THE NARAYEN RESEARCH STATION

by

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The Narayen Research Station is being established by the C.S.I.R.O., Division of Tropical Pastures on 22,600 acres of land made available to C.S.I.R.O., by the Queensland Government. It is situated some 40 miles west of Mundubbera on the Auburn River. The Station will provide new facilities for pasture research to serve the brigalow and spear grass regions and will make possible an intensification of much of the work which has already been undertaken. To explain the research objectives it is convenient to start by reviewing what is known about pasture improvement in the two regions. This knowledge comes from research by C.S.I.R.O. and the Queensland Department of Primary Industries, and from an ever increasing amount of farmer experience.

Spear Grass Region

The basic pasture problem has been fairly well defined. We know the pattern of animal production, that cattle do well in summer and poorly in winter, and we know that the real problem is inadequate nutrition in winter. There is a need to grow better quality feed and to grow more of it, so as to carry more stock and to carry them in better condition. We also know that most of the improvement we can bring about in winter performance on pasture, excluding irrigation and grazing crops, will arise from something we do to the pasture in summer when it is growing. Recognition of the dual roles of fertilizer and better pasture species is basic to pasture improvement.

Soils in the region are many and varied and only a relatively small proportion of them have been studied. Nevertheless it is clear that most of them lack nitrogen and phosphorus and that many also lack molybdenum or sulphur or both. Some of them lack potassium as well. If we rely on legumes to supply nitrogen, then in practice this means fertilizer applications of superphosphate, sometimes with molybdenum added, and sometimes with potash salts as well.

Experiments have shown that correct use of fertilizer makes it possible to grow better species, particularly legumes, and to grow more feed. With grass-legume mixtures it is quite common to double pasture yield, and with nitrogenous fertilizers yields can be even higher. But yield is not the only thing—we can also influence feed quality and animal response.

Findings at Rodd's Bay illustrate these points. In one experiment, Townsville lucerne growing without fertilizer produced about 1 ton of dry matter per acre containing about 15% protein, but when adequately fertilized with molybdenised super, it produced about 2½ tons of dry matter containing about 20% protein; that represented 2½ times as much dry matter and nearly 4 times as much protein per acre. This result is reflected in animal performance. Thus, unfertilized Townsville lucerne pastures at Rodd's Bay will carry 1 steer to 3 acres with an annual live-weight gain of about 300 lb. per head, whereas fertilized Townsville lucerne pastures will carry 1 steer to 2 acres with a gain of about 400 lb.; this means an extra 100 lb. of live-weight gain per acre which is equivalent to about 60 lb. more carcase beef per acre.

*Inaugural Address to the South Burnett Section, Gayndah, August 25, 1966.

Much knowledge has also been gained about suitable species for different areas, and this has been followed by a most welcome expansion of commercial seed production in the last few years. Seed prices are often high, but at least seed is available for purchase, and in many instances the landholder has a choice of species and of variety.

Many good grasses are available such as Rhodes grass, green panic, guinea grasses, buffel grass, setaria, paspalums, and so on, and at least some of these will grow successfully in some part of the region. Broadly speaking it is easy to grow a better grass provided it is supplied with enough nitrogen.

With legumes the position is also reasonably good. Thus there is Townsville lucerne for coastal areas south of the Tropic and for most of the northern part of the region. There is also Siratro which is giving good results in many areas, *Glycine javanica* which is more particular about its soil requirements but which is also a valuable legume, and *Leucaena leucocephala* which has not yet been used to any extent despite its undoubted value. In addition there appears to be a limited use for lotononis and the desmodiums in higher rainfall parts of the region. A few other tropical legumes also appear promising. Undoubtedly the most difficult part of the region for tropical legumes is the sub-coastal part of the southern half where winters are long and severe.

Then there is always lucerne. The value of lucerne as a legume component for mixed pastures on fertile soils has been shown in experiments at the Cooper Laboratory and at Brian Pastures and considerable success has been achieved with lucerne plus superphosphate on some granite soils in the Upper Burnett. Recent research in the Eskdale district of the Brisbane Valley has shown that lucerne can be successfully grown on acid granite soils with the aid of lime pelleting, and a mixed pasture of lucerne, Siratro, and Rhodes grass has been produced in which the two legumes exhibit a degree of complementary seasonal growth.

Brigalow Region

The starting point here is rather different because the soils are generally better and because of the accumulated fertility of the brigalow scrub. Hence after clearing it is possible to grow pure grass pastures of high yield and good feed quality for several years. However without a legume or nitrogenous fertilizer this is a mining operation so that pasture yield and quality gradually decline. Thus except for the first few years the basic problem is the same as in the spear grass region—we need better feed and more of it. In addition, of course, there is the problem of brigalow suckering.

Fertility of brigalow soils is generally fair to good. However some are marginal for phosphorus and molybdenum and there is certain to be a fertilizer requirement with time. Also, there are salt problems in some areas.

Regarding species, once again there are many grasses which can be grown and apart from yielding ability selection is largely concerned with aspects such as frost and drought tolerance and compatibility with legumes. The legume problem is more difficult than in the spear grass region largely because of lower rainfall and hard winters with severe frosts. Lucerne is by far the best legume at present but stands decline with disease and it needs fairly careful grazing management. Glycine and Siratro have been successful in some areas but improved varieties are needed with greater cold tolerance.

Beef production on improved pasture in the Brigalow can be very high. On newly cleared land pastures of *Sorghum almum* will give grazing within about 6 weeks of sowing and over the first year, given a reasonable season, will carry a steer to 1½ acres or better, with live-weight gains of 400 to 500 lb./head. Even though production declines with time, it can still be relatively high. Thus near Banana *S. almum*—green panic pasture in the fifth year after clearing has been recorded as producing 390 lb. live-weight gain per head in 12 months at a stocking rate of a beast to 2.3 acres.

Research Needs in the Future

In the two regions the present research position is thus much the same. We have gone through a phase in which most of the effort has gone into the search for new grasses and legumes and into the study of the fertilizer needs of different soils and of the new species. As a result it is possible to recommend improved pastures for certain parts of both regions and to make a reasonable prediction about the level of animal production that can be expected. However there are still many problem areas, and these are particularly the drier and colder parts, for which we still have to prove suitable legumes even though suitable grasses may be available. The ultimate objective for all areas is to find mixed grass-legume pastures which will exhibit increases in pasture and animal productivity and soil fertility with time. Unfortunately such a degree of success can only be claimed so far for Townsville lucerne pastures near the coast, and many of the new pastures still fall a long way short of what we think we can do.

Thus much more work is needed on the phase of pasture building, and also we need a much more intensive study of the new pastures to learn more about the whole complex of pasture, animal, and soil. We need to compare many of the species and varieties of grasses and to study their compatibility with different legumes. We need to examine the effects of different stocking rates on animal production and on pasture persistence. We need to measure the effect of different amounts of fertilizer, both initial applications and maintenance applications, on pasture and animal production. We need to study different grazing management systems, again with respect to animal production and pasture persistence, and so on ————.

All these things—species, stocking rate, kind and amount of fertilizer, management system—are inter-related and a change in one may influence the response to another. Therefore it is necessary to study several factors together. And, of course, the results must be measured in terms of animal products and over long periods. Further, we need to know what effects all these things have on soil fertility.

To do these things we need large areas of land and full control of all aspects of property management. Pasture research has gained much from the generous co-operation of private land-holders who have made land available for experiments, and it is of interest that C.S.I.R.O. is using some 1,100 acres of private land in the brigalow and southern spear grass regions at the present time. But this system is no longer fair to the grazier when one experiment may require 400 to 500 acres and it may have to continue for 10 years or more. This is what brings us to the need for the new research station.

The Search for a Suitable Property

Once the scheme to establish a large research station had been approved in

principle, the first move in the search for a suitable property was that the Prime Minister wrote to the Premier of Queensland asking if the State had land which it might be willing to make available. The basic requirements were stated as:—

(1) a minimum area of 2,500 to 3,000 acres of brigalow country and 6,000 to 7,000 acres of spear grass country suitable for experimental use;
(2) annual rainfall of about 30 inches.
(3) within a radius of about 300 miles from Brisbane to give reasonable access from the Cunningham Laboratory.
(4) close to a town where many of the staff might be able to live.

The response was favourable and immediate, and the Lands Department suggested three possible areas. The first, which was near Banana, was rejected because the country was too good, and the second was too far west to serve the spear grass country. The third area was one portion of the expired Hawkwood lease, and it was at once apparent that this block had possibilities. It had very suitable spear grass country, and the right rainfall, but the area of brigalow was too small and the site was too far from town for staff to travel out and back daily.

Therefore we looked for properties that might be purchased, and obtained information from agents about properties listed for sale in a broad strip of country stretching from Kingaroy—Taroom through to Westwood—Duaringa. Details of about 70 properties were examined and 10 were inspected, these including several possibilities involving aggregation of adjoining holdings. However the right combination was not found.

So, we re-examined the Hawkwood area and found that combination of two of the proposed sub-divisions provided the right types of country. This involved a larger area than had originally been contemplated, and it also involved higher costs, partly because of the extra area, and partly because the distance from town made it necessary to build accommodation for all the staff on the property. After further discussions the Queensland Government offered to make the extra area available, and the Commonwealth Government agreed to provide the extra funds.

It is pleasing to record and acknowledge the wonderful co-operation received from the Lands Department in all these negotiations.

A variety of types of grazing country is represented on the property. The precise situation will be determined by survey, but it is estimated that the area suitable for experimental use totals about 12,000 acres of spear grass land and 4,000 acres of brigalow land. Within the spear grass areas the major types represented are silver-leaf ironbark, narrow-leaf ironbark, and narrow-leaf ironbark plus rusty gum (*Angophora costata*) on granitic soils, but there are also areas of silver-leaf ironbark on brown clay-loam soils and on basaltic soils. The major types of brigalow land comprise brigalow-belah, brigalow-bottle tree, and brigalow-vine scrub. There are also considerable areas of very poor country, mostly on soils of lateritic origin, carrying a mixture of spotted-gum, ironbark, and wattle.

Establishing the Station

Operations on the Station were started in July 1966, and it is anticipated that it will take about five years to complete the first phase of development. There is a great deal to be done because the land does not include the homestead area of the original

holding. Basic development projects for the first four years include houses for married staff and quarters for single men, implement sheds and workshops, storage sheds, and a laboratory and office building; a road to give access to the building site and minor roads and tracks to proved for movement within the property; some 18 miles of new boundary fencing plus much internal subdivision fencing; a water supply for the housing area and more stock water points; telephone and electricity connections. We have to build up a herd of cattle to graze on the property, whilst there are two existing sets of stockyards these will need extensive modifications to fit our needs. And finally there will be land clearing, fencing, water reticulation, and cultivation to set up experiments.

All this will take much time and effort. As a consequence only small scale experiments to study fertilizer requirements and species behaviour will be possible in this first year. These will be done on both the brigalow and spear grass lands and will provide necessary preliminary information to help plan further work. The first large scale grazing trials are expected to start in the 1967-68 summer.

Fortunately there are no development problems concerned with staffing the Research Station. Managerial staff have already been recruited, and the research program will be undertaken by existing staff of the Division of Tropical Pastures at the Cunningham and Cooper Laboratories. Thus we have a fine property with types of country to suit our needs, we have funds to set the place up, and we have the research staff. The future will show how well we can succeed.

PASTURE IMPROVEMENT IN THE SOUTHERN SPEAR GRASS REGION
MAY MEETING, 1966

C.S.I.R.O. PASTURE RESEARCH, ESKDALE DISTRICT—L.'T MANNETJE

See 't Mannetje, L. (1967)—Pasture development in the Eskdale district of South eastern Queensland. Tropical Grasslands **1**(1): 9-19.

DISCUSSION

What do you consider is the contribution of legumes to the nitrogen status of this Rhodes grass/Siratro/lucerne pasture?

Dr. 't Mannetje: It is difficult to measure. Siratro contains about 3% N, Hunter River lucerne 5% N. The grasses and weeds have shown a good response to the presence of legumes and contain up to 1.2% N. Overall the nitrogen status is fair in the legume pastures. I think it is reasonable to say that the legume contributes about 100 lb. N per ac. per year.

Is it possible to establish legumes in native pasture?

Dr. 't Mannetje: I don't know yet. The drought has prevented us investigating this. Perhaps Mr. Filet of the Department of Primary Industries has some information.