# ECONOMIC ASPECTS OF TRANSPORT CO-ORDINATION IN NORTHERN AUSTRALIA

R. A. PATTERSON

*Bureau of Agricultural Economics*

For any large area of land which possesses the characteristics of northern Australia, careful planning for the best utilization of resources is an essential pre-requisite to development. With respect to transport development in the remote areas of northern Australia, the low productivity of the overall area implies that any over-capitalization in the form of superfluous duplication of transport facilities will result in a lowering of the standard of services being offered as well as increasing the cost of the services.[1]

The problems associated with over-capitalization have assumed more importance in recent years. The rapid development of highways and motor vehicle technology, together with the servicing of more areas by air transport, often accentuate the problem. Arising out of this often superfluous competition is the tendency to concentrate upon the most lucrative routes at the expense of those which possess less financial incentive. Under these circumstances hauliers are often compelled to operate at a level well below the optimum economic size.

In recent years greater emphasis has been placed on transport development in northern Australia;[2] some authorities, after exhaustive investigations, have even gone so far as to state that the provision of transport is the key to the development of northern Australia. A salient problem confronting the authorities responsible for development in northern Australia relates to the actual type of transport facilities which should be provided, as well as a knowledge of the economic justification of different modes of transport development. Experience has shown that planning programmes need to be designed on a national front and not on an individual State basis, as has too often been the case in the past. Two States, Queensland and West Australia, and the Commonwealth-controlled Northern Territory, are directly involved in transport development, whereas portions of South Australia and New South Wales cannot be ignored in any inclusive programme of development in the northern areas.

An important feature to be observed with respect to transport is that many of the cattle regions are interdependent, the pattern of movement

1. The overall objective of public transportation policy is usually summed up as being one which attempts to satisfy the transport requirements of the economy by a rational allocation of traffic with a minimum expenditure of economic resources. For a discussion on basic principles relating to public and private policies for transport competition see J. R. Meyer *et al, The Economics of Competition in the Transportation Industries*, Harvard University Press (1959) pp. 242-245.

2. See Bureau of Agricultural Economics, " The Economics of Road Transport of Cattle—Northern Territory and Queensland Channel Country (1959) ". C. R. Lambert, " A Survey of Transport Needs ", *Northern Australia, Task for a Nation*, Angus and Robertson, Sydney (1956). W. A. Beattie, *A Survey of the Beef Cattle Industry of Australia*, Divisional Report No. 5, C.S.I.R.O. Melbourne (1952), J. H. Kelly, *Report on the Beef Cattle Industry in Northern Australia*, Bureau of Agricultural Economics, Canberra (1952).

between them being determined by quarantine restrictions, location of meatworks, location of fattening areas, and the existence of established market outlets in general.

With regard to these northern areas the problem is basically one of overcoming the paucity of effective surface transport rather than one concerned with overlapping facilities. Under these conditions it is justifiable to ask the question why co-ordination of transport is being considered, when, in fact, lack of facilities, rather than over-supply, is the major problem facing the development planners. In answer it is contended that if transport development is proceeded with on a soundly planned basis which establishes the role of each form of transport in the economic conjuncture, many problems at a later stage can be avoided.

At the outset it needs to be emphasized that the nature of development in northern Australia has no counterpart in any comparable area in Australia. The pastoral areas of the north of Western Australia, Northern Territory, Gulf Peninsula and Channel Country of Queensland and the northern pastoral areas of South Australia, embrace an area equal to approximately 50% of the total occupied area of Australia and for all practical purposes are devoted almost entirely to the production of cattle. There are no large towns or centres of industrial activity which can provide a significant home market for local production, nor is there any economic evidence available, to date, to suggest that large centres of local consumption will be developed as a result of the establishment of agricultural industries. With the exception of isolated pockets of mining interests it can be stated that, under known technological conditions, almost the entire economic health of this vast area is dependent on the growth of the beef cattle industry.

*General Theory of Freight Rates Applicable to Northern Australia*

Rail, road and water transport may all involve large amounts of fixed capital, of which a significant proportion is irrevocably sunk in the original location—railway beds and station equipment, roads and harbour facilities. In addition, these forms of transport require specialized equipment for cattle transport which, in turn, involve varying degrees of fixed capital.[3]

Transport economic studies show that, in general, in a well-organized transport system, total costs incurred by road and water hauliers vary largely with the volume of traffic carried. Detailed investigations carried out by the United States Interstate Commerce Commission have revealed that fixed costs of motor carriers are no greater than ten per cent of total costs.[4] It can be argued that this position applies to small shipping operators also, as waterways are provided by nature and fixed costs involved in harbour facilities, navigation aids and channel dredging, are the responsibility of Government.

Under these conditions of operation, economies of scale are quite modest, so that the motor carrier and small ship industry will consist

3. This paper is concerned only with the analysis of the development of the conventional methods of moving cattle. Although air transport of beef is a practical possibility and is being successfully demonstrated in the West Kimberleys, economic analysis of this mode of transport service does not suggest scope for its development except, perhaps, in isolated pockets of country where road costs are prohibitive and where even droving is extremely difficult. Although the absence of reliable data has precluded any analysis being made of hovercraft and other off-road transport, it is difficult to see the role which these forms of transport could play in effective development of the remote areas of Australia.

4. Interstate Commerce Commission, *Explanation of the Development of Motor Carrier Costs with a Statement of their Significance*, Washington (1958).

of a large number of small operators. On the other hand, because of the magnitude of fixed capital invested, railways are large undertakings and are compelled to strive for full capacity traffic in order to maximize financial returns.[5]

The distinction between fixed and variable costs is of prime importance in transport economics. As regards the development of transport systems in northern Australia the extreme sensitivity of income level to changes in the volume of traffic will be a major determining factor in deciding the level of freight rates to apply for any particular type of service. Because of the invariability of a proportion of costs which would be associated with the initial development of transport facilities in the remote areas, average cost per unit of freight carried tends to decline as the volume of traffic is increased. The existence of a significant proportion of fixed costs usually results in some type of discrimination, or a differential structure of freight rates which cannot be justified by differences in costs of service.

As regards transport development we are concerned principally with the possibility of discrimination between places rather than between commodities. Examples of place discrimination relevant to conditions in northern Australia are group or blanket rate structures, higher charges for hauls over shorter distances than for hauls over longer distances when the movement is over the same route and in the same direction, and the practice of allowing charges to increase at a lesser rate than the rate at which cost of service increases with length of haul.

A policy of charging discriminatory rates between places is based on the nature of the demand for the transport service. No necessary relationship exists between length of haul and value of service—the maximum freight rate limit beyond which traffic will not move. The most profitable freight rate to the carrier will depend on the shape of the demand curve and its relationship to the level of variable costs—the lower freight rate limit. It is apparent then that the principal economic objective of an operator becomes one of designing a freight rate schedule in order to attract that volume of traffic which will maximize the contribution to fixed costs. The construction of a rate schedule implies a reasonably accurate knowledge of the elasticity of the demand for transport with respect to the level of freight rates. Consequently, in many instances a freight rate schedule based on "what the traffic will bear" is highly subjective and, as a result, often indeterminate. This problem becomes even more apparent when new modes of transport are introduced in competition with existing systems.

Under a differential freight rate structure an important question arises as to whether the traffic bearing the higher rate is, in fact, subsidizing the traffic operating at the lower rate. It is often contended that because the freight rate for some traffic is lower than the cost of service, traffic from other areas must be bearing a higher cost than would have been the case if the former traffic were charged its full cost of service. However, because of the relationship of value of service to fixed and variable costs, preferential rates do not necessarily burden other traffic. In practice, most studies show that a preferential rate structure actually makes possible a lowering of freight rates on other traffic, rather than increasing them. The upper limit for freight rates influenced by value of service should bear a close relationship to the cost of service. In other words a policy of discrimination may be considered equitable providing the discrimination is in the downwards direction only.

5. The extensive reports associated with the U.S. Interstate Commerce Commission contain many research and policy findings in relation to the problems created by fixed capital charges in railway operations.

*Water Transport Development*

Extensive field investigations in the northern areas indicate that scope for the development of coastal water transport exists in those areas where road transport will not be a potential competitor.[6] The reason for the inability of water to compete with road transport in these areas is due mainly to a combination of factors involving the density of cattle numbers and the class of country located in areas adjoining water loading points, and the final destination of the cattle produced. In these areas analysis shows that droving is the only alternative form of transport which will be available to the producer. The areas in which scope exists for water transport development are fairly clearly defined—Cape York Peninsula, coastal Gulf Region of the Northern Territory and the North Kimberley area of Western Australia. In the first two areas, the cattle density is extremely low, having a carrying capacity average of approximately five beasts per square mile with little prospect for any major increase. In the North Kimberleys, cattle production has, as yet, not been commenced despite the availability of pastoral leases for settlement. Detailed land classification data suggest that when settlement does occur average carrying capacity will not exceed four beasts per square mile.

The volume of cattle carried by water in the remote coastal areas is dependent on four principal variables—length of seasonal operation, the number of cattle available at the various loading points, the capacity of the cattle ship and the time taken to complete the individual return trips.

Property investigations in the Queensland and Northern Territory areas which would be influenced by water transport have provided details of the supply of cattle available at different levels of water freight rates, as well as the costs and value of losses involved in moving cattle by alternative methods.[7] Analysis of these supply data show that the average total cost for moving a seasonal shipment from various loading points is calculated to be in the vicinity of 5.24d. per net ton-mile. It should be pointed out, however, that as each loading point involves different distances, the actual shape of the overall average cost curve for the seasonal shipment will depend on the individual demand curves at the loading points which are, in turn, dependent on the level of freight rates charged by the shipper. At an average total cost of approximately 5.24d. per net ton-mile for the level of total traffic envisaged, the freight rate per net ton-mile would not necessarily be constant for all loading points.

To achieve a schedule of freight rates which would make the largest contribution to fixed and variable costs, a water transport operator may need to consider the possibility of charging, at competitive loading points, freight rates less than the full cost of service. Similarly, at loading points like Weipa the freight rate levied might be equal to or greater than cost of service. In effect this means that the purpose of freight concessions to cattle producers in districts served by loading points located at Burketown and Karumba, would be to attract a greater volume of traffic than would have been available if freight rates were based on total cost of service.

In the North Kimberleys, the area falling within the influence of water transport extends from the northern coast line to the Drysdale River Crossing about 130 miles south. The alternative to moving cattle by

6. Costs per net ton-mile for water carriers are usually the lowest of the recognized modes of transport. Terminal costs of the large water carriers are typically high but or the type of water transport envisaged for northern Australia terminal costs would not represent a significant cost element. See Meyer *et al*, *Competition in the Transportation Industries*, Harvard University Press (1959) pp. 112-113.

7. *The Development of Water Transport for Beef Cattle—The Gulf of Carpentaria and Cape York Peninsula.* Bureau of Agricultural Economics, Canberra (1961).

water transport lies in the establishment of stock routes to Wyndham Meatworks, or to the Glenroy-Mt. House area for treatment at the air-beef abattoir or for possible road transport to Broome or Derby. Providing physical conditions associated with shipping present no major problem and a satisfactorily designed ship could be secured to handle the smaller numbers of cattle, the level of freight costs could be estimated at approximately 5d. per net ton-mile—approximately the same as in north Queensland.

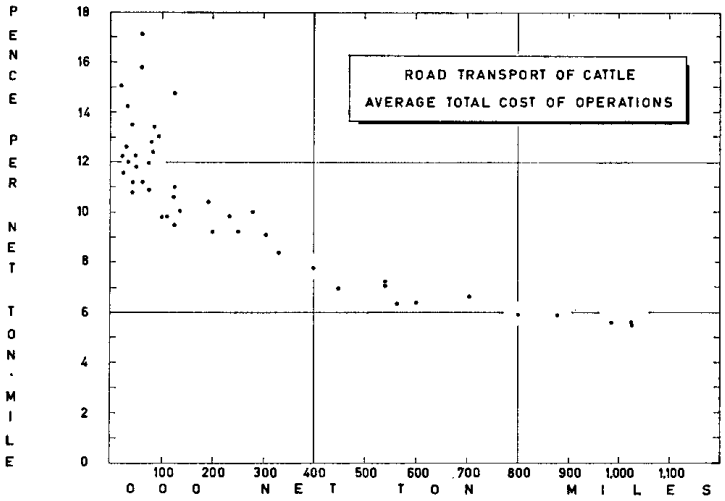
*Road Transport Development*

It is being increasingly recognized that the co-ordination of the movement of cattle by road and rail offers the greatest scope for solving the transport problem in northern Australia. It is frequently argued in cattle circles that producers will use road transport only if it offers a greater net income than that which could be derived from droving. Economic studies of the development of motor transport in all areas of northern Australia strongly indicate that, irrespective of the supply of drovers, producers who have orientated their production methods to this form of transport will not revert to a production system based on droving even if cattle prices are significantly reduced. In some areas where stock routes are good and droving distances are only short, or where roads capable of moving cattle by road trains do not exist, droving will remain the principal method of marketing cattle.

The approach to a consideration of the expansion of road transport is twofold. In the first place a study is made of the scope for development over existing road systems suitable for cattle transport by road trains. In the second place, it is necessary to evaluate the possibilities of the construction of additional arterial or feeder roads in areas where the provision of motor transport facilities would result in a significant increase in the volume of cattle turned off. With regard to existing roads which have not been constructed primarily for cattle movement by road trains, it is assumed that the condition of these roads will continue to be maintained irrespective of the number of cattle moved over them. Consequently, the main issue arising in areas coming within the influence of existing roads is the comparative economics of competitive methods of moving cattle. On the other hand, in those areas where new construction is required, both the capital invested and annual operating costs associated with the proposed roads need to be fully considered, in addition to the actual economics of road transport operations.

Economic analysis of road train operations which have been made to date show that the majority of hauliers are operating at a high unit-cost level. The most common argument advanced by hauliers in support of the need for the relatively high level of freight charges is that existing poor road conditions take heavy toll on transport equipment which, in turn, results in a reduced working life as well as high maintenance costs. However, analysis of road transport costs shows that the present level of unit costs is due to other factors besides increased operating costs resulting from poor roads. The explanation lies principally in the relationship of fixed costs and unused capacity to the annual volume of traffic carried. Although economic studies in areas where road transport is well developed show that total annual costs in the road transport industry are characterized by a low proportion of fixed costs this is not the case with cattle train hauliers in northern Australia. Because of a number of reasons, road train operators do not carry sufficient traffic in relation to the annual commitment of fixed costs. A clear picture of the position is illustrated in Fig. I which shows the average net ton-mile costs for 46 road train units in remote areas of Australia.

From the above analysis it is clear that considerable scope exists for a




reduction in the costs of moving cattle by motor transport. To emphasize the significance of utilizing plant as much as possible and so spreading fixed costs over as great a traffic volume as possible, estimates have been made of the proportion of fixed costs associated with road trains at present operating in northern Australia. The plotting of net ton-miles in relation to total operating costs of each train indicates that a linear relationship between the two variables is a reasonable assumption and an estimate of the proportion of fixed costs at different traffic levels can be made.[8] The average net ton-miles travelled amounted to 420,000. At this traffic volume 41 percent of the total costs is represented by fixed costs. By contrast, the average net ton-miles of the trains operating at a cost below 6d. per net ton-mile was 970,000, with fixed costs representing 19 percent of total costs.

At the present time the most important problem facing the hauliers of cattle in northern Australia is one of organization. The objective can be stated simply as one which requires the utilization of their resources in such a way as to move the seasonal volume of cattle traffic available with the smallest number of road trains practicable. The difficulty of achieving this becomes apparent. Because of the seasonal nature of cattle production and the large size of cattle properties, the main volume of cattle turn-off in the remote areas is confined to a few months of the year, particularly where fat cattle are involved. Events have shown, however, that as areas with relatively smaller property size, such as the Alice Springs District, commence to concentrate more upon the production of young stores the spread of the seasonal turn-off is greatly lengthened.

In those areas which at present fall within the influence of roads already suitable for carrying road trains, it can be expected that the present trend of moving cattle by motor transport at the expense of droving, will continue. It can also be anticipated that as more cattle become available for movement by road train, unit costs will be reduced and will give

8. If freight, other than cattle, were also carried, multi-variate regression could be used in order to estimate the incremental variable cost per unit of general freight traffic and to estimate the incremental variable cost per unit of cattle traffic. For a discussion on the employment of multi-variate regressions in transport economics see John R. Meyer, Gerald Kraft, The Evaluation of Statistical Costing Techniques as Applied in the Transportation Industry, *American Economic Review*, (May, 1961) pp. 313-334.

further impetus to motor transport development. At this stage of development is is reasonable to assume that significant improvements will be made in relation to road transport equipment which will benefit both hauliers and producers alike.

Given improved organization so that a greater utilization can be made of road train units, analysis of the costs of large diesel units capable of carrying around 100 head of cattle on bitumen suggest that road hauliers will be able to transport cattle at a freight cost of 6d. per net ton-mile. For young store cattle this would be equivalent to a freight rate of approximately 17/- per head per 100 miles on bitumen and 19/- per head per 100 miles on well formed earth roads. For fat bullocks weighing at the rate of two per ton a freight rate of 25/- per head per 100 miles on bitumen and 29/- per head per 100 miles on earth formed roads could be expected.

*New Road Construction*

Property surveys in all major cattle producing areas of northern Australia show that the greatest overall need for transport development lies in the Queensland Gulf and Channel Country. The Gulf region contains the highest cattle density of any area in the north but it does not, as yet, possess roads capable of carrying road trains south to railheads on the Mt. Isa-Townsville railway or to the eastern coast meatworks. In the Channel Country the full utilization of existing resources can never be made until roads are provided to move store cattle into the area and fats or semi-fats out of the area.

In the Northern Territory, the Victoria River District is the area most deficient in roads. The prime purpose of motor transport will be to provide access roads so as to move fat cattle to Wyndham or Territory export works and store cattle to the Stuart Highway.

In Western Australia the expansion of the cattle industry is dependent on linking Wyndham meatworks with the Victoria River District at Newry in the north, and Mistake Creek in the south. If the cattle industry continues to develop, a more urgent need for road construction linking the Glenroy-Mt. House area with Derby, and Mistake Creek with Nicholson, will arise.

The social need for roads in the remote areas does not mean that an economic case exists for their justification. As the principal beneficiary of road construction will be the cattle industry and the people directly and indirectly concerned with its prosperity, any evaluation of the benefits of road construction in terms of increased beef production must be related to the overall capital investment and annual road maintenance costs, as well as the economics of road transport.

It is not proposed here to deal in detail with the methodology employed in analysing the economic case for each road proposal in the areas considered. The technique of evaluation is based on the benefit-cost analysis for determining the economic justification of development projects. Briefly, the variables used in this analysis have been:—

(a) the annual value of the increase in cattle turn-off attributable to the provision of road transport facilities;

(b) the increased property costs of producing the additional turn-off;

(c) the annual capital and operating costs associated with constructing and maintaining the roads;

(d) the annual capital and operating costs associated with the provision of road transport equipment.

Up to the present, analysis of the economic justification of all roads

which are considered necessary to the development of particular areas has not been completed. These roads are listed below. Asterisks indicate where analysis has been completed and where economic justification of road construction has been established. The remaining roads include those in a condition at present capable of moving cattle by road trains, and others which involve some degree of construction to bring them to a suitable standard. Economic analysis is continuing in relation to the latter category.

*Road Systems Considered Necessary for the Development of Cattle Industry*

QUEENSLAND

*Gulf and North East*

Burketown–Donors Hill–Wurung–Quamby*
Wurung–Julia Creek*
Gilbert River–Hann Highway*
Highbury–Mungana*
Mt. Garnet–Hughenden
Clarke River–Charters Towers
Charters Towers–Blair Athol
Ewan–Northern Highway
May Downs–Dingo
Duaringa–Taroom

*Channel Country*

Mt. Isa–Dajarra–Boulia*
Boulia–Lucknow–Winton*
Monkira–Windorah–Quilpie*
Kihee–Eromanga–Quilpie*
Thargomindah–Bourke (via Cunnamulla or Hungerford)

SOUTH AUSTRALIA

Birdsville–Maree

NEW SOUTH WALES

Naryilco–Warri Gate–Broken Hill

WESTERN AUSTRALIA

Fitzroy Crossing–Derby–Broome
Wyndham–Mistake Creek*
Mt. House–Derby
Meekatharra–Pt. Hedland

NORTHERN TERRITORY

Barkly and Stuart Highways
Anthony Lagoon–Barkly Highway*
Jervois Range–Stuart Highway*
Yuendumu–Stuart Highway*
Kulgera–Finke*
Newry–Timber Creek–Top Springs–Stuart Highway*
Top Springs–Wave Hill*

*Competition with Droving*

Although the cattle industry in the remote northern areas, in general, believes that droving will become less important as the industry develops, walking cattle is, nevertheless, a vital marketing method which should not be discarded on the grounds that drovers are becoming increasingly difficult to secure.

If it could be reliably expected that significantly higher net incomes would be gained from the continuation of production methods based on droving, rather than on any alternative method of moving cattle to market, it is logical to infer that the cattle industry would take steps to alleviate the problem of a drover shortage. However, other important considerations must be taken into account when studying the future of droving. One needs only to mention the more obvious—the number and condition of stock routes, livestock carrying capacity of individual stock routes, capital investment and annual costs of stock route improvements, wastage of travelling cattle, and the limitation on the class and number of cattle turn-off.

Despite the fact that droving costs per head are lower than comparable road transport costs per head, property studies, in those areas of Australia in which road transport has been introduced show that the average net income from production systems based on motor transport marketing is significantly greater than would be the case under droving. For properties situated in close proximity to rail heads or other outlets where motor transport has little influence on production methods or the number and quality of the type of cattle turn-off, it is a matter of weighing the relevant physical and economic variables to determine the most profitable marketing system.

*Railway Development*

In the past many recommendations have been made by interested parties concerning the possibility of railway construction in northern Australia. Studies of the present and potential cattle turn-off, in relation to the direction of cattle movement, show fairly conclusively that the most practical possibility for railway construction in northern Australia is an extension of the Queensland network from Mt. Isa or Dajarra into the Barkly Tableland of the Northern Territory. Analysis of traffic density and cattle flow indicates the best siting for a railway would be from Dajarra to Anthony Lagoon via Camooweal and Alexandria, a distance of approximately 400 miles.

Costs of railway construction are based principally on estimates made available to the Bureau of Agricultural Economics. These costs are related to different levels of traffic which could be expected to be available for movement by rail if freight rates were favourable. At the relatively low traffic density envisaged, little difference in average construction cost per mile occurs for various levels of traffic. The average total cost per net ton-mile at a traffic density of 15 million net ton-miles is estimated at 29 pence whereas at a traffic density of 40 million net ton-miles the unit cost is reduced to 14.4 pence. Allocating freight, other than cattle, results in an estimated traffic volume equivalent to 7.9 million net ton-miles and an overall traffic volume of 34.7 million net ton-miles. At this level of traffic average total cost would be in the vicinity of 14.6 pence per net ton-mile.

It is apparent when one considers the existence of a sealed highway across the Barkly Tableland running almost parallel to a proposed railway, that the number of cattle attracted to either form of transport service would depend on the relative level of freight rates. At a cost approximating 14.6 pence per net ton-mile cattle producers would not use rail transport. Because of the rapid decline in average cost per ton-mile as the volume of traffic increases, it is logical to ask at what level of traffic would a railway be able to compete with road transport across the Barkly Tableland.

The general shape of the average total cost curve in the analysis of railway costs is in the form of an hyperbola. Using the equation $Y = \frac{1}{a + bX}$ where $Y$ = average total cost and $X$ = net ton-miles, an estimate is made of the quantity of traffic at which average rail and road costs would tend to coincide. If we take an estimated average total cost for road transport on the Barkly Highway of 6d. per net ton-mile, the estimated level of railway traffic needed to reduce costs to 6d. would be in the vicinity of 97 million net ton-miles. At this level, which is greatly in excess of the estimated potential traffic volume of 34.7 million net ton-miles, the actual cattle traffic component would be equivalent to approximately 550,000 head. It is clear that, under known technological conditions in the area to be served by the railway, it would be impossible for the industry to produce such a volume of cattle within any reasonable foreseeable period of time.

Moreover, even if this railway were in a position to compete with road transport, it is unlikely that any government would seriously consider its construction based on the development of the pastoral industry alone. Much expenditure has already been incurred in the construction and maintenance of the Barkly Highway. Any duplication of transport resources in this area could only be seriously considered if the volume of traffic were so high as to be unable to move satisfactorily along the highway.

The capital investment involved in railway construction in other areas in northern Australia could be expected to be higher than on the Barkly Tableland. Analysis of relative cattle densities, in relation to alternative

forms of moving cattle, suggests that in the foreseeable future little scope exists for new railway development in any of the remote areas of Australia, unless supplementary forms are available to increase the flow of cattle traffic.

*Conclusions*

In the remote areas of Australia the rapid development of road transport of cattle to provide all-year-round facilities for linking breeding with fattening areas, and fattening areas with meatwork outlets, can be considered one of the most important production incentives to be experienced by the cattle industry.

Analysis of the economics of road transport operations in these areas supports the contention that great scope exists for the expansion of road transport providing suitable roads are available. On gravel-earth formed roads hauliers who have organized their operations to make maximum use of capacity throughout the season can move cattle at an average total cost of 6d. per net ton-mile. The average total cost on sealed surface roads is reduced by approximately 0.9d. per net ton-mile.

One of the most important factors inhibiting the expansion of road transport of cattle is the paucity of suitable roads. Analysis of economic data relating to road construction has shown that certain arterial and feeder roads necessary for the development of the cattle industry, can be justified on economic grounds.

The areas in which the provision of additional roads would make the greatest contribution to increased production are the Gulf and Channel Country of Queensland, and the Victoria River District of the Northern Territory. These roads would be essentially feeders linking the areas with railways, arterial roads or meatworks.

The scope for water transport lies in the coastal Gulf areas of North Queensland and the Northern Territory, and in the undeveloped area of the North Kimberleys of Western Australia. Economic analysis shows that providing ship capacity can be fully utilized during an eight-months season, cattle could be moved to the Queensland east coast at a freight rate of approximately 5d. per net ton-mile.

Principally because of the high fixed costs in relation to the level of traffic density, railway construction in the remote areas cannot be justified under known technological conditions.