

QUEENSLAND'S PASTURES: PAST, PRESENT AND FUTURE— A PERSPECTIVE*

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INTRODUCTION

The belief that early settlers had a high regard for Queensland's native pastures as forage for domestic livestock and more recent opinion, which generally considers that native pastures provide poor grazing, have prompted my research on the influences, and their timing, which appear to have heralded changes in attitude toward native pasture as a grazing resource.

In my case the quotation of Richter is particularly appropriate: "Never write on a subject without having first read yourself full on it; and never read on a subject 'til you have thought yourself hungry on it". I have given much thought to the general theme during the year, more recently I began the reading and of necessity the writing had to commence long before I reached the desirable state suggested in Richter's quotation.

In pursuing this topic I began with the Queensland Agricultural Journal, first published in 1897, as my major source of information concerning the past. In these pages people of the times, with similar professional interests to our own, were describing the current situation, advising on problem remedies, presenting ideas and comments and reporting research findings.

THE PAST

Native pasture and its deterioration

I have taken July 9, 1897, the date of the official opening of the Queensland Agricultural College at Lawes by the Governor, Lord Lamington, as the beginning of scientifically-based pasture management and development in Queensland. On this occasion the Minister for Agriculture, A. J. Thynne, referred to "this magnificent country we have at our disposal". Lord Lamington emphasised the need for students to develop their faculties of observation and stated that "Those who have merely a technical knowledge of the theories of agriculture, and go to work on plans which they have seen applied in the old country . . . those who engage in farming without practical experience . . . generally spell failure for themselves" (Anon. 1897).

Tardent (1897) had great expectations for western Queensland (450–750 mm mean annual rainfall) and suggested that "If the sheep farmer does not exceed the length of his working capital, if he is careful not to overstock or otherwise ill-use his paddocks, . . . he is sure to succeed . . . The natural grasses and herbage are there exceptionally rich and nutritious; . . . the climatic conditions are here so much more favourable, the soils so much more fertile, . . . to what they were in the early days of the American colonization of the west, . . . Whilst not a single Queensland farmer will go to the southern colonies, thousands will come here from the south. They will avail themselves of the virgin nature and greater fertility of our soils".

In a report on our natural grasses (Anon. 1923) the writer states that "Australia is particularly fortunate in possessing such a grand variety of indigenous grasses and bushes on which livestock thrive so well. Possibly no other country in the world is so well provided for in this respect as the Commonwealth . . . The average person can

* Presidential address delivered to the 1980 Annual General Meeting of the Tropical Grassland Society of Australia.

hardly realise to what extent the pastoral industry of Queensland is dependent upon her Mitchell, Flinders, blue, kangaroo and many other varieties of native grasses". The only disconcerting note was, "a large number of men who are closely associated with the land are unable to distinguish good from worthless grasses". This situation has not changed in the intervening years.

An early report (Anon. 1900) of pasture deterioration was from the Biggenden State Farm. "Our paddocks being subdivided, we have always an abundant supply of fresh and well-grown grass, whilst in places which are stocked all the year round the good grasses never get a chance to seed, and are soon replaced by coarse, useless, or noxious species". In the 150 years since our pastoral industries were established year-long grazing of native pastures has been the management practice used to maximize animal production. Although this is usually compatible with continuous grazing (Heady 1961) changes in the composition of native pastures and the long term effects of heavy and continuous stocking have directed agriculturalists toward evaluating sown pastures (Hart 1949).

Grimley (1903) stated that "It is a matter beyond controversy that the pastures of Australia have deteriorated since they were occupied, the carrying capacity is reduced; the better grasses have to a large extent disappeared, inferior grasses have taken their place and pestilential weeds have been introduced". Mr. J. Soutter in the discussion of Grimley's paper supported this conviction. "We have neglected our natural grasses far too long, and we allowed the squatter in the early days to squander them. The natural grasses were eaten down, nothing was left to reproduce seed, with the result that a great many of our grasses are now lost".

Brooks (1921) writes "In view of the fact that our grasses are such a valuable asset, it is somewhat surprising that so little attention has been given, more particularly by pastoralists, to their habits and characteristics. Even the testing of high quality indigenous varieties in areas where the more inferior sorts predominate would be a work of immense value and importance. While dairy and other farmers are equally indifferent as to the merits of our native grasses, they must be credited with giving introduced varieties a fair amount of attention".

Pollock (1927) expressed concern about native pasture deterioration indicated by change in species composition. "A consideration of improvement of the pasturage on large grazing areas is suggested in the provision for adequate reproduction of existing good grasses and legumes, and the introduction of others. In either case the necessity would exist for annually locking up portion of the area until desirable growths, either existing or supplied, had shed their seed. This would entail cutting up the area into different paddocks to allow one being so treated each year, a proposition probably considered impossible by many". This author noted the prevalence of native legumes and their subsequent disappearance on the coastal slopes and the change from the time fat cattle could be had all year to the current situation when these were available at only one time of the year. The opinion was expressed that "The prosperity of the State is influenced by the returns from pastoral industries, so it must be considered that the pasturage is a national asset, and its deterioration or improvement a matter of great importance".

The visiting scientists

A number of eminent scientists was invited to Australia in the 1920s. Professor R. G. Stapledon, Head of the Plant Breeding Research Institute at Aberystwyth, Wales, and an authority on the composition of pastures (Anon. 1926) was the first. Then followed brief visits by Dr. Orr of the Rowett Institute at Aberdeen, Scotland, and Sir Arnold Theiler, retired Director of the Veterinary Institute of South Africa at Pretoria, both of whom were expert in the field of animal health and nutrition. Later, Sir John Russell, Director of the Rothamsted Experimental Station, Harpenden, England presented lectures on his special subject of plant nutrition (Anon. 1928).

A colonial attitude was soon revealed; "Before long we may expect him (Sir Arnold Theiler) to give us the facts as he sees them, and when Dr. Orr has done the same, it is certain that definite lines will be laid down for all those who desire to raise our pastoral standards to follow" (Anon. 1928).

Mr. W. Davies, lecturer in Agrostology at the University of Aberystwyth, Wales (later Dr. William Davies, Director of the Grasslands Research Institute, Hurley, England) introduced the concept of "modern grass research" during a visit which coincided with the period in which Coleman (1931) had begun work fitting this description i.e. intensive pasture production and management. "Modern grass philosophy" according to Davies "can be summed up in four words—species, strain, fertility and management . . . and it is along those lines that grassland experiments must be conducted. My pre-eminent suggestion for Queensland is more and more investigation along the lines of improving strains of rye grass, paspalum, cocksfoot, lucerne, white clover, true Wimmera rye grasses and leafy strains of Italian rye grass . . . I am of the opinion that what has been achieved in the southern states of Australia, can be achieved in Queensland if a suitable clover can be found, and it can only be found if well planned investigations are conducted having that end in view" (Anon. 1932).

The work of these visitors was acclaimed by Australian scientists and their ideas were accepted as being relevant to local problems. About this time Hodge (1933, 1934) was warning of the continuing deterioration of the native pastures and the increasing necessity for winter supplementation of sheep on the Darling Downs, as well as providing advice on management to encourage the more useful grasses.

The visits of overseas scientists coincided with a period of rapid expansion in the dairy industry in coastal and sub-coastal southern Queensland. The inability of native pastures to provide quality forage for dairy cows throughout the year was realized and it was hoped that intensive pasture production using introduced species would overcome the problem. Soil and animal mineral deficiencies were revealed on poor coastal soils. Spectacular conversion of coastal and sub-coastal scrubs on fertile soils using Rhodes grass and paspalum was being achieved. The pressing requirements of the dairy industry and the interests of the visitors in intensive pasture production and animal nutrition reinforced the contemporary emphasis. This contributed to the neglect of the management requirements of the native pastures which supported the beef cattle and sheep industries and continued to provide forage for dairy herds.

Our pasture resources in perspective

Winders (1937a, 1937b) described the current pasture environment. "Whilst in Queensland much of the native pasture of the open downs, and of the more open types of forest country, has always been of good grazing value, the denser eucalypt forests, the rain forests (or "scrubs") and the brigalow "scrubs" in their natural state carry little or no grass and are practically useless for grazing purposes".

"In addition to the rain forests of the coastal areas, there occur in the country between the coastal ranges and the crest of the Great Dividing Range, "scrubs" of a drier type. Softwood areas of this nature occur on basaltic soils and on rich alluviums, and in most of the settled districts the original timber has been felled and burnt and the land sown to Rhodes grass for grazing by dairy cattle. Rhodes grass and paspalum have also been sown extensively after the clearing of heavily wooded blackbutt forests lying close to the coast; and on the cleared sections of the brigalow scrub areas of Queensland, Rhodes grass has been sown with good results".

"After some years, however, the initial high fertility of the soil, and its water-holding capacity, will have been depleted to some extent and steps will have to be taken, when practicable, to arrest pasture deterioration. Experience indicates that grass pastures (Rhodes grass) are limited in longevity and productiveness by the supply of available soil nitrates". A report (Anon. 1937) stated that "Protection and

improvement of native grasses has been bracketed with the establishment of sown pastures of proved stock-feeding value The necessity of correct pasture management and the evils of overgrazing are kept continuously before stockowners”.

Pasture deterioration, management and improvement were of obvious concern when the Premier of Queensland (Hon. F. A. Cooper) invited Dr. Hirschfeld to address the Queensland Cabinet, Members of the Legislative Assembly, representatives of the pastoral industry and senior Government officers on the subject of the development and improvement of Queensland pastures (Anon. 1945). In this address Hirschfeld (1945) listed the causes of deterioration of our pastures as overstocking, eating out of the good grasses and loss of mineral substances of the soil. He recommended preserving such good native grasses as we still possess, introducing and trying out grasses from other parts of Australia and other parts of the world with a climate similar to our own in the hope that these grasses might turn out better than the native ones. In an attempt to preserve our good native grasses he suggested closing up paddocks during seeding time, in rotation, allowing seed to fall.

THE PRESENT

I consider the period from 1945 to the present to be the era of the ‘replacement philosophy’ well expressed by Davies and Shaw (1964). “The factors limiting improvement in this region are the species, the soils, and the climate the main drawbacks to animal production on native pasture can be ascribed to the existing species and that their feeding value seems to be more influenced by climate than by soils. The first requirement, therefore, is to find better plants that do not suffer from the same limitations imposed by climate, particularly with regard to winter dormancy. We have tested many introduced plants and have found some that do not suffer to the same extent from these climatic limitations; but with them soil fertility assumes more importance and may determine their success or failure. For sown pasture plants we have concentrated first of all on defining and correcting soil nutrient deficiencies, and have then tested species in this new situation. Species are being sought both for introduction into native pasture and for sown pasture”. Shaw and Norman (1970) considered that all pasture research in tropical and sub-tropical woodlands and grasslands has been based on the above thesis.

However, Skerman (1972) suggested that we have an obligation, since we have over 162 million ha of natural grazing lands, to direct a good deal of attention to conservation and efficient utilization of our natural grasslands and to step up research in range management. This view was reinforced by Woolcock (1972) who pointed to the dearth of rangeland research which is in marked contrast to the emphasis being placed on the evaluation of new species introduced from abroad into Queensland. Arnold (1969) considered that integrated use of rangeland and areas of sown pasture was a largely neglected but important field of research in Australia.

A changing need

Most scrub areas available and suitable for development have been cleared so there is limited prospect for future use of the technology appropriate to their initial development. Areas of sown pasture are shown in Figure 1.

The impact of the conversion of brigalow and gidgee forests and woodlands on the pasture statistics of Queensland is seen in the estimate of 2 million ha of ‘grass only’ pasture on these lands in 1974 (Cameron 1977). The total sown pasture area at that time was only 3.2 million ha. In 1980 (Australian Bureau of Statistics 1964-65 to 1979-80) the ‘grass only’ pastures, embracing mostly the former brigalow and gidgee communities, accounted for 72% of the State’s sown pasture area.

In contrast to the projection of Ebersohn and Lee (1972) and the exponentially increasing trend presented by Cameron (1975), Figure 1 shows a marked decrease

SHEET 24—FIGURE 1

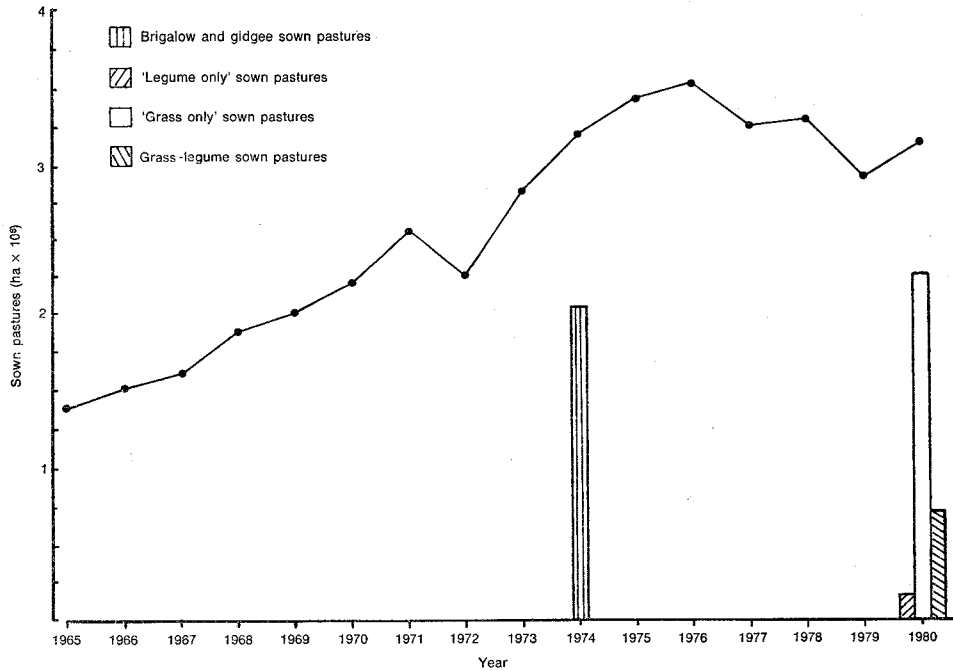


FIGURE 1

Area of sown pasture in Queensland for the years 1965 to 1980, area of sown pasture on formerly brigalow and gidgee communities in 1974 and areas of 'legume only', 'grass only' and grass-legume pastures in 1980.

in the rate of expansion in the area of sown pasture since 1974, at which time most of the brigalow and gidgee conversion had occurred. In 1980, less than 5% of the 3.2 million ha of sown pasture in Queensland was 'legume only' pasture, such as those developed by introducing *Stylosanthes* spp. into native pasture communities. At this time the 0.7 million ha legume-grass sown pastures were confined mainly to the high and medium rainfall coastal areas.

Of the 173 million ha in Queensland, Weston *et al.* (1981) estimated a 37 million ha unexploited sown pasture potential (excluding the 12 million ha unexploited cropping potential). Because of the nature of the animal production response to increasing areas of sown pasture (Rickert and Winter 1980), property management objectives are likely to be met with replacement of a small proportion of this native pasture.

THE FUTURE

The future is not easily planned and crystal ball predictions are frequently erroneous. It is, therefore, with reserve that I offer the following opinions on some aspects of pastures and their future development in Queensland.

Grasses are the basis for permanent rainfed sown pastures and need to be appropriately selected. None of the 40 grass species cultivated to any extent for pastures in both the tropical and temperate regions come from the world's natural grasslands; they are all mesic grasses related to forest margins and woodland vegetation types where the environment is relatively favourable. Most pasture vegetation, as opposed to natural grassland, may be considered to be in a seral condition and if the

management strategy of the pasture is changed or relaxed, the pasture begins reverting to some other form of vegetation, generally in the direction of the original vegetation if sufficient sources of genetic material still remain (Tothill 1978). It is understandable that the pasture became regarded as a crop (Winders 1973b, Davies 1960) requiring careful management to maintain the delicate balance of species components in sown pastures (Tothill 1978).

Ease of establishment, persistence under heavy grazing and tolerance of low soil nitrogen availability are major criteria for selection of new long-term pasture grasses. There will be an increasing demand for such grasses in revegetating areas of degraded native pasture. Grasses which are highly productive under good fertility conditions may be no more, or even less, productive than those with lower potential under poor conditions.

The better native perennial grasses in Queensland are considered inferior because they are unadapted to heavy continuous grazing, rather than being inferior with respect to responsiveness to improved nutrition or quality of forage given equivalent growing conditions to commercial introduced species. Management, particularly of native pastures, requires greater attention and the long-term nature of management effects should be better appreciated.

Second-stage development of pastures on former forest communities (rainforest, brigalow, gidgee) is similar to that required for woodlands where to date sown pasture development has been minimal. The prospect for further large-scale pasture development is dependent on technology which is yet unproven i.e. introduction of legumes into the extensive native pastures. It is important to realise the legume's role as a pioneer or early seral species and the manner in which the legume tends to give way to an uneasy balance between itself and the vigorous and demanding grasses. However, the vigour of the grass in the long term is dependent on the legume maintaining a reasonable nitrogen status in the system, so that a severe fall-off in the legume activity results in a subsequent decline in grass productivity and vigour (Tothill 1978) and probable eventual replacement by grasses less demanding of nitrogen fertility.

CONCLUSION

Pastures have diverse roles in Queensland and appropriate technology should be developed to satisfy the requirements of our pastoral industries. Native pastures, permanent sown pastures, ley pastures and annual forage crops have application in different situations.

The early high regard for our native pastures gave way to the view that they are poor forage. Undoubtedly many native pastures have deteriorated since settlement and this has justifiably influenced the attitude towards them. A poor grazing potential was probably an inherent feature of others. The extent of contemporary native pasture deterioration is an unknown and contentious issue.

Native tropical grasslands have limited animal production potential and considerable success has been achieved in reducing this restriction by replacing native pastures with introduced species. However, disillusionment with sown pastures has often been associated with lower production after the initial "flush" and with lack of persistence.

The realization that only a small proportion of our native grasslands may be replaced by crops or sown pastures in our time (Henzell 1980) has stimulated an emerging contemporary perspective. This views our pasture resources as components along an intensification gradient, rather than competing alternatives, to be utilized singly or in combination to meet various management objectives.

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OPTIONS IN PASTURE RESEARCH*

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ABSTRACT

Research in agriculture has been equated with conducting experiments. Other forms of research may be more appropriate. The relative efficiencies of just sitting and thinking, and of case studies, surveys, simulation and pilot trials are considered. These may complement the conduct of experiments, and each other, and lead to substantial savings in money and time. The conduct of different kinds of research is illustrated by simple flow charts.

INTRODUCTION

The economic production of food, fibre and draught power through animals depends on using the cheapest resources available. Grazed pastures provide the cheapest source of feed for ruminants, are available for all, or much of the year in most parts of the world, and are harvested by the grazing animal without large costs in non-renewable resources. Indeed in many regions other sources of food are not

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