,000ha in 1999-2000, with a strong expectation of continuing expansion.

KEY WORDS

Farming systems, process, butterfly pea, phase pasture, ley.

INTRODUCTION

In recent years significant R,D&E effort in the grain growing areas of Queensland and northern NSW has been based within large, multi-disciplinary farming systems projects. This paper provides an example of how the farming systems process has had a major impact in the success of the phase legume, butterfly pea (*Clitoria ternatea*), in Central Queensland over the last 3 years. Some of the relevant and useful attributes of this process are outlined.

To provide a context for the butterfly pea initiative in Central Queensland, we give some background to the issue of soil fertility decline and a history of butterfly pea.

PHASE LEGUMES AND SOIL FERTILITY IN CENTRAL QUEENSLAND

In common with all regularly cropped areas, Central Queensland has experienced fertility decline. However, Central Queensland has not been able to use phase legumes to assist in overcoming this problem, as has been the case in southern Australia. This has meant nitrogen fertility decline has continued unabated since extensive farming developed in the region in the late 1940's.

One substitute that has been used is lab lab, a short-term, legume forage that must be re-planted every year or every second year. It is therefore not ideal as a phase legume species, even though it is highly productive.

Leucaena, a popular browse shrub in Central Queensland, is totally unsuitable as a phase legume because it probably needs to be in the ground for at least 10 years to be cost-effective. It then requires land to be re-cleared before cropping can recommence. Other legumes, such as Siratro, have failed as phase legumes in the region.

A good phase legume, which we believe is the key to sustainable and profitable farming in Central Queensland, has therefore been elusive.

Nitrogen fertiliser has been used to maintain soil nitrogen fertility under cropping. However the application of nitrogen can be a high-risk strategy in the highly variable rainfall environment of Central Queensland. This is particularly the case on the shallow soils that are fairly common in the region.

BUTTERFLY PEA AS A PHASE LEGUME

The quest for a productive and adapted phase legume for the cropping soils of the region, the “holy grail” of Central Queensland farming systems, appears to be over. Butterfly pea has proven itself to be the winner that we in the Central Queensland Sustainable Farming Systems Project hoped it would be in 1997.

The attributes of butterfly pea as a phase legume are –

- Suited to heavy clay cropping soils in Central Queensland
- Perennial – does not require re-sowing
- Self-regenerating from seed – populations increase over time
- Competitive with weeds and grasses once established
- Fine stems allowing possibility of zero-till in a subsequent cropping phase
- Frost tolerant in CQ and regenerates quickly in warm, wet weather
- Weed control at establishment is relatively easy
- Removal of butterfly pea as a weed in crops is easy
- Productive with good quality forage
- Provides excellent weight gains in cattle
- Recovers from “abusive” grazing
- Multipurpose – seed, grazing, hay
- Heliothis resistant
- Builds soil fertility

DEVELOPMENTAL HISTORY OF BUTTERFLY PEA

The history of butterfly pea in Australia can be divided into four stages as shown in Figure 1.

Figure 1 shows the firm foundation of knowledge developed by DPI and CSIRO scientists and the critical development work and persistence of a leading farmer, Stuart Coaker, prior to the farming systems project’s involvement. The project successfully capitalised on this foundation.

Up until the early 1990’s butterfly pea was being evaluated as a legume for permanent pastures on a range of soils rather than as a phase legume for the heavy clay soils that are used for cropping. Poor establishment when sown into existing grass pastures, together with the high cost and indifferent performance of Milgarra in these permanent pastures, are some reasons why the legume failed to find favour with farmers.

The farming systems project’s butterfly pea initiative has been targeted specifically at phase legume issues on heavy clay soils and has been directed at solving problems and answering questions in that context.

RESULTS

Project initiatives

The project’s butterfly pea initiatives have –

- Developed an establishment package for butterfly pea including recommendations from our process research on row space, plant population, and weed control.
- Organised a permit for use of the herbicide, Spinnaker, to control weeds in butterfly pea at establishment.
- Demonstrated that butterfly pea can be effectively controlled as a weed in grain crops using current herbicides.
- Measured cattle weight gains and economic returns from grazing butterfly pea at two development sites. The site grazed for longest returned a gross margin of $194/ha from 89 days grazing, with weight gains of 0.91kg /head/day. The group member at this site has planted a further 520 ha of butterfly pea on his farm last summer.
- Implemented a further group development site with butterfly pea and the recently released Burgundy pea (*Macroptilium bracteatum*) to develop grain farming systems based on sole legume and legume/grass phase pastures.
- Collaborated with industry in a full-year, 40ha grazing study at Orion.
- Had Sustainable Farming Systems Project group members plant whole paddocks of butterfly pea with a view to restoring fertility on “worn out” cropping country.
- Taken extensive samples from butterfly pea stands varying in age from recently planted to 7 years old in order to monitor soil fertility build-up.
- Run two successful butterfly pea field days in autumn, 1999. These were at “Maria Downs” (Knox Jamieson) and “Lindley Downs” (Stuart Coaker), the latter attracting over 70 people.
- Carried out numerous farm walks at development sites where butterfly pea has been featured.
- Produced a popular 40-minute butterfly pea video in 1998, with over 200 copies in circulation.
- Seen butterfly pea sales rise exponentially in Central Queensland

Stage 1

Introduced to northern Australia with Chinese in the gold rush years of the 19th century.

Stage 2

Trialed extensively by DPI throughout Queensland as a pasture legume and recognised in the 1980’s as a useful pasture species for regions in the Gulf of Carpentaria by Trevor Hall, DPI (1).

Released by Trevor Hall as cv. Milgarra in November 1991- a composite comprising 20 selected, introduced and naturalised lines (2).

Seed increase by John Hopkinson (DPI) at Walkamin Research Station.

Farmer evaluation as a legume for permanent pastures through to the mid-1990’s.

Decline in interest with one remaining grower, Stuart Coaker.

Stage 3

Evaluation on heavy clay soils in Central Qld as a pasture legume by Bob Clem and Maurie Conway (DPI) and Dick Jones and Bruce Pengelly (CSIRO).

Continuing development and plantings by Stuart Coaker, “Lindley Downs,” Orion, Qld.

Stage 4

Recognition of its potential as a phase legume in 1997 by staff of the project, Sustainable Farming Systems for Central Qld.

R,D&E by the CQ sustainable farming systems project including evaluation and development as a phase legume by farmer participatory action learning groups.

Promotion and recommendation using agency credibility and resources.

Rapid adoption as both a phase and pasture legume from less than 500ha in 1996-97 to more than 30,000 ha by 1999-2000.

Figure 1. History of butterfly pea development in Australia.

Specific attributes of the CQ farming systems approach

Attributes that the Central Queensland sustainable farming systems project has brought to the successful development of butterfly pea as a phase legume include –

- Combining expertise from farming, scientific and agribusiness sectors.
- Linking crop and pasture experience in identifying the potential of butterfly pea as a phase legume.
- Having a project officer, Maurie Conway, with the specific expertise to answer butterfly pea questions for growers and project team members from the beginning of the project.
- Developing a new goal of butterfly pea as a phase legume, rather than as a pasture legume.
- Providing simultaneous, R,D&E across a wide geographic area.
- Providing a network of action learning groups that were keen to evaluate and develop butterfly pea at a range of sites across CQ simultaneously.
- Having action learning groups immediately implement new research and integrate it into their systems.
- Identifying through project consensus and experience the areas where R,D&E could remove blockages to butterfly pea adoption.
- Providing a focus for R,D&E and promotion of butterfly pea in CQ.
- Coordinated development and extension through action learning groups, field days, video production, farm walks, media articles etc.
- Unashamed promotion of a “good thing” in association with industry.

Generic attributes of a farming systems approach

The non project-specific attributes brought to this R,D&E work that could be relevant to any systems project are -

• Coordinated linkages to multiple stakeholders over a wide area.

• Coordinated R,D&E over a wide area.

• Provision of multi-disciplinary input for accelerated progress.

• Integration of technology on farms.

• Provision of focus and impact.

CONCLUSIONS

The fundamental advantage of a farming systems approach over previous R,D&E paradigms

is that it provides improved capacity to develop and integrate technology and accelerate progress.

In summarising the intrinsic value of this approach to the butterfly pea example, we are convinced that good communication is the prime factor linking the above attributes. However, there is a high cost associated with the large communication input required to keep many participants informed and interacting. It is nevertheless, a price worth paying.

Our perspective is that farming systems projects are a useful tool in the R,D&E process. They complement traditional R,D&E processes, but they cannot, and should not, totally substitute for them. We need both.

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