

final report

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Communication of Stylo Management Practices

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FINAL REPORT 1997-2001

Project No: NAP3.220 (PROMIS 2323)

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Milestone: FINAL REPORT October 2001

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Workshop Group - A group of about 30 pasture scientists, extension workers, graziers, agri-business and R&D funders.

Producer Consultative Group - A group of producers to oversee and review the project.

Project objectives:

By June 2001 ensure that the majority of producers with stylo-based pasture are made aware of management strategies and practices that can reduce the incidence of acidification and erosion so as to improve long term production and sustainability.

Project summary:

An investigation in 1996 (MvIvor *et al* 1997) found that legume dominance in tropical legume-based pasture was a potential environmental hazard in stylo pasture systems. Industry workshops in 1997 focussed on the problem and developed the framework of a project to address the threat. This consisted of clarifying the potential problems and identifying best bet management strategies that that could be implemented to address stylo dominance. Industry (graziers, scientists, extension people and R&D funders) prepared a set of management guidelines, which were widely promoted to industry from 1997 via all available media.

The identified management guidelines to reduce the risk of legume dominance included:

- identification and mapping of 'at risk' environments
- strategic control of grazing pressure
- summer spelling to promote grass seed production
- periodic summer burning to reduce stylo and promote grass
- use of 'grazing resilient' grasses to compete with stylo

- use of fertiliser to promote grass in specific situations
- particular strategies for managing legume seed and hay crops
- the use of GRASS CHECK to monitor pasture changes

Promotion activities highlighted the enormous positive contribution of stylo to the beef industry as well as the potential negative impacts of stylo dominance in pasture systems.

In the first year the main negotiated activities that were completed were the preparation and distribution of technical information on acidification to extension/scientific institution staff, conduct of the client awareness campaign via media stories and the preparation of a set of stylo management guidelines for all industry clients.

The major project objective of making graziers aware of potential problems was probably achieved in the second year with the flood of publicity and the colour brochure mail-out and ancillary distribution of management guidelines

This information was complemented by the inclusion of stylo management segments at Field Days and through the activities of a large number of industry group (e.g. Future Profit, Landcare). At these activities we attempted to concentrate on the positive aspects of management that benefit the producer as well as system sustainability.

Stylo management guidelines were placed on the DPI Web site and Prime Notes CD-ROM as DPI Notes.

A survey of DPI Extension staff in 1998-99 indicated that visible stylo dominance was largely absent in the favourable growing conditions of the 1998-99 summer.

Promotion of sustainable stylo management practices was continued throughout the project life. A survey of 20 of the main stylo growing shires was conducted at the end of the 2001 growing season. Replies were received from 266 growers representing nearly 500,000 ha of stylo (APPENDIX I)

The two major findings of the survey were that grazier assessment of stylo pastures indicated that stylo dominance (>75% stylo in pasture) was extremely low (< 1% of area) and that a very high percentage of graziers (>75%) were using one or more management practices that influence stylo/grass balance. Seca and Verano in the north, Seca in central Qld and Finestem stylo were the implicated where stylo content was > 50% in pasture.

Problem definition:

In the mid 1990's pasture scientists and producers were becoming aware that stylo could dominate native grass pastures in some situations. While high legume content improved overall forage quality and animal performance there was a potential problem with soil exposure to erosion where grass cover declined to a low level. A MRC (MLA) commissioned review (McIvor, Noble and Orr, 1997) of the stability of native pasture oversown with legume highlighted a potential problem of legume dominance and the associated risks. Noble *et al* (1997) further emphasised problems with stylo dominance when they showed that unused nitrogen 'fixed' by stylo dominant pasture caused significant soil acidification the lighter textured, low base soils, when leached down the soil profile.

Industry workshops were convened by MRC in November 1996 (Charters Towers) and June 1997 (Rockhampton) to review the situation. The 1997 workshop brought together pasture specialists in research and extension together with the practical use and management of stylo-based pasture provided by graziers. The workshop conclusions were:

- stylo-based pasture had a highly beneficial economic effect on beef production

- there was emerging evidence that stylo dominance, at the expense of native grass, could expose the soil to erosion and/or acidification in particular situations
- there already was a body of knowledge and practical experience available on management practices that would assist in maintaining grass/legume balance in pasture
- in the interest of the long-term production and stability of stylo-based native pasture 'best practice' management guidelines should be widely promoted to industry by a wide range of extension methods.

Defining the objectives and methodology

The objective as defined at the workshop was: *by June 2001 ensure that the majority of producers with stylo-based pasture were made aware of management strategies and practices that can reduce the incidence of acidification and erosion so as to improve long term production and sustainability.*

It was agreed that the collective experience of the workshop group would be used to identify and contribute to the preparation of appropriate management strategies and their communication to clients. These management strategies were to be prepared in a form suitable for extension to industry. These management guidelines were to be prepared in both 'hard copy' and electronic copy for industry distribution. A mail-out to industry was also proposed.

The workshop group also identified and recommended a wide range of other extension/promotion activities to assist in achieving the objective. These included the use of all media (written, radio, TV, video, electronic) as well as field days, meetings, conferences and working with established groups like Landcare and Future Profit groups.

The project was evaluated for achievement of objectives in the final year, 2001.

Results - Achievements in relation to objectives

The project commenced in late 1997. The initial activities were the preparation and distribution of training and extension material and presentation of preliminary awareness publicity to the media.

1) Preparation of a Technical Report on soil acidification by legumes (Oct 1997)

The purpose of this was to inform Technical Staff of recent scientific developments. The report was prepared by Dr Andrew Noble (Noble 1997) and highlighted the processes involved in soil acidification by tropical legumes and likely consequences where legume dominance occurred. About 70 copies were distributed to beef industry research and extension staff in October 1997.

2) Industry awareness promotion (late 1997 to early 1998)

Awareness articles on stylo dominance problems (see Publications). The first client announcement of potential problems with stylo dominance and the project aims to counter these was via articles in NAP News (McIvor *et al* 1997) and the Tropical Grassland Societies Newsletter TGS News and Views (Partridge 1997) in October and December 1997.

Radio. One ABC Country Hour interview and two Breakfast Session interviews dealing with stylo management were conducted by the Project Leader in October and November 1997.

TV and Video. A segment on stylo dominance, soil acidification and management options was aired in late October 1997. Copies of this are held at major Information Centres.

3) Preparation of management guidelines (APPENDIX III).

The workshop group combined to help prepare and edit management strategies for stylo based pasture. These included 500-800 word information sheets on each of the following topics:

- a) **Stylo dominance - a need for management.** This introductory note outlines the history of stylo and highlights its significance to the Queensland beef industry. With close to 1M ha sown it can have a big effect on animal performance in terms of weight gain, age of turn-off and improved breeding. In 1997 stylo was estimated to contribute > \$30M to the grazing industry. This sheet also warns readers that stylo can dominate in certain circumstances and that this can lead to undesirable effects on pasture, soil, animal production and ultimately landscape sustainability.
- b) **Stylo dominance - areas at risk.** The Second Guideline identifies the areas and conditions under which stylo dominance is most likely to occur. The most 'at risk' areas are light textured, infertile soil and where summer grazing pressure is excessive. This situation gives a competitive advantage to stylo over native grass. It is important to recognise and map these areas so that appropriate management systems can be incorporated in the whole property management plan. The 2001 update also includes information on the availability of soil testing procedures that will predict potential acidification rates.
- c) **Grazing management to prevent stylo dominance.** Grazing management, the third Guideline, identifies grazing pressure as a major factor that can influence grass/legume balance. It explains the powerful effect that continual heavy selective grazing in summer has on native grass seeding and its subsequent regeneration and survival. The role of strategic summer spelling is promoted.
- d) **Using fire to manage stylo dominance.** The Fourth Guideline re-introduces readers to the role that periodic burning can have in native pasture containing stylo. In addition to the traditional reasons for graziers to burn native pasture (woody weed management, remove excessive mature dry material) it can be used effectively in reducing the stylo population and promoting native grass. Burning needs to be implemented while there is still grass fuel available in the paddock.
- e) **A role for sown grasses.** In areas where stylo dominance is considered likely or where dominance has already occurred then the inclusion of a sown grass more competitive than the native grasses may be a viable option. In the Fifth Guideline a number of grasses have been identified for different environments, the stoloniferous ones being important (*Bothriochloa*, *Urochloa*, *Digitaria*, *Brachiaria*). A region list is provided together with suggestions on how and when to incorporate them.
- f) **Managing seed and hay crops.** Legume seed and hay crops present special problems as the pure stand of 'N' fixing legume, where most material (and nutrients) is removed from the paddock, predisposes to rapid soil acidification. The use of fertiliser and lime may be necessary. Other strategies that include rotational land use with grass crops and pasture to 'soak' up fixed nitrogen are discussed.
- g) **The role for fertiliser.** Most stylo is grown in association with native pasture without the use of fertiliser. This Guideline outlines the strategic role of fertiliser and the relative importance of both fertiliser P and supplement P in grazing systems.

The management Prime Note guidelines are available on DPI's web site [www.dpi.qld.gov.au]. They are also available on the DPI PRIME NOTES CD-ROM.

4) Preparation of colour brochure.

During 1998 a colour brochure, Stylo and grass-keeping your balance (APPENDIX IV) was prepared for mail-out to graziers in the stylo growing areas. Editing involved consultation with the Workshop Group. The 3-fold, six page brochure contained 16 colour photos and was presented in easy-to read text. It basically was a summary of the Guidelines and highlighted both the high importance of stylo to the beef industry as well as potential problems and how to manage them. Eight thousand copies were printed. About 5,000 were mailed out to graziers in the spring of 1998. It was mailed to all graziers with over 250 ha of land in 38 Shires with greater than 500mm annual rainfall and north of 26° latitude. Provincial cities and essentially cropping shires (sugarcane, grain/cotton areas) were excluded.

5) Promotion of management guidelines.

The following promotion activities were ongoing from 1998 onwards:

- a) **Additional Colour Brochure distribution.** *In addition to the mail-out, about another 1500 copies have been distributed through Information Centres, Field Days, Meetings etc. since 1998. Another 150 copies were mailed out in July 2001 in response to requests generated through the project survey.*
- b) **Guide Lines (Prime Note) distribution.** In 1998 the prepared guidelines (Agdex 131/21) were entered on the DPI WEB site and the Prime Notes CD-ROM (Version 6, 1998). This was updated in July 2001 (APPENDIX III) for inclusion in the next Prime Notes update.
- c) **Field Days.** Two major Field Days were held in north Queensland when the project was initiated. A Field Day at "Thalanga", Charters Towers, was hosted by the Dalrymple Landcare Committee with financial support from DPI and MLA. Presentations and discussions involved graziers, DPI, CSIRO and the Seed Industry and covered the full range of benefits and problems associated with stylo sown in native pasture. Practical demonstrations of grass planting were also carried out. An excellent booklet was compiled (Rolfe and Dahl, 1997) for distribution which contained all the presentations plus the project Management Guidelines.

A second Field Day (March 1998) hosted by MRC and the Tropical Grassland Society at "Strathbogie", Gumlu where the owner, Jim Bloomfield, was presented with the MRC-TGS Pasture Award. Over 80 people attended. Andrew Noble facilitated a session on stylo and soil acidification. A poster on stylo dominance was on display and the Management Guidelines were distributed.

Since 1998 stylo management has been included in programmes at other field days at "Glenore", "Rangemore", "Eureka Creek" (two), "Lynford", "Doraville" and "Strathmuir" (PDS Sites), Calliope Grazing Trial (MLA), Belmont Research Station (NHT site).

- d) **Landcare and Group Field Walks and Bus Trips.** In the central region Col Middleton, Ken Murphy, Gavin Graham and David Orr were involved in at least eight Field Walks and bus trips in association with PDS sites operated by the Marlborough, Ulam/Raglan and Morinish Landcare Groups. Stylo management was a major part of the program each time.

Stylo management was included for discussion in several Future Profit and Landcare group activities.

- e) **Technical papers, conferences etc.** A poster paper by Raymond Jones and Andrew Noble (CSIRO) on the potential of soil acidification by leucaena was presented at an International Leucaena Workshop in Hanoi in February 1998. David Orr (Orr *et al* 1997) presented a Poster Paper highlighting management needs of Seca stylo pasture to the Australian Rangelands Society Conference (Gatton) in Dec 1997. Andrew Noble and Col Middleton prepared and presented Posters and Poster Papers at the National Soil Acidification Conference at Coolool in 1998 (Middleton and Noble 1998, Noble 1998). Noble *et al.* (2000) presented a paper on stylo management and environmental considerations, plus several posters, at the Tropical Grasslands Conference at Emerald in 2000. All these activities highlighted the problem of legume dominance and demonstrated the cooperative effort between graziers, scientist and extension workers, agri-business and funders in promoting sustainable management practices.

Project material was presented at Meat Profit Days at Charters Towers and Emerald, the Emerald Store Cattle Workshop and Leucaena Establishment Workshop (Biloela).

- f) **Management extension via related R&D projects.**

Details are given under Section 6.

- g) **Other promotion.** The Guidelines were made available to FARMLINE for its Fact Sheets. Marlborough Landcare featured stylo management in one issue late 1997. Harry Bishop (DPI Mackay) had an article on the need for grass maintenance in stylo pasture in *The Queensland Farmer*, October 1997.

The booklet *Stylo for Better Beef* (Partridge, Middleton and Shaw 1996) has been promoted via DPI Information Centres, NAP Newsletter and the Tropical Grassland Society.

The producer pasture monitoring program, GRASSCHECK, has been actively promoted by extension staff through Future Profit, Landcare and similar groups. This is an effective way of assessing stylo and grass changes in pasture.

6. Linkages to other projects

Several other MLA funded projects have significant direct relevance to this project. Close contact has been maintained with these and promotion/extension activities combined where appropriate. Projects with related R&D activities have included:

- a) **Sustainability of stylo-based pasture systems in northern Australia: Managing soil acidity (NAP3.218 – Noble 2000).** Combined extension activities at 'Strathbogie' field day, National Soil Acidification Conference (joint Paper/Posters) were conducted. (Refer to the MLA, North Australian Peer Review Report 2000, *NAP Occasional Publication* No. 11)
- b) **Effect of stocking rate, legumes, supplements and fire on animal production and stability of native pasture (NAP3.207)** that researches grazing pressure and fire effects on soil/pasture/animal in native pasture with/without stylo. The results from this project contributed to the Management Guidelines and the Colour Brochure. There has been regular interaction with the Galloway Plains Advisory Committee members at meetings. The graziers of this group have taken an active interest in both the Galloway Plains grazing trial and its relevance to the Stylo Communication project. (Refer to the MLA, North Australian Peer Review Report 2000, *NAP Occasional Publication* No. 11)
- c) **Management of native pasture oversown with stylo (NAP3.221)** that researches some management practices in north Queensland (fire, summer spelling, sowing grasses, and grazing pressure) aimed at maintaining grass/legume balance in stylo based pasture. (Refer to the MLA, North Australian Peer Review Report 2000, *NAP Occasional Publication* No. 11)

- d) **Producer Demonstration Sites (NAP3.302).** Sites at Marlborough (David Orr) and Mackay/Nebo (Harry Bishop) that demonstrate pasture management practices in stylo based pasture.

The Marlborough site demonstrates management strategies (strategic use of fertiliser and spring burning) aimed to reduce stylo and encourage grass in a stylo dominant pasture.

In the Mackay-Nebo area a PDS site identifies and demonstrates the use of a range of grasses sown into stylo dominant pasture on several properties. (Refer to PDS Producer Demonstration Sites Project Reports 1999-2000 and 2000-2001, DPI, Rockhampton)

7. Continued promotion

The Guidelines will continue to be accessible via the DPI system (Information Centres, WEB site and Prime Notes CD-ROM) and updated as necessary. The Guidelines will also be included in the Grazing Land Management training package currently under preparation.

8. Project evaluation

Ongoing evaluation.

The distribution of the Colour brochure should have achieved the main objective of making land managers aware of the need to maintain grass/legume pastures in a balanced state.

Achieving success in distribution does not necessarily lead to adoption.

In July 1999 key DPI extension staff in all (SEQ, CQ, NQ and FNQ) stylo growing areas were surveyed as to their perception of client reaction to the Colour Brochure mail-out and to perceived stylo dominance in the 1998-99 season. Feedback indicated:

- graziers were becoming more aware of potential problems from legume dominance.
- there was no evidence of any real problems in southeast Queensland where getting and maintaining legumes was of greater concern.
- there was agreement throughout the state that the better season resulted in a big increase in grass relative to legume and that serious dominance of legume was isolated, on a small scale and often associated with older stands.
- there was limited feedback from the Colour Brochure distribution. The most common request after the Brochure distribution was from producers who did not receive a copy. This highlights two points. Firstly, the brochure distribution, because of cost, was limited to properties > 250 ha. Secondly, graziers were reading it and talking to their neighbours.

The Ulam/Raglan and Morinish Landcare Groups arranged a Field walk at the Marlborough PDS Site that demonstrates stylo management practices. Members were asked to complete a questionnaire relating to the Colour Brochure mail-out. Accepting that the sample was small (about 20) and not random the following details of current practice emerged:

- all 90% of those that received the brochure read it all, the remainder read at least some
- areas of stylo pasture ranged from 20 to 7000 ha.
- 70% of respondents had some stylo
- 90% of stylo was grown with native pasture alone, the remainder had sown grasses included.
- none of the respondents considered they had any major stylo dominance
- The following management practices (% of properties with stylo) were carried out:

Activity	%
Spelling	45
Reduced stocking	55
Burning	65
Fertilise	0
Renovate	45
Sown grass	25

33% of respondents carried out both spelling/reduced stocking and burning. All respondents were carrying out at least one of the management activities listed in the Table.

Peer review of project

Each year MLA sponsors a Peer Review of the progress of projects in relation to objectives and milestones. These have been published as NAP Occasional Publications No. 6 (1988), No.10 (1999) and No.11 (2000).

Final survey. In June 2001 a survey form (APPENDIX II) was mailed out, with a Reply Paid envelope, to 1400 properties in 20 Shires north of 26° S latitude and with a MAR of 500mm or more. The Shires surveyed represented the main ones with soils suited to stylo. The results are shown in APPENDIX I.

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APPENDIX I Grazier Survey of Stylo Use and Management in 20 Shires in Queensland

Aim:

To assess the use and management of stylo-based pasture and determine the extent of stylo dominance as recognised by graziers.

Method:

An investigation (McIvor *et al* 1996) indicated potential environment problems if stylo dominance occurred in stylo based pasture. To address this a range of management guidelines were prepared (Middleton *et al* 1998) and extended to industry via a colour brochure (Partridge *et al* 1998) in 1998. In June 2001 a survey form (attached) was mailed out, with a Reply Paid envelope, to 1400 properties in 20 Shires north of 26° S latitude and with a MAR of 500mm or more. The Shires surveyed represented the main ones with soils suited to stylo. They were arbitrarily divided into three 'regions' on a latitude basis as follows.

North (north of 22°00' S lat): Cook, Mareeba, Etheridge, Herberton, Hinchinbrook, Thuringowa, Ayr, Dalrymple and Bowen.

Central(22°00' – 24°30' S lat): Nebo, Livingstone, Duinga, Fitzroy and Calliope

South (24°30' – 26°00'): Miriam Vale, Monto, Biggenden, Eidsvold, Mundubbera and Gayndah.

The main survey questions asked property owners/managers to identify:

- where and how stylo was sown
- what stylo was sown and what natural spread had occurred
- the estimated area and age of stylo
- an estimate of area of different grass/legume balance classes
- different management practices undertaken on stylo-based pasture.

The completed survey was entered on a Microsoft ACCESS database to allow detailed interrogation of attribute associations. The database, without owner or property names, is held by the Queensland Beef Industry Institute in Rockhampton.

Results:

1. Response to the survey in relation to the initial Colour Brochure mail-out in 1998 and the survey mail-out three years later is shown in Table Ia.

A total of 266 replies were recorded relating to about 500,000 ha of stylo-based pasture (see Table Ic). The response rate was in the range of 18 –22 % of grazing properties (>250 ha) in the sample shires. This is considered a reasonable response given the type of voluntary survey.

2. Receipt of the Colour Brochure in 1998.

Three years after its apparent distribution to all graziers in the target shires, a large number do not recall receiving it. Only 37% remember receiving it. Of the total number of respondents 60% requested and were sent another copy.

3. Property data (Table Ib).

The average property size ranged from 14,600 ha in North Qld to 3,300 ha in South Qld. Based on property total cattle numbers the stocking rate (all classes of cattle) ranged from 8.4 ha/animal in the North to around 4/ha in the Central and South. This reflects the more extensive grazing systems in the more seasonal growing conditions in north Queensland. The respondents indicated a high percentage of properties with some stylo. (This assumes that properties without stylo filed returns on a prorata basis to those with stylo).

Table Ia. Response to stylo survey (based on properties of 250 ha and above)

Attribute	North	Central	South	Total
Colour Brochure mail-out (38 Shires total)	801	1943	2229	4973
Colour Brochure mail-out (20 sample Shires)	755	1006	830	2591
Survey mail-out in sample shires	482	582	337	1401
% of sample shire beef properties sent survey	63.8	57.8	40.6	54.1
Completed survey forms returned.....No	85	124	57	266
% of survey mail-out	17.6	21.3	21.9	16.9

Property use of stylo increased from South (61%) to North (87%). The lower percentage of properties using stylo as one goes further south may reflect:

- Less favourable conditions (colder) for stylo at higher latitudes.
- Other pasture options with a longer growing rainfall season and colder winters at higher latitudes are more readily available.

Similar reasons would probably explain why the area of stylo per property also increased from South to North. However, on the basis of the proportion of a property containing stylo Central Qld was highest with 35% of the property area containing stylo.

Table Ib. Property and cattle data

Attribute	North	Central	South	Total/Mean
Properties sampled	85	124	57	266
Average property size -ha	14595	3690	3305	7092
Average cattle number per property	1742	922	742	-
Average stocking rate – ha/animal	8.4	4.0	4.4	-
Properties with some stylo - % *	87.0	70.2	61.4	73.7
Stylo per property - ha [#]	3290	1285	608	-
Stylo per property - % of property	22.5	34.8	18.4	-

* This may be an over-estimate in that some graziers without stylo pasture may not have seen merit in replying to the survey.

[#] This is based on Survey Question No. 7, Table IIIc.

4. How the stylo was established (Table Ic)

The information provided in Survey Question 8 indicated the respondents represented almost 495,000 ha of stylo. Since the survey sample was relatively small it would be safe to conclude that the area of stylo now present in Queensland would far exceed the 1997 estimate of Miller *et al* (1997) of between 577,000 and 740,000 ha of effective stylo in Queensland.

Excluding natural spread, over half the stylo sown has been into native pasture, with and without other species and without any soil disturbance (Table Ic, types 1,2 and 3). In both North and South Qld half the sown stylo (excludes natural spread) was sown alone into native pasture. Some soil disturbance at planting was more widely used in Southern and Central Qld. This no doubt reflects smaller, more developed (clearing and tree thinning) properties.

A significant feature of the data was the high percentage of stylo reported as natural spread on properties. This accounted for over one third of the total stylo and was highest in Central and North Queensland.

The relatively large area of 'other types' in North Qld was mostly re-emerging Townsville stylo.

Sown grass was planted in about one third of sown stylo areas (excludes natural spread stylo). Use of sown grass on a percentage area basis was highest in Central and South Qld.

Table Ic. Method of stylo sowing (ha)

Stylo type	North	Central	South	Total
1. Stylo alone sown into native pasture (nil cultivation)ha	102555	23995	11525	138075
....% of total stylo	30.5	18.3	41.2	27.9
2. Stylo sown with other legumes into native pasture (nil cultivation) ...ha	31760	8325	1705	41790
....% of total stylo	9.5	6.3	6.1	8.5
3. Stylo plus other grass sown into native pasture (nil any cultivation)ha	30065	21375	390	51830
....% of total stylo	9.0	16.3	1.4	10.5
4. Stylo plus other grass sown into native pasture with some cultivation/soil disturbanceha	21455	13140	6615	41210
....% of total stylo	6.4	10.0	23.6	8.3
5. Stylo and improved grass sown in fully prepared seedbedha	3190	8825	1560	13575
....% of total stylo	0.9	6.7	5.6	2.7
6. Stylo naturally spread into other pastureha	121335	54350	6175	181860
....% of total stylo	36.2	41.5	22.1	36.8
7. Other, seed production, hay etcha	25165	1065	5	26235
....% of total stylo	7.5	0.8	-	5.3
TOTALha	335525	131075	27975	494575
....% of total stylo	100.0	100.0	100.0	100.0

5. Stylo cultivar use (Table Id)

Table Id does not make allowance for cultivars sown as mixtures on the same country and cannot be used to measure the total stylo area sown. Also comparisons between Tables Id and Ic are not valid because of a higher number of nil returns in Question 7 relative to Question 8.

Seca and Verano stylo account for most of the stylo sown in North and Central Qld, the ratio of Seca to Verano being about 2.1:1 in North Qld and 3.4:1 in Central Qld. In Southern Qld Finestem stylo predominates, followed by Seca. Except for a significant area of Amiga stylo and 'other stylo' (Townsville stylo) in North Qld, other varieties are small in area.

Table Id. Distribution of stylo (ha) in regions

Cultivar	North Qld	Central Qld	South Qld	Total - ha
Seca	326980	186920	21305	535205
Verano	154965	55230	355	210550
Finestem/Oxley	-	935	27825	28760
Siran	4970	6330	465	11765
Amiga	56290	3960	110	60360
Other	25075	1055	55	26185
TOTAL	568280	254430	50115	-

6. Stylo age (Table Ie)

Only three age classes were used. The largest area of stylo was in the 6-10 yr age bracket (1991-1995 planting). The smaller area of stylo less than 5 years old would reflect lower plantings in a series of drought years. The high percentage of stylo in the > 10 year age bracket (planted before 1991) is a good indicator of the persistence of stylo.

Table Ie. Cultivar (ha) and age of stylo

Cultivar	Age class - years			Total area
	< 5 years	6-10 years	> 10 years	
Seca	187660	205870	141680	535210
Verano	52200	86800	71550	210550
Finestem/Oxley	7515	7350	13895	28760
Siran	2465	7305	2000	11770
Amiga	20290	22570	17500	60360
Other	120	300	25015	25420
TOTAL	270250	330195	271640	

7. Stylo content (Table If)

An assessment of the stylo content classes within pastures as estimated by graziers is shown in Table If. Respondents to this question provided estimates covering 468,000 ha of stylo-based pasture. By far the most stylo pasture (75-82%) was in the < 25% stylo category at the

sample time at the end of the wet season in May 2001. The 25-50% stylo category accounted for 15-23% of stylo pasture.

The encouraging result was that the stylo categories with greater than 50% stylo accounted for less than 3.4% of stylo-based pasture. In fact the highest stylo class (> 75% stylo, little grass) accounted for no more than about 2,500 ha in the sample area. However, while the actual area of stylo dominant pasture reported was low the percentage of properties that had some stylo-based pasture ranged from 22% in South Queensland to 31% in north Queensland. High stylo pasture was small in area on any one property but many properties were involved.

In the high/dominant stylo class 90% of the pastures were over 5 years old and 70% were over 10 years old.

As expected there were differences between regions in the cultivars causing high stylo content (> 50% stylo) (Table Ig). In North Qld Seca and Verano stylo were equally important. In Central Qld high stylo pastures were almost all Seca stylo while in South Qld Finestem stylo was the main culprit. This result reflects the difference in adaptation of cultivars throughout the state.

Table If. Stylo content classes (ha) and % of area in each region

Stylo content	North		Central		South	
	ha	%	ha	%	ha	%
Low	236675	75.1	106880	82.1	18555	82.3
Good mix	72735	23.2	21490	16.5	3215	14.3
High stylo	5080	1.6	1260	1.0	740	3.3
Stylo dominant	840	0.3	470	0.4	20	0.1
TOTAL	315330	100.0	130100	100.0	22530	100.0

Note 1. % of properties with some stylo pasture in the high stylo and stylo dominant class

(> 50% stylo): North 31.0%, Central 19.4% and South 22.2%

Note 2. Of stylo dominant pasture (> 75% stylo) 90% were over 5 years old and 70% were over 10 years old.

Table Ig. Stylo cultivar effect on high stylo content pasture in each region (% of total area with > 50% stylo content)

Cultivar	North Qld	Central Qld	South Qld
Seca/Siran	46.5	82.2	39.1
Verano/Amiga	45.5	2.0	-
Finestem	-	11.7	60.9
Not specified	8.0	4.1	-

8. Adoption of stylo management practices

In relation to the use of the different management practices (Survey Question 11) a high percentage of graziers are currently using a range (either singly or in combination) of

management practices. Over the three regions 75-90% of respondents were using one or more of the practices listed (Table Ih).

But did graziers change any management practice when stylo was used? A high percentage of graziers indicated their management practice did not change when stylo pasture was sown (56-70%), mainly because they were already using one or more of the listed practices..

Table Ih. Grazer adoption of stylo management practices

Region	% of respondents who did not change management practices after stylo was sown	% of graziers using one or more listed management practices
North Qld	56.1	89.3
Central Qld	70.4	67.6
South Qld	67.5	75.5
TOTAL	64.4	78.0

The use of different management practices is shown in Table Ii. Periodic summer spelling (mean 60% of properties) and burning (mean 56% of properties) were the main practices used in all regions.

Increased stocking rate commonly accompanied the planting of stylo. Insufficient data was offered to quantify the level of increase. Comments offered by some graziers suggested an increase of the order of 10-20% was used.

There was insufficient data to determine grazer perceptions of what effect changed management practices had on stylo content in pastures.

Table Ii. The relative use of stylo management practices by graziers (based on those respondents who use one or more of the listed management practices)

Management practice	% of respondents who use the identified management practice			
	North Qld	Central Qld	South Qld	Mean
1. Reduced stocking rate	3.4	8.3	3.3	7.3
2. Increased stocking rate	31.0	22.9	40.0	30.1
3. Periodic burn	53.4	64.6	46.7	55.9
4. Periodic summer spelling	69.0	54.2	53.3	60.3
5. Combination of 1-4	50.0	52.1	43.3	49.3
6. Other management practice [#]	10.3	25.2	10.0	15.4

[#] Included, cell grazing, rotational grazing and use of fertiliser

9. Summary of major findings

- The large area of stylo in the state and on properties and the high percentage of graziers using it supports the wide adaptation of the legume and the high regard with which the legume is held.

- Over half the stylo sown has been into native pasture. In the Central and Southern areas significant areas have incorporated some soil disturbance.
- Natural on-property spread accounts for one third of all stylo.
- Seca and Verano account for most stylo sown although Finestem predominates in the South and Verano is equally important as Seca in the North.
- Most stylo pasture in the state contains < 25% stylo.
- The very small area of high/dominant stylo pasture indicates the existing environmental threat (erosion, soil acidification) from stylo-based pasture remains low.
- The potential for future environment threat remains present as one quarter to one third of properties have at least some stylo in the > 50% content class.
- Older pastures (>5 years) accounted for almost all high/dominant stylo pastures.
- Seca and Verano (North), Seca (Central) and Finestem and Seca (South) account for all high/dominant stylo pasture.
- Those management practices expected to have an effect on stylo content and on which the Guidelines were prepared and promoted (summer spelling, periodic burning, inclusion of resilient grasses), are being widely used. A high percentage of these practices were being used before the project commenced.

10. Recommendations

Stylo dominance remains very low and most graziers are using one or more management practice that can be used to manipulate stylo/grass balance. However, since there was a significant number of graziers (20-30%) with some stylo pastures with >50% stylo there is a need to monitor the situation in the future and to maintain active promotion of the Guidelines. There is also a need for industry and institutions to promote the availability of a simple field-based soil test and computer-based risk assessment model that allow high-risk soils to be avoided or which may need special management.

11. Acknowledgements

The author wishes to thank Mr Michael Yee and Mrs Madonna Hoffmann for the contribution to data entry and database construction and interrogation respectively.

APPENDIX II. MLA - DPI Stylo Management Survey

Name (Optional).....Address:.....

1. Shire.....

2. Property size.....ha

3. Average Yearly Rainfall. Please tick (✓)
 Less than 500 mm.....
 501-600 mm.....
 601-700 mm.....
 701-800 mm.....
 over 800 mm.....

4. Current cattle numbers (i) Total..... (ii) Breeders.....

5. Do you have any pasture containing any variety of stylo legume. Yes No

6. Do you recall receiving a Colour Brochure (*Stylo and grass - keeping your balance*) in the mail or from any source since 1998?
 Yes No Unsure

Did you read it?
 Yes No Unsure

If you have any stylo pasture, go to Question 7. If you do not have stylo pasture go to Question 12 and then please return your Questionnaire in the Reply Paid envelope by 18 June 2001.

7. What area of stylo pasture (all varieties) have you got? Complete the Table.

Pasture type	Area sown ha	The other varieties sown
1. Stylo alone sown into native pasture		
2. Stylo sown with other legumes into native pasture		
3. Stylo plus other grass sown into native pasture without any cultivation		
4. Stylo plus other grass sown into native pasture with some cultivation or soil disturbance		
5. Stylo and improved grass sown in fully prepared seedbed.		
6. Stylo that has naturally spread into native pasture		
7. Other eg. sown for hay, seed production		
TOTAL AREA of STYLO		

8. What stylo do you have and how old is it? Please complete the Table below.

Variety	Total area (ha)	Estimated area (ha) for each age range		
		Less than 5 yrs old	6-10 yrs old	Over 10 yrs old
Seca				
Verano				
Siran				
Amiga				
Other				

9. In the Table below can you estimate the area of stylo-based pasture you have in each of the four categories based on the proportion of stylo to grass in the pasture now? Also what is the main soil type for each stylo content class?

Stylo content class	Area (ha)	Stylo varieties involved	Main soil type: S = sand or gravel D = duplex (sandy surface over clay) L = loam C = clay throughout
1. Low stylo [less than one quarter stylo and more than three quarters grass]			
2. Good mix [one quarter to one half stylo, the remainder grass]			
3. High stylo [One half to three quarters stylo, the remainder grass]			
4. Stylo dominant [more than three quarters stylo with little or no desirable grass]			

10. If you have any stylo dominant areas listed under Item 4 in the above Table (more than 75% stylo and little or no grass) how old is the stylo pasture? Please tick (✓):

less than 5 years 6-10 years more than 10 years

11. After including stylo, have you changed any of your management practices on established grass/stylo pasture to help maintain the balance between grass and stylo? Complete for each management practice you have used.

Management practice. Have you:	Yes or No	Notes: When, frequency, how much increase or decrease etc.	Has the changed management resulted in:			
			More grass & less stylo	Less grass & more stylo	No change	Unsure
1. Changed pasture management when stylo included						
2. Reduced overall stocking rate (SR)		How much SR decrease?				
3. Increased overall stocking rate		How much SR increase?				
4. Used periodic burning of stylo pasture		Burn when & how often?				
5. Used periodic summer spelling of stylo-based pasture.		Spell when & how often?				
6. Used a combination of 2 to 5 above		Describe:				
7. Other (specify)		Describe:				

12. Would you like another copy of the colour brochure '*Stylo and grass - keeping your balance*'
 Yes No If yes, please provide your postal address.

Any comments?

Please return in the POST PAID envelope by 18 June 2001. THANK YOU.

APPENDIX III. Stylo Management Guidelines

The following pages contain the full set of 7 Guideline Leaflets as they appear as DPI Notes on the DPI WEB Site: <http://www.dpi.qld.gov.au/beef>

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Stylo Management Guidelines

1. Stylo dominance - a need for management

Col Middleton, Queensland Beef Industry Institute, Rockhampton

The value of stylo:

Native pasture supports the bulk of the beef herd in northern Australia. It is a low-cost system that occurs over a wide range of environments. However seasonal quality limitations (protein, energy, minerals) restrict the breeding and growing performance of animals. Market demand for younger beef has led to the development of feeding systems to either supplement or complement native pasture.

Over the last 20 years, the performance of animals on coastal and sub-coastal native pasture lands has been markedly increased by the low-cost inclusion of stylos (Seca, Siran, Verano and Amiga). These are hardy, low-maintenance legumes that establish easily among native grasses such as black speargrass and they can thrive on low to moderate fertility soils. Stylo has been so successful that over 1M ha has been sown, worth over \$25M per year to the beef industry.

The moderately high protein legume, in balanced combination with native pasture, results in 25-60 kg/year extra liveweight on growing animals with similar levels of advantage in the breeding herd. This means a younger turnoff age and more flexibility in the beef enterprise. On top of this stylo is a 'nitrogen fixer' that improves soil fertility.

Can I have too much stylo?

For high animal production a strong legume component of pasture (greater than 10%) is required. On the other hand we have to maintain good ground cover to protect the soil from degradation. With the inclusion of the legume, management to ensure a balance between animal production and soil cover, requires a little more care.

There are some situations where stylo may become dominant to the extent the native grass component is severely reduced or even lost altogether. If this happens it will probably have little effect, initially, on animal production. However the loss of the grass (or stylo dominance) may expose the soil to erosion, and in the longer term, soil acidification.

1. Soil cover, water retention and erosion:

The single-stemmed stylo plant with a deep tap root system provides less ground surface protection than multi-tillered grasses. The better soil

surface protection given by grass relative to stylo promotes better water infiltration (less runoff), less erosion and less weed invasion. Shallow, light textured soils on sloping country are most at risk.

2. Nitrogen fixation and soil acidification:

The 'fixed' nitrogen that legumes produce is converted in the soil to nitrate. This nitrate is normally taken up by the grass resulting in increased yield and nutritive value. With little grass the nitrate will be leached through the soil during wet periods resulting in a lowering of soil pH. This leads to reduced plant growth and survival.

3. Loss of stylo through 'natural' disasters:

The total replacement of a perennial grass with stylo can create a situation where 'natural disasters' (e.g. like the virulent anthracnose fungal disease of Townsville stylo in the 1960's) or unforeseen woody weed invasion could result in potentially severe soil/landscape degradation.

What causes stylo dominance?

Stylo can out-compete native grass because it is a highly competitive and persistent plant. It exploits water to a greater depth than grass, is adapted to low soil fertility and is tolerant of high grazing pressure. Also grasses are preferentially grazed in the summer growing season when they are green (stylo is less palatable than green grass) leading to reduced grass seed production needed for survival.

Stylo dominance is most likely on the shallow, infertile, light textured soils where it is highly adapted. Stylo is less likely to dominate on high fertility and/or clay soils where grass competition is usually much greater.

Can stylo dominance be managed?

Yes. The area of highly stylo dominant pasture in Queensland is very small. The key is to capitalise on stylo nitrogen fixation by ensuring a strong grass component, native or sown, is maintained in the pasture. There are a number of commonly used management features (site selection, grazing, spelling, burning, alternate grasses) we can employ to achieve this. These are outlined in separate DPI Notes in this series.

Further information

- Col Middleton, Principal Scientist (Pasture Agronomy), Phone: 07 4923 8100
- *Stylos for better beef* - A Booklet by Ian Partridge, Col Middleton and Kev Shaw. Available for \$10 per copy from DPI and Tropical Grassland Society outlets.
- DPI Client Service Centres, (extension Leaflets, pasture management) and Pasture Extension officers.

Acknowledgement

This DPI Note is one of a series in a DPI, CSIRO, MLA & Beef Industry Project that aims to provide

information on how to manage stylo-based pasture for sustainable production. Others in the series deal with site selection, grazing management, strategic burning, using sown grasses and management of stylo seed and hay crops.



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Stylo Management Guidelines 2. Stylo dominance - areas at risk

dpi note

Col Middleton, Queensland Beef Industry Institute, Rockhampton

This Note helps you identify those areas that are most susceptible to stylo dominance so that you can Map them and apply specific management.

The first DPI Note (BI0307) in this series indicated the huge benefits of the stylos (Seca, Siran, Verano and Amiga) to the Queensland beef industry through the effects of higher animal production and nitrogen fixation when included in native grass pasture. It also warned that stylo, particularly Seca, could become dominant and the grass content greatly reduced in some situations.

This loss of grass results in less ground cover and the potential for soil erosion and weed invasion. Without grass the 'fixed' nitrogen leaches down the profile causing the soil to become more acid. In time, pasture growth and soil physical and chemical properties can suffer. The potential problem in Queensland is minor at present. With appropriate management we can prevent future problems.

What areas are most prone to stylo dominance?

The areas at risk are those where the accompanying grass (usually native grasses) are less well adapted than stylo to the prevailing conditions, including imposed management. The stylo out-competes the grass which may eventually disappear. The conditions that best suit the stylo relative to the native grass and that are most likely to result in stylo dominance are:

1. Light textured (sandy surface) soils.

The stylos are very well adapted to these soils. With a deep tap root system capable of drawing on water deeper than grasses, they provide intense competition. On heavier textured soil (clay loams, clay), the native grasses like forest bluegrass are more competitive with stylo. In the central and south-east areas the heavier soils (commonly on the flats) are frosted and this helps prevent stylo dominance.

2. Low fertility soils.

Stylos are naturally adapted to relatively low fertility and will grow quite happily at available soil phosphorus levels above 4 ppm. Native grasses have difficulty in competing against stylo for the limited moisture and nutrients available in the low fertility soils.

3. High grazing pressure.

The stylos are well adapted to high grazing pressure at all times of the year. The plants establish easily, they have a deep tap-root system helping them to survive, and can tolerate heavy grazing. More importantly, they are relatively less palatable than young green grass in the summer growing season. Grass can be preferentially grazed in the summer growing season reducing its ability to set seed while stylo will produce plenty of hard seed in most years. Both stylo and grass are dependent on seed set to allow regeneration.

A combination of sandy textured soil of low fertility together with a high grazing pressure every summer growing season are the conditions most likely to lead to stylo dominance. It is also true these soils are the ones most susceptible to erosion and acidification. Map these areas out on your property plan.

The management guidelines to alleviate the threat on these 'at risk' areas include:

- Where possible avoid these 'high risk' soils - plant on the heavier textured, more 'fertile' soil.
- Do not overstock in the summer growing period and occasionally spell over this period to allow the grass to set seed (DPI Note BI0309, No.3 in this series).
- Burn in spring occasionally to reduce stylo population (DPI Note BI0310, No.4 in this series).
- Plant a more competitive grass with the stylo such as Urochloa (Sabi grass), Indian bluegrass, creeping bluegrass (DPI Note BI0311, No.5 in this series).

A simple field based soil test and computer based risk assessment model has been developed to assess soils for their susceptibility to accelerated acidification. For further information contact Andrew Noble.

Further information

- Col Middleton, Principal Scientist (Pasture Agronomy), Phone: 07 4923 8100
- Andrew Noble, Principal Research Scientist, CSIRO, Phone 07 4753 8555
- *Stylos for better beef* - A Booklet by Ian Partridge, Col Middleton and Kev Shaw. Available for \$10 per copy from DPI and Tropical Grassland Society outlets.
- DPI Client Service Centres, (extension Leaflets, pasture management) and Pasture Extension officers.

Acknowledgement

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on how to manage stylo-based pasture for sustainable production. Others in the series deal with the need for grazing management, strategic burning, using sown grasses, the role of fertilisers and managing stylo seed and hay crops.



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Stylo Management Guidelines 3. Grazing management to prevent stylo dominance

[dpi note](#)

Col Middleton, Queensland Beef Industry Institute, Rockhampton

This DPI Note outlines what grazing management tips you can use to help maintain a better balance of native grass in your pasture when stylo is included.

How important is stylo content?

The inclusion of stylo in native pasture has the capacity to add an extra 25-60 kg liveweight annually to growing animals. As outlined in the first DPI Note in this Series (BI0307), there are some situations (low soil fertility and moderate to heavy grazing pressure during summer) where stylo sown in association with native grass may become so dominant the more palatable grasses are lost. In the short term stylo dominance will not affect animal performance. However, potential problems can arise if the situation persists.

Firstly, the shallow, surface-rooted grasses are much better at holding the surface soil together than deep tap-rooted legumes which offer minimal soil surface coverage. This may reduce water infiltration and increase water run-off and soil erosion potential on many soil types where stylo is grown.

Secondly, stylo produces nitrogen through 'fixation'. A companion grass will use this nitrogen to produce more and better quality grass. If there are no grasses to use the 'fixed' nitrogen, then it is leached down the soil profile. On light textured soil this process will make the soil more acid and less productive.



Grazing practices:

The grazing management you impose can **influence** the botanical composition of your pasture. Stylos are tough plants and can survive most grazing management treatment without problems. Native grasses are not so resilient.

1. During establishment.

Stylo seedlings are hardy but slow to establish. Establishment can be hastened by reducing grass competition by cultivation, burning or heavy grazing before planting. Stylo can be grazed during establishment with little damage. Moderate grazing, no burning plus late summer spelling in the first two or three years to allow stylo to set seed can speed up legume

development. This will shorten the time before cattle start to benefit.

Once you have got a strong legume presence (say 50-50 grass and legume) then maintaining the grass assumes greater importance.

2. Grazing pressure.

Stocking rate has the overriding influence on pasture condition and animal performance. Only with moderately low stocking rates on native pasture can animals select a good diet and make superior weight gain without the decline of native grasses.

Stock at a rate that will allow your steers to gain that extra 25-60 kg each year and meet your target weight for age. **The key is to use the stylo pasture to put more weight on each animal rather than carry more animals.**

Overstocking in the summer growing season leads to selective heavy grazing of the best native grasses. The palatable perennial grasses set little seed and will be replaced by unpalatable grasses, other weeds and eventually bare ground.

While this is happening, the stylo keeps on producing seed and increasing in density. A 50-50 balance of grass and legume will keep a good ground cover to protect the soil, use the 'fixed' legume nitrogen and ensure high animal performance. Overgrazing will upset this balance.

3. Strategic spelling.

Protect the most desirable native grasses from loss by constant heavy defoliation by strategic spelling during the summer growing season. Native pasture, particularly those oversown with stylo, should be spelled over the *summer seed production period*, perhaps on a four to five year rotation. In addition to allowing grass to set seed, it also allows for spring burning to help keep excessive stylo and woody weeds in check.

4. Strategic pasture burning.

Fire can be used to manage stylo population and content. Hot fires will kill all stylo seedlings and more than half of the mature plants. Fire can also promote subsequent seedling emergence if there is a reserve of seed in the soil. This subject is dealt with in detail in DPI Note BI0310, (number four in this series on management of stylo).

5. Monitor what is happening.

In addition to monitoring cattle performance, it is just as important to know what is happening to your pasture and soil. Long-term sustainable production depends on keeping the grass/legume balance around 50:50. It is not difficult to pick up the early signs of change in the balance of species in your pasture. You should already know which are the undesirable and unpalatable grasses and other plants.

GRASS CHECK is a simple pasture monitoring package to check and record pasture and soil condition. It helps determine pasture productivity and sustainable stocking rates. It also provides an early warning of problems like feed shortage, weed invasion, loss of palatable grasses, encroaching bare areas, soil erosion and compaction.

Check your local DPI Office or FutureProfit Group for details on how to use

it on your property.

Further information

- Col Middleton, Principal Scientist (Pasture Agronomy), Phone: 07 4923 8100
- David Orr, Principal Scientist (Rangeland Ecology), Phone: 07 4923 8100
- Stylos for better beef - A Booklet by Ian Partridge, Col Middleton and Kev Shaw. Available for \$10 per copy from DPI and Tropical Grassland Society outlets.
- DPI Client Service Centres, (extension Leaflets, pasture management) and Pasture Extension officers.

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Stylo Management Guidelines 4. Using fire to manage stylo dominance

[dpi note](#)

David Orr, Queensland Beef Industry Institute, Rockhampton

Developing Seca stylo pastures can be viewed in two different stages.

The first is the establishment stage where the aim should be to increase the density of plants. The second is the management stage where the aim should be to manage plant density and to prevent stylo dominance in those situations where this is likely to occur (see Stylo Management Guidelines, DPI Note BI0308, No.2 in this series on stylo). It is suggested that the proportion of stylo should be no more than about 50%.

Establishment stage:

The establishment stage usually takes three to five years. The length of this stage will be determined mainly by seasonal rainfall which will influence plant establishment. During this stage, the oversown seed will germinate and seedling plants will establish, flower and produce seed. Burning Seca pastures in this establishment stage will kill the young and developing Seca plants and so eliminate stylo from the pasture. This establishment stage can be considered to be complete when the density of Seca plants has reached about 10 to 12 plants per square metre and there is a good supply of Seca seed on the soil surface .

Management stage:

Once Seca density exceeds 10 to 15 plants per square metre, density of native perennial grasses will be reduced and the pasture will require some management intervention to prevent Seca density increases. One management intervention option is fire.

Burning Seca pastures in Spring can be used to reduce Seca plant density. Spring burning can be useful to maintain native perennial grasses like black speargrass. Depending on fire heat, spring burning will kill many of the existing Seca plants, both young and old, but these plants will be replaced by seedling regeneration. This seedling replacement occurs because the heat generated by burning will "crack" the hard seed coat causing these soil surface seeds to germinate and establish. Prior to burning, ensure there is sufficient seed on the soil surface.

Plan burning to manage Seca:

If you are planning to burn in Spring, it is important to ensure there is sufficient grass remaining to carry the fire. Seca often has very little leaf present in the Spring when burning should be conducted and Seca alone will not carry the fire very well. Using a lighter than normal stocking rate from late summer through winter should ensure there is sufficient grass for spring burning. Burning should be conducted a day or two after about 25 mm of rainfall as this will ensure a relatively cool fire and enable plants to re-establish some green shoots soon after the fire.

For best results, pastures burnt in Spring should be rested in the summer. However, if it is necessary to graze following fire, then grazing pressure should be reduced below that which is regarded as normal. In this way, the perennial grasses will be able to recover and compete with the Seca plants.

Further information:

- David Orr, Principal Scientist (Rangeland Ecology), Phone: 07 4923 8100
- *Stylos for better beef* - A Booklet by Ian Partridge, Col Middleton and Kev Shaw. Available for \$10 per copy from DPI and Tropical Grassland Society outlets.
- DPI Client Service Centres, (extension Leaflets, pasture management) and Pasture Extension officers.

Acknowledgement

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Stylo Management Guidelines 5. A role for sown grasses

dpi note

Col Middleton, Queensland Beef Industry Institute, Rockhampton

Is there a need?

Much of the 1M ha sown to stylo in Queensland is in very low to moderate fertility soil in association with native pasture such as black speargrass, kangaroo grass, forest bluegrass and golden beardgrass. Stylo plant population is often slow to increase but will eventually accelerate in density because of its competitive ability at low fertility.

Under some conditions (eg low fertility and heavy summer grazing), stylo can increase dramatically due to selective grazing of native grass. In some circumstances this has led to the loss of the more palatable grasses and almost complete stylo dominance.

This stylo dominance will not adversely affect animal performance in the short term, but in the long term stylo dominance can lead to potential soil erosion and soil acidification. (See DPI Note BI0307 - Stylo dominance and DPI Note BI0308- Areas at risk). This problem is more likely on the infertile, light textured soils.

A good insurance policy is to include 'grazing tolerant' sown grasses when sowing stylo on these soils. A productive permanent grass with an active root system can effectively mop up the nitrogen produced by legumes, produce high quality forage, increase ground cover and reduce soil acidification.

What grasses are suited?

As a general rule, the grasses that can withstand heavy grazing pressure and offer good ground cover are the creeping or stoloniferous types that root down at the nodes. A number of these are capable of persisting and allowing sustainable production.

The grasses to consider are listed in Table 1. Selection will depend on rainfall and soil fertility. As soil fertility increases, stylo dominance usually becomes less as more competitive grasses such as buffel can be used.

Moderate fertility soil:

Suitable grasses include buffel grass, American in the north and Biloela and Gayndah in the central and south. Also Nixon urochloa is well suited to the north and central areas. In the south and central areas, the rhodes grasses (Katambora and Callide) and creeping bluegrass (Bisset and Hatch) are also useful where fertility is moderate.

In higher rainfall areas, particularly in the north and central areas, Jarra fingergrass, Koronivia grass (cv. Tully), and Signal grass should be considered.

Low fertility soil:

The Indian bluegrasses (Bowen, Medway, Dawson and Keppel) are the most widely adapted. They can tolerate low fertility, colonise rapidly, provide excellent soil protection and compete with stylo. In association with stylo, animal productivity is about equal to that of native pasture plus stylo. The chance of stylo dominance is unlikely where Indian bluegrass is adapted.

Since conditions (eg soil fertility) are not often uniform over sown areas, other grasses are often worth trying. These are listed in Table 1.

Planting the grass:

The big problem with grass establishment is it needs some soil disturbance for best results. It does not establish readily if just spread on the surface like stylo. Where a grass is to be sown, it is best done in conjunction with stylo planting. Optimum establishment is where the grass is sown with the stylo into a cultivated seedbed.

A cultivated seedbed is not always possible. On accessible areas, specialised establishment machinery like band seeding implements can be used. The crocodile seeder is another useful method. If timber or regrowth treatment is carried out (eg blade ploughing), sow the grass at this time. If you sow grass without soil disturbance, then at the very minimum, existing pastures needs to be short such as after a burn.

Machinery use creates another cost. One method of cost reduction is to use strip planting. The grass and stylo are sown together in strips so about 25-50% of the total area is sown. Over a number of years, sown grass and stylo will spread to the intervening areas. Some grasses like the Indian bluegrasses do this more effectively.

Companion grasses should be sown at 1-2 kg/ha.

TABLE 1. Sown grass suitability

Soil fertility*	Region		
	North	Central	South-east
Moderate soil P, 6-12 ppm	Nixon urochloa American buffel N of 18 deg S latitude Try Hatch/Bisset where rain >800mm Jarra where rain >800mm Koronivia where rain >1200mm Gamba where rain >1200mm Signal where rain >1500mm Floren bluegrass (heavy soils)	Biloela buffel grass American buffel Katambora rhodes grass Bisset bluegrass >750mm rain Hatch bluegrass >750mm rain Nixon urochloa Signal grass >1200mm rain Try Jarra finger grass Strickland finger grass	Biloela buffel grass Gayndah buffel grass Katambora rhodes grass Bisset creeping bluegrass Hatch creeping bluegrass Try Nixon urochloa Jarra finger grass Strickland finger grass Premier digitgrass
Low soil P, < 6ppm	Medway Indian bluegrass Bowen Indian bluegrass Dawson Indian bluegrass Nixon urochloa	Medway Indian bluegrass Dawson Indian bluegrass	Dawson Indian bluegrass Medway Indian bluegrass

	<p>Try Saraji urochloa</p>	<p>Keppel Indian bluegrass</p> <p>Try Bisset creeping bluegrass Hatch creeping bluegrass Strickland finger grass Nixon urochloa Saraji urochloa</p>	<p>Try Bisset creeping bluegrass Strickland finger grass</p>
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* No recommendations are given for high fertility soils as stylo dominance is unlikely due to vigorous grass competition.

Further information:

- Col Middleton, Principal Scientist (Pasture Agronomy), Phone: 07 4923 8100
- *Stylos for better beef* - A Booklet by Ian Partridge, Col Middleton and Kev Shaw. Available for \$10 per copy from DPI and Tropical Grassland Society outlets.
- DPI Client Service Centres, (extension Leaflets, pasture management) and Pasture Extension officers.

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Stylo Management Guidelines

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6. Management of stylo seed and hay crops

*John Hopkinson, Queensland Beef Industry Institute,
Walkamin Research Station*

In the previous Notes in this series it was shown that if stylo became dominant in grazed pasture you would need to implement some simple management practices to avoid this situation. Stylo dominant stands on some soils (low fertility, light texture) can result in soil acidification caused by leaching of unused nitrates down the soil profile, and possibly increased soil erosion. Growing legumes like stylo for hay or seed have special management needs because:

- we usually have a pure, dense legume stand fixing nitrogen that can cause acidification
- we can also have large amounts of material (and nutrients) being removed from the site.

Both of these contribute to soil acidification on soils of low nutrient status and light texture.

Hay

Stylo hay is usually grown on grazing properties low in nutrients and buffering capacity and where the crop is often repeatedly cut over many years. Removal of hay without equivalent inputs of soil nutrients contributes to acidification and nutrient depletion. Appropriate management includes:

- using fertiliser to replace the nutrients lost
- using lime to correct acidity
- grow stylo with a grass to take up fixed nitrogen. This will reduce the adverse effects of pure legume although there will be a lowering of hay quality
- finally grow the hay crop as part of a rotation system with non-legume crops or grass.

Soil degradation from stylo hay production is probably already common even if largely unnoticed. In the long run, it will be important because the most valuable county on a station is used for hay production.

Seed crops

Seed crops are pure swards with a dense population of legumes that are vigorously fixing nitrogen. A combination of easily leached nutrients, poorly buffered soils of low nutrient holding capacity in districts with a long dry season and a violent, intense wet season provide conditions to which stylos are well adapted and produce seed most successfully. There is a

surplus of fixed nitrogen and the conditions encourage nitrate leaching. Removal of seed and hay further aggravate the tendency to acidification.

The solution used by experienced legume seed growers is to treat the seed crop as part of an intensively managed farming rotation system that includes:

- use of fertiliser to replace major and trace elements lost from the system. It will be essential to maintain yields in any case
- monitor soil pH and use lime as required to correct any soil acidity problems
- rotation of the legume seed crop with non-leguminous, N-absorbing crops such as cereals, sugar cane and grasses.

Acidity prevention

It will be necessary to anticipate acidification rather than correct it and to take account of its occurrence in subsoil as well as the plough layer. Evidence from elsewhere of acidification and nutrient depletion in subsoil is directly relevant to stylos, especially as they are grown in conditions where deep rooting and dependence on subsoil moisture are necessary elements of the system. Since subsoil imbalances are notoriously hard to rectify, prevention rather than cure is the better approach.

Erosion prevention

Stylo seed production involves a farming system with high built-in soil erosion risks because it is necessary to prepare clean seedbeds in early summer and crop in rotation with other similar crops. But, being high return crops grown on high value land, they justify the normal good practices that reduce such risks to the minimum - earthworks, maintenance of soil organic matter levels and managed crop rotations. As part of a well-managed mixed farming system, stylo seed production can cope with the risks and be part of a sustainable whole.

Problems of soil instability and their consequences are more likely to occur where seed production is a casual, opportunist activity for landowners possessing low farming skills. This is where soil degradation is currently most conspicuous.

Further information

- Kendrick Cox, Scientist (Pasture Seed Production), Phone: 07 4092 9924
- *Stylos for better beef* - A Booklet by Ian Partridge, Col Middleton and Kev Shaw. Available for \$10 per copy from DPI and Tropical Grassland Society outlets.
- DPI Client Service Centres, (extension Leaflets, pasture management) and Pasture Extension officers.

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Stylo Management Guidelines

7. Fertilising stylo pasture

dpi note

*Kev Shaw, Queensland Beef Industry Institute, Rockhampton
Col Middleton, Queensland Beef Industry Institute, Rockhampton*

Most stylo is grown with native pasture on sandy, gravelly and duplex soils (texture contrast soils) of low to moderate fertility. Phosphorus (P) and sometimes sulphur (S) are the main limitations to stylo performance in northern Australia. On these less fertile areas stylo can out-compete native grass leading to the loss of the native grasses.

Stylo is tolerant of lower soil fertility:

Stylos grow well on soils with moderate soil P levels. Maximum stylo yields and animal growth rates in dry tropical environments occur at 8 to 10 parts per million of available P in the top 10 cm of soil. Even at 4-6 ppm of available P, stylos will produce up to 50% of their maximum yield. Below that, however, pasture establishment is not recommended without fertiliser, as establishment is slow and erratic.

The majority of our stylo is grown with native grass on soils with 4-6 ppm of available P. A stylo dominance problem may arise when the grazing pressure prevents native grasses from seeding, or limits the opportunities for new grass seedling development. Stylo can out-compete native grass in these circumstances.

Develop the better country first:

The best option is to avoid stylo dominance by growing it on the more fertile soils (at least moderate P status, 5-6 ppm or higher) which have been identified in the property planning stages. With high soil P levels (>8 ppm) stylo dominance is less common as competitive grasses like buffel can be used.

On moderate P soils fertiliser use on stylo/native grass is unlikely to be viable. However, the use of P fertiliser together with an improved grass sown after clearing and soil disturbance is viable. Rapid establishment gives soil protection and a quick return on capital invested. The extra cost for fertiliser is small considering other developmental costs. Improved grasses require a higher P supply than stylos and indeed high soil P usually results in periods of grass dominance over time as they take advantage of the elevated nitrogen supply under the legume. No commercial benefit is likely above about 10 kg P/ha every 3-5 years.

Special purpose use of fertilised pasture:

On properties without any moderate to high P soil, special purpose

pastures (e.g. for weaners) can be developed on low fertile soils using fertiliser and improved grasses and legumes including. This will allow you to carry more stock and produce higher growth rates than on the undeveloped low fertile soils. An example is in Cape York Peninsula where this practice (with some supplement where needed) can improve production from native pastures in uncleared woodland from 1 beast/15ha giving an annual liveweight gains of 90kg/head to 1 beast/3 ha with annual liveweight gains of 150kg.

Stylo with P supplementation is cheaper than stylo with fertiliser:

On moderate P soils Stylo growth and protein levels will be satisfactory for animal performance but plant P levels may still limit animal growth. It is more cost effective to supply P to animals as a supplement than to raise the pasture growth and P level with fertiliser.

Since most properties in the stylo growing areas of Queensland can find some soil with moderate P levels this is the preferred option. The economic use of fertiliser in this situation would require consistent liveweight prices in excess of \$1.30/kg.

Sulphur is rarely deficient:

Sulphur is needed for the production of plant proteins and so deficiency symptoms resemble those for nitrogen deficiency. Plants appear pale or yellow. Sulphur deficiency is not often a major problem with stylo. Some granodiorite based soils like those in the coastal Burnett area are sulphur deficient so check with your pasture extension officer if fertiliser is needed. Sulphur deficiency can be induced, however, if high levels of P fertiliser are used to develop effective stylo pastures on some soils (e.g. sandy soils of Cape York Peninsula) or in the production of seed crops.

Sulphur levels of more than 10 ppm in surface soil or a profile mean of more than 4 ppm indicates sufficiency. Where it is needed, an application of 10-20 kg S/ha is sufficient for 5 to 10 years in pastoral situations. A higher rate (up to 5 kg S/ha/year) is needed for cut and removal seed/hay crops.

Further information:

- Kev Shaw, Senior Extension Officer, Phone 07 4936 0332
- *Stylos for better beef* - A Booklet by Ian Partridge, Col Middleton and Kev Shaw. Available for \$10 per copy from DPI and Tropical Grassland Society outlets.
- *The Soil Fertility of Central and North-East Queensland Grazing Lands* – A booklet with accompanying maps by CR Ahern, PG Shields, NG Enderlin and DE Baker. Available from DPI for \$39.
- DPI Client Service Centres (extension Leaflets, pasture management) and Pasture Extension Officers.
- DPI's Call Centre; phone 13 25 23 (Queensland residents) 8am to 6pm weekdays. Non Queensland residents phone 07 6404 6999; Email callweb@dpi.qld.gov.au
- Pasture seed sales outlets for Information Leaflets.

Acknowledgement

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**APPENDIX IV. Important publications relating to the Stylo
Management Project**



The North Australia Program

**Review of Stability and
Productivity of Native
Pastures Oversown with
Tropical Legumes**

**John G. McIvor
Andrew D. Noble
David M. Orr**

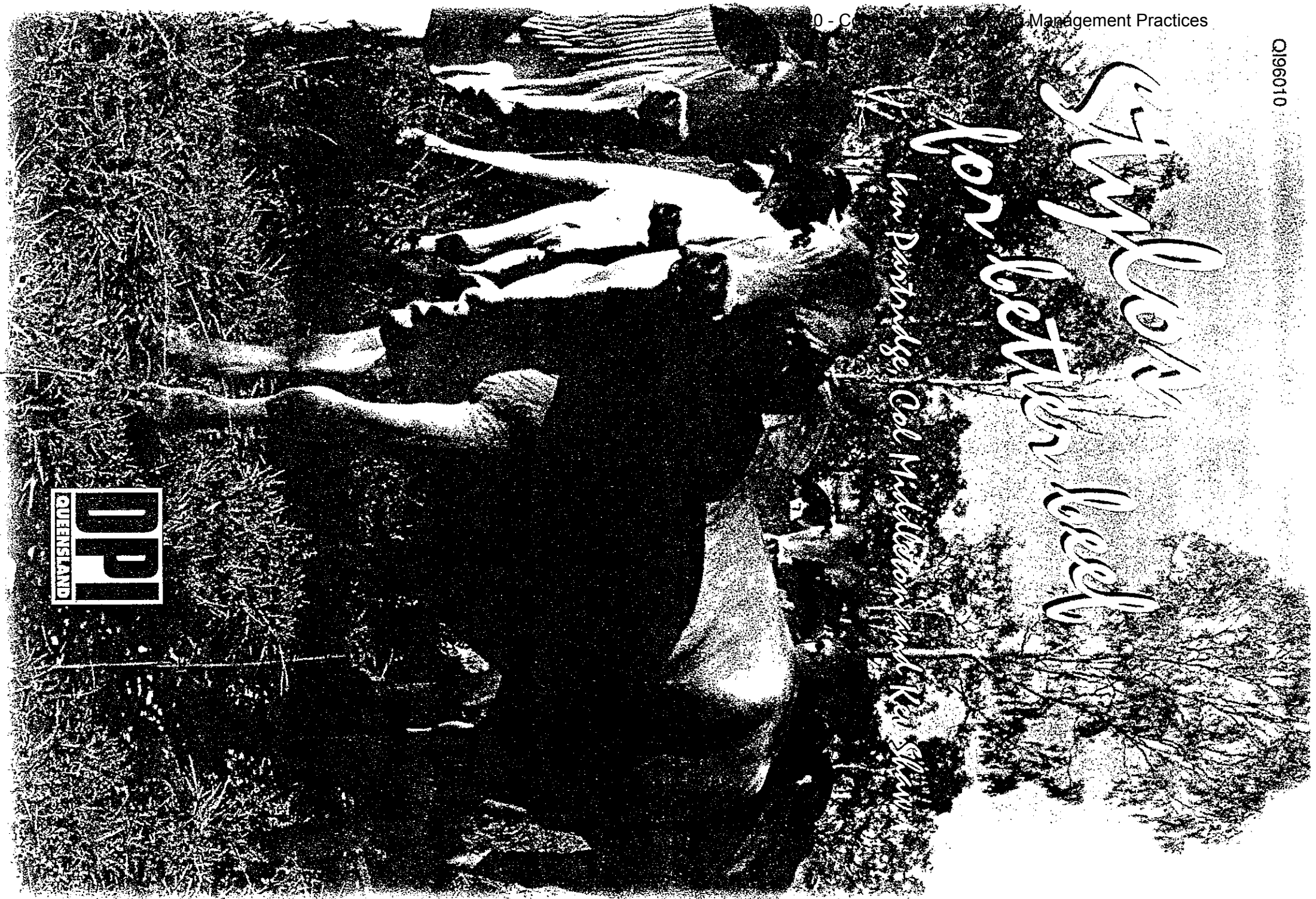
NAP Occasional Publication No. 1



**Meat
Research
Corporation**

Stay Lean for Better Wool

Alan Purtridge, Col Maddison and Ken Skirrow



Information Series QI96010

ISBN 0 7242 5977 5

ISSN 0727-6273

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GPO Box 46
Brisbane Qld 4001

*Soil Acidification: A Potential Threat
to Legume Based Pasture Systems.*

Andrew Noble
CSIRO Land and Water, Townsville
October 1997



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