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Agricultural development in the north Kimberley : terms, conditions and farm size recommendations

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Agricultural Development In The North Kimberley

A Report On The Terms, Conditions And Farm Size Under Which Development Could Be Accomplished

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Resource Management Technical Report No. 4

Disclaimer

The contents of this report were based on the best available information at the time of publication. It is based in part on various assumptions and predictions. Conditions may change over time and conclusions should be interpreted in the light of the latest information available.

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1. Summary

1. This report deals only with that land in the Kimberley, which receives more than 750 mm of annual rainfall. It comprises about 110,000 sq. kilometres (11,000,000 ha) of land.
2. There are approximately 1,250,000 hectares of land in this area of Kimberley, which may be sown to pastures such as Townsville Stylo, other Stylosanthes species or to other introduced pastures.
3. There are about 100,000 hectares of land in the same area, which could be used for arable cropping. There are no extensive tracts of arable land, most are small and would, only in rare cases, be capable of amalgamation into farms. The report has therefore disregarded this class of country in the assessment of agricultural potential.
4. The balance of the land (88%) is unsuitable for either pasture development or arable cropping with present known species or farming methods. It is rugged, often precipitous and mountainous, rocky terrain with shallow, skeletal soils occurring in patches.
5. The report recommends that grazing properties comprising 10,000 ha. of land capable of growing improved pastures, together with 60 000 ha. of native pastureland, should be established in the area.
6. The economic size of the farm unit is 5,300 adult cattle, equivalents.
7. Developmental costs, including cattle purchased, are estimated to be in excess of 3700,000 per farm. Annual running costs are estimated to be about 0105,000 per farm or \$93.00 per beast turned off.
8. At an assumed annual turn-off of 1,140 adult beasts per annum, breakeven returns of 30.44 per kg. of carcass weight are required to cover running costs or 00.74 per kg. To cover investment return of 10% and running costs.
9. Establishment costs may be lower for those already established in the area.
10. Land should be made available only to those with adequate capital and expertise in the area. The release is unlikely*to be suited to average family farming operations and certainly not to those with insufficient capital.
11. Farms of 70,000 hectares should be designed on a 1:6 ratio of improved to native pasture on the recommendation of the Pastoral Appraisalment Board under an amendment to the Land Act concerning special settlement lands. The land in each farm to be converted to Crown Grant, but only after 25 years of the lease being issued and after improvements and development has been completed to the satisfaction. of the Pastoral Appraisalment Board.

12. The large size of the proposed farms is recognised, but it is considered that in this tropical area, adequate provision should be made to ensure that the farms do not become dependent on the State.

2. Introduction

For the purposes of this report we have dealt only with that land in the North Kimberley, which receives more than 750 mm of rain annually. In this area, this amount can be regarded as the minimum required for the growth of Townsville stylo, since it also provides about fifteen weeks of effective growing season (J.E. Begg. J.A.I.A.S. Sept. 1972; Fitzpatrick and Arnold, CSIRO Land Research Series No. 9). Stewart (CSIRO Land Research Series No.28) found that 750 mm of rainfall provided this necessary length of growing season in four out of five years in the Kimberley area.

Other species of *Stylosanthes* such as the perennials, *S. scabra* and *S. hamata* and earlier maturing strains of Townsville Stylo may extend the boundary further south into drier regions. This extension of the area available would be conjectural and is therefore not used in any part of the discussion. However, the principles, which will be derived here, could be applied to the drier areas of the Kimberley Division where other species such as Birdwood Grass and Buffel Grass could enhance production above the levels of native pasture.

These perennial species and others may also enhance the productivity of sown pastures above that at present possible with Townsville Stylo. There are, however, no definitive studies nor large scale experience with these species. While it is possible to be optimistic and extrapolate from the limited plot work available, we feel this would be unwise. In this area, it is better to err upon the side of large property size than to risk the possibility of insufficient farm size and inadequate income, which in turn must lead to undesirable amalgamations or unnecessary farm income support or subsidy.

We have consequently relied upon data obtained from grazing and productivity trials with Townsville Stylo to establish stocking rates and farm size.

It must be stressed that there is a very limited amount of land developed and sown to stylo in Western Australia. Productivity and management data under Kimberley conditions are therefore very limited. More information relating to productivity should be obtained from such places as Kalumburu Mission where 2,000 ha of stylo have been introduced and Drysdale Station where several hundred ha of stylo have been established. This information can be used in conjunction with other published data on the use of stylo to assist or modify the general proposals outlined below. It must also be recognised that productivity and management features will vary within the Kimberley region with the lower rainfall areas tending to lower production or stocking rates.

We have dealt in the report with the use of these lands for Townsville Stylo or similar pasture plant development. We have not considered in any detail alternative uses the land may offer for the growing of crops of grain or hay. We do not believe that there will be much scope for this sort of development in the Kimberley in the medium term. There is no established technology, nor as far as we can see, even markets which will absorb large amounts of hay. The dismal history of similar projects at Katherine in recent times has tended to downgrade the investment incentives for this type of agriculture. The high cost of fertiliser will be a considerable disincentive; a

situation which is unlikely to change significantly even if fertilisers are available from the Queensland Duchess deposits.

As near as can be determined, there are about 100,000 ha of potentially arable black soil plain in the area covered by the present study. These, with the potential stylo lands, are the only areas which are capable of improved production using conventional and known techniques. Most of these cropping lands occur as quite small inclusions with more extensive areas of rocky uplands or stylo country. The Yampi Peninsula does though have somewhat more extensive tracts but the total area here does not exceed 32,000 ha.

In view of the limitations imposed by this restricted size, we do not consider that viable farming enterprises as distinct from grazing ventures, will be feasible in the area. In the absence of precise information on their location and extent, the clay soils are better regarded as inclusions within grazing properties. Field survey may reveal areas large enough to be farmed, but it is not proper for us to speculate upon this possibility.

3. The Area Suitable For Townsville Stylo.

We have used two sources of information for the assessment of the land suitable for Townsville Stylo. A report by Kubicki and Beer commissioned by the Pastoral Appraisal Board has been used for the North Kimberley. The CSIRO report on the lands of the West Kimberley area has been used to determine the suitability of land on the Yampi and Dampier Peninsulas, which receive more than 750 mm of rainfall annually. This area was not examined by Kubicki and Beer.

3.1 North Kimberley

There are about one million hectares of land suitable for the production of Townsville Stylo and other *Stylosanthes* species in the North Kimberley area. This consists of about 270 000 ha. of highly suitable land and 700 000 ha of moderately; suitable land. These figures determined by Kubicki and Beer are conservative and it has been suggested (Payne priv. comm.) that they could be upgraded somewhat. This increase in the area would not, however, alter the patchwork nature of the distribution of suitable land.

The North Kimberley area consists of essentially rugged country and most of the suitable land lies in a broad strip running approximately north and south along the Drysdale River. The remainder of the suitable land occurs in pockets of land associated with the lowest portions of basalt based land systems.

At present, the land is held under pastoral lease and as aboriginal reserve. There are 22 properties in the North Kimberley and the distribution of the land on these suitable for Townsville Stylo is as follows:

Station	Area suitable (ha)
Beverley Springs	34 700
Carson River	73 700
Doongan	39 500
Drysdale River	99 800
*Durack River	10 800
Ellenbrae	88 500
Gibb River	76 600
*Glenroy	600
*Home Valley	3 200
Kalumburu	31 300
*Marion Downs	20 000
Mitchell River	59 300
Mt. Barnett	20 000
Mt. Elizabeth	35 100
*Mt. Hart	300
*Mt. House	13 700
Panter Downs	25 300
Paraparap	63 400
Pentecost Downs	29 800
*Tableland	700
Theda	51 600

The properties marked with an asterisk have either comparatively small areas of land suitable for Townsville Stylo or are in a marginal rainfall area for reliable Townsville Stylo production. These properties should not be considered in an examination of the potential of the area for the species.

Less than 20 per cent of the land suitable for Townsville Stylo in the North Kimberley is unalienated under the provisions of a pastoral lease. The land is distributed as follows:

Region	Area Suitable (ha)	Percentage of Total
Ashton - 1:250 000 sheet	61 600	6.38
Charnley - 1:250 000 sheet	14 400	1.49
Drysdale - 1:250 000 sheet	59 000	6.11
Montague Sound - 1:250 000 sheet	12 600	1.30
Mt Elizabeth - 1:250 000 sheet	16 000	1.65
Prince Regent - 1:250 000 sheet	23 100	2.39

3.2 *Yampi and Dampier Peninsulas*

In addition to the above areas in North Kimberley a further 128 000 ha of land occur on the Yampi Peninsula, which could support Townsville Stylo. This land is found on Tarraji River, Oobagoona and Kimbolton Stations. It lies generally south of the McLarty Range, which forms the southern boundary of Collier Bay.

Dampier Peninsula has a further 100 000 to 150 000 ha of suitable land. Thus, about 1,250 000 ha of land can be considered in respect of improved tropical legume pastures in that area receiving a rainfall of 750 cm or more annually.

4. Production Studies With Townsville Stylo In Australia

4.1 Stocking rate

Only a few studies have been made of the productivity of Townsville Stylo pastures in Northern Australia. There is also a certain amount of hearsay evidence on productivity but little of this can be substantiated in terms of the intensity and season of use by cattle. In Western Australia there is only one investigation of the use, which cattle make of Townsville Stylo. This is being conducted at Mt Elizabeth Station and has been in progress for slightly more than one year. In 1976 stocking rates of a beast to 2.5 hectares were too high. In the absence of data on use in WA, it is necessary to turn to experience elsewhere in Australia.

In the Northern Territory and Queensland the studies reported have been short-term investigations of up to three years, which have given indications of productivity. In general, levels of use of about 1 A.U. (Animal Unit) to 2 hectares to 1 A.U. to 2.4 ha have seemed reasonable. On the wetter central Queensland coast where Townsville Stylo is grown with Black Spear Grass, stocking rates of 1 A.U./1.3 ha have been achieved.

However, it should be noted that these results have been obtained on relatively small trial areas. When applied to larger areas a lower stocking rate of 1 A.U./4 ha may be more appropriate to maintenance of the pasture on a year in, year out basis. Higher stocking rates may be possible towards Kalumburu, but it is possible only to speculate on this and certainly no more.

4.2 Management practices advocated for Townsville stylo in Australia

Two distinct schools of thought have developed in Australia in respect of the stocking system which may be imposed on pastures improved with Townsville Stylo. Both include a manipulation of numbers throughout the year.

In some parts of Queensland the Townsville Stylo pasture sections are integrated with the native pasture on the station. The ideal approach there involves:

- Stock graze native pastures in the early part (6-8 weeks) of the wet.
- Stock graze Townsville Stylo at high stocking rates until May.
- Stock graze Townsville Stylo pastures and native pastures until the beginning of the next wet.

In Central coastal Queensland, Townsville Stylo sown either into black spear grass (*Heteropogon contortus*) pastures or with *Urochloa mosambicensis* as a total pasture has been grazed on a year round basis.

In the Northern Territory where investigations on Townsville Stylo have been in progress for some years at Katherine and further north, year round grazing has been practised. These investigations, however, have been on small plots specifically

designed to produce Stylo along with native pastures. There has been no attempt to integrate the use of these sown pastures with land incapable of supporting them.

In this regard, McLintock's economic appraisal of the place of Townsville Stylo (Quarterly Rev. of Agric. Econ. 1970) points out that not all the land will be capable of carrying stylo. This assessment of the economics specifies that a substantial proportion of the area of a property will be incapable of carrying Townsville Stylo.

It appears as though the inclusion of land left in native pasture is assumed in all discussions on the usefulness of Townsville Stylo. More recent work by Winks (1974 A.J.E.A.A.H.) at Swans Lagoon, where he investigated stocking rate and fertiliser application on sown Stylo pastures indicated that continuous grazing may not always be desirable from an animal weight gain viewpoint. He has suggested that further investigation of the integration of native pastureland with Townsville Stylo is warranted.

5. Farm Design Criteria For Agricultural Enterprises In The North Kimberley

5.1 General considerations

It appears as though farms composed of part native pasture and part improved pasture should be the principal criterion in the design specification. The technical information on stylo use is so scanty that it would be unwise, we feel, for us to suggest that farms composed of stylo only will be operationally feasible.

We are also strongly of the view that it would be unsatisfactory from the State's point of view to have the better native pasture land developed to stylo or other exotic pasture on the basis of farms made up solely of these developed pastures. This approach would leave the least productive, but more abundant land, in the Kimberley virtually unused and certainly, unusable. The balance of the land thus left, while large in area, has a very low inherent productivity and would be unlikely to be stocked as a series of independent units.

We are also convinced that the Pastoral Appraisal Board, because of its particular expertise in the area, is the body most capable of administering the proposed new development in Townsville Stylo, other pastures and crops. Therefore, we feel that it will be necessary to have the Board involved in the area on a continuing basis since native grazing land will be included in each proposed subdivision. It is quite clear that continued supervision of the native pastureland will be required if it is not to degenerate. The Board already functions in this area of grazing regulation and it seems only sensible to continue to have it involved.

5.2 Stocking rate

Since not all land is ideally suitable for Townsville Stylo, and some has for the North Kimberley been classified as only moderately suitable, we have selected; a stocking rate of 1 beast to 3.7 ha as the average annual grazing capacity of stylo land in the Kimberley's. The stocking rate and season of use for six months assumes an annual consumption of about 1080 kg/ha from the stylo pasture and a productivity of not less than 3500 kg of pasture per hectare from the pasture assuming year long grazing (30% consumption of pasture on offer is regarded as being attainable by most workers). Between 4 000 – 6 000 kg has been obtained from adequately fertilised stylo native grass pastures in Queensland.

The grazing of Townsville Stylo pastures, however, as already discussed, is probably not going to be year long, but will be intermittent. Both season of use and intensity of use will vary throughout the year dependent upon the needs of the pasture. It appears, for instance, that heavy grazing maybe necessary for short periods to control annual weeds invasion. Grazing may have to be restricted to encourage establishment during the early part of the wet, and late in the wet period to encourage seed set in some species.

5.3 *Native pastures in the Farm System*

Stocking rates for the unimproved land in the Kimberley will be low. For the cost part, they will be about 1 beast to 25 ha. though the range will be from 1 to 9 ha. to 1 to 50 ha. If a grazing system similar to that proposed for Queensland is used, stock will have access to the native pastures for six months of the year. During this period, they will require about 2,000 kg of dry matter. At the mean stocking rate of 1 beast to 25 hectares, consumption of 80 kg per ha. of dry matter will be demanded. It will be quite feasible to reduce the area required for each animal on native pasture to 12 hectares or thereabouts, since this would increase the consumption demand to 176 kg per hectare, which is commensurate with the productivity of Kimberley pastures.

5.4 *Townsville Stylo and Native Pasture combinations*

Using the above standards, the ratio of stylo land to native pasture is approximately 1:6. This is the relationship which we have used in our estimates of the size of property which will be economically viable in the Kimberley.

6. Economic Implications Of Stylo Development

This section of the report attempts to assess the type of land holding needed to provide a viable farming enterprise. We have attempted to quantify herd size, capital required, operating costs and returns required to cover these costs.

In order to make suggestions and set out the guidelines for the release of Kimberley land for stylo development the following assumptions have been made.

6.1 Objective

To allocate sufficient land to allow the running of a commercial beef enterprise. The allocated area is expected to contain some land suitable for stylo development, with the balance being native pasture.

6.2 Size and Carrying Capacity of the Grazing Presort

The herd consists of the following animals. It is possible to postulate any number of herd pasture combinations, but this herd appears to be the minimum size required.

Herd composition-breeding cows	2 500
Other cattle over 1 y.o.	2 800
Annual turn off	740 steers
	400 cull cows
Percentage turn off	22

The stylo and native pasture areas are grazed on and off for equal periods. As discussed, the stylo area allows for an annual per beast consumption of 1 080 kg of stylo or provides an annual stock rate equivalent of 1 beast to about 3.7 ha. The native pasture area is required to provide for an annual consumption of 176 kg per beast or an annual stocking rate equivalent of 1 beast per 22.6 ha.

In order to provide sufficient grazing for a herd of cattle of this size, the following areas will be required:

Native pasture land	60 000 ha.
Townsville Stylo land	10 000 ha.
Total area	70 000 ha

6.3 Improvements and other Capital Costs

(i) Fencing

5 paddocks stylo	70 km	\$
4 paddocks native	150 Km	
	220 Km @ \$500	110 0
Water supplies and yards		20 0
Housing and sheds		50 0

(ii) Plant

Car, ute, 2 motorbikes, stock truck – 4WD vehicle, welders, tools, etc.		35 0
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(iii) Stock

5 300 @ \$50		265 0
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(iv) Stylo Establishment - Cost/ha

Burning	1.50	
Seed 5 kg/ha	7.50	
Double super 50 kg/ha @ 212 t inc.freight	10.60	
Aerial seed and fert. Application	4.00	
	23.60	
Cost for 10 000 ha		236 0
TOTAL		716 0

6.4 Annual running costs

Fertiliser 25 kg double super equiv/year	53 0
250 t double super incl freight 3212/t	
Aerial application of fertiliser \$2/ha	10 0
Labour units (2)	15 0
Repairs and maintenance	5 0
Fuel and oil	3 0
Plant replacement allowance	5 0
Rates and CT payment	1 5
Sundry expenses including freight	13.4
	\$105 9

Annual running cost/beast turned off \$93 (including freight to the works).

The following carcass weights are assumed for the annual turn off:

Ox	740 @ 230 kg	170 200 kg
Cows	400 @ 170 kg	68 000
		238 200 kg dr.wt.

Annual running cost/kg dressed weight beef produced is 44 cents.

Annual estimated production for sale of dressed weight beef/ha of stylo is 12 kg. (assuming 50% of the feed is provided by the stylo)

6.5 Annual stock reconciliation

Breeding cows 2 500	Deaths	485
Other cattle 2 800	Sales steers	740
Annual calf branding 1 625	Cull cows	400
	Breeding cows	2 500
	Other cattle	2 800
TOTAL	6 925	6 925

Other cattle are all steers over 1 y.o. and heifers. Annual turn off 22%. Death rate 7%. Calving percentage 65%.

6.6 Implications of the above cost and return estimate.

The capital input required to develop and fully establish the property is estimated to be around \$700 000. Development and establishment costs could be significantly reduced if done by a station owner on part of his station. These cost savings may be possible on such items as buildings, fencing, water supplies because of their existence on the station. This would apply of course only to current lessees in the area, which we consider should have at least some pre-emptive right to new subdivisions.

The estimated annual running costs are about \$105 900 or \$93 per beast sold. This means that an average net price of 44c per kg dressed weight needs to be achieved for ox and cow beef sold. This cost is exclusive of a return on capital or repayment of any development loan. If 10% return is allowed for the investment this increases the break even cost from \$93/beast to \$155/beast or increases the net price required for 44c/kg to 74c/kg. Heavy bullocks in Perth in December 1976 returned 38-41 cents per kg.

The size of the operation has been based on a two labour unit requirement. Consideration has been given to smaller units but it is felt that a one man unit plus casual labour or one man on his own would not prove satisfactory in this situation.

The most important cost component in the annual costing is fertiliser. The fertiliser calculation is based, on the application of the equivalent of 25 kg of double super per hectare each year. The fertiliser calculation is made biennially by air to minimise costs.

The stylo is established using the Stocker Stutz wet burn technique. The establishment is made with an initial sowing of 50 kg/ha of double super/ha and 5 kg of stylo/ha. The stylo area is fenced in 5 major paddocks and the native pasture area is fenced into 4 major paddocks. Provision is also made in the costings for adequate water, yards, buildings and plant.

7. Potential Users Of New Stylo Lands

Upon release, land suitable for stylo development is most likely to be used in conjunction with existing station operations because of the reduced capital requirements and the station owner's knowledge and industry experience.

Large capital holding or controlling operations with sufficient capital to develop the country or adequate surplus of funds to commit to an annual development programme will also be attracted to this project.

This proposed release is unlikely to be suited to the average family farming operation and will certainly not provide the scope for those with low; financial resources to go farming. Care will need to be taken when selecting settlers to allocate blocks only to those with adequate capital and expertise.

8. Tenure Systems

The foregoing sections on the size and cost structures of pasture development in the Kimberley suggest that a herd size of 5 300 cattle (2 500 breeders) and land holdings of 70 000 hectares will be required for each venture. The capital required is very large, and although it could perhaps be reduced in some instances by the present lessees slowly developing the pastures, the costs in terms of personal effort will be great therefore, we are of the view that some security of tenure beyond that offered by pastoral lease or special lease conditions will be required to encourage financial investment and personal involvement. It is doubtful if financial houses would approve substantial advances to enterprises where the security is a pastoral or special lease subject at all times to resumption for agricultural purposes.

We suggest that an amendment be sought to the Land Act at the same time as the current amendments are being presented to Parliament, which will allow large holdings to be taken up in the Kimberley under Special Settlement Lands provisions. Always providing that the legislation allows for the Pastoral Appraisal Board to be the regulating authority. Suggested amendment is attached as an appendix.

SIGNED	D.G. Wilcox Department of Agriculture, South Perth
	J. Ripley Department of Agriculture, South Perth
	R.F. Johnson Department of Lands & Surveys, Perth

9. Appendix 1

Suggested draft of new section in land act to provide for conditional purchase leases in: Kimberley division to facilitate establishment and production of non- indigenous pastures and crops

1. The Governor may, by notice in the Gazette, define and set apart any Crown Lands in the Kimberley. Division as Special Settlement lands for the purposes of the introduction and establishment of non-indigenous pastures, and may declare the same open for selection as such, and he may in like manner withdraw any land from being so open for selection.
2. The following conditions shall apply:
 - (a) the price of the land shall be fixed by the Governor, but shall not be less than dollars per hectare, payable half-yearly at the rate of one-fiftieth of the total purchase money in each instalment.
 - (b) the maximum area held by one person or by an incorporated company shall be determined by the Minister on the recommendation of the Pastoral Appraisal Board.
 - (c) the application shall be in the form of theSchedule.
 - (d) on approval of the application, a lease in the form of the Schedule shall be issued for twenty-five years, to date from the first day of the quarter next preceding the date of the approval of the application.
 - (e) the lessee shall, within six months from the date of his lease, take possession of the land and commence development as prescribed in paragraphs (f) (g) and (k) of this sub-section.
 - (f) the lessee shall effect in specified improvements on those lands designated as suitable for pasture by way of clearing and the sowing of pastures or crops at least two per centum of the total area of that land in the first year from the date of approval of the application for the lease and at least two per centum of the total area of that land in each of the next following 24 years, and progressively sow to non-indigenous pasture or crop, or to both, to ensure that at least 10 per centum of the total area of that land is or has been so sown by the end of the 5th year and 50% per centum of the total area of that land by the end of the 25th year or in such manner and extent as prescribed by the Pastoral Appraisal Board.
 - (g) the lessee shall, withinyears from the date of the commencement of his lease, fence in with a fence of such description as may be approved by the Minister on the recommendation of the Pastoral Appraisal Board, at least one-half of the cleared and cultivated land and the whole of the land within 25 years.

- (h) the land that is designated as not suitable-for ????? shall be fenced in such a manner as to permit its use in association with the land designated as suited for pasture development. Such improvements to be completed by the end of the 25th year.
- 3. At the expiration of the lease, if the conditions etc. etc., a Crown Grant shall be issued. Provided that no Crown Grant shall be issued unless on the recommendation to the Minister by the Pastoral' Appraisement Board.
- 4. The provisions of section one hundred and fifteen A of this Act shall apply as if the lease issued under paragraph (d) of sub-section two of this section were a pastoral lease.