final report

Regional Impact of Feedlot Investment

CONTENTS

SUMMARY

This research was commissioned by the Meat Research Corporation and the Australian Lot Feeders Association in conjunction with the Australian Local Government Association. The goal of this study is to provide clear, sensible indications of the regional benefits or otherwise of a feedlot development.

There has been considerable investment and growth in the feedlot industry, particularly since 1988, in rural and regional Australia with associated greater demands for physical inputs (cattle, feedstuffs, plant and equipment, energy, etc.) and services (transport, repairs and maintenance, professional, etc). The demand for these goods and services and the employment generated by the feedlots and the associated industries, create significant economic and social impacts in the regions concerned.

This study identifies, in a consistent and methodically sound way, the magnitude and distribution of the impacts associated with a feedlot development in a region. The research involved case study examinations of established feedlot operations in Eastern Australia. The co-operating establishments requested strict confidentiality as regards their operations, which excludes the use of actual case examples. The study is therefore based on a representative feedlot modelled to represent the characteristics and influence of a typical feedlot development located and sited in a typical locality and region in Eastern Australia, and is able to represent the demands and interactions of a typical feedlot.

The representative feedlot, which caters for the export market, has a capacity of 25,000 head with an annual average utilisation rate of 90 per cent. Half the capacity is used for cattle fed 150 day programs (150 DOF), half divided evenly between 100 and 300 DOF programs. As part of the sensitivity analysis, a less detailed impact assessment was undertaken for a 10,000 head feedlot.

For this study, the *local* economy is defined as the area within a 50 kilometre radius of the feedlot and the *regional* economy as the area within a 100 kilometre radius.

The economic impact of the representative feedlot development at local and regional levels, has been assessed in several dimensions, namely:

- **The impact of a feedlot establishment (or expansion):** Expenditure in the local economy is estimated in the range $7.5m to $10.0m, with an additional $4.5m to $6.0m spent in the regional economy during construction. Employment impacts are less certain but are estimated in the range 37-50 jobs per annum at the local level, with an additional 22-30 jobs at the regional level over a two year period.

- **The direct impacts of feedlot operations:** The on-going feedlot operation creates the equivalent of 50 full-time jobs and approximately $8.2m in value added per annum.

- **The indirect impacts of feedlot operations:** The on-going feedlot operation creates demands for goods and services from other firms, which in turn generate similar demands. In the broader regional economy (including the local) an additional 72 jobs are created and approximately $3.5m in value added.

  A negative indirect impact can be the shortening of the life of Local Rural Roads, and hence increased Local Government costs. The study found the cost of this attrition to be approximately $83,340 annually or $0.33 per head of capacity per annum per kilometre travelled. In the broader picture this cost is far outweighed by the positive benefits.

- **The total impacts of feedlot operations:** The total impacts of feedlot operations, which are the summation of the direct and indirect impacts, are shown in the table below.

Total Impact of Feedlot Operation (25,000 head capacity)
Local and Regional Economies

	Value Added ($m)	Value Added/Head ($)	Employment (no. of jobs)
Direct	8.2	328	50
Indirect	3.5	140	72
Total	**11.7**	**468**	**122**

- **The non-quantifiable impacts:** There were positive non-quantifiable impacts identified including: increased market stability for feed and cattle producers; possible price premiums for grain and cattle; new market opportunities; the maintenance of existing businesses; the maintenance of local services; enhanced nature of employment; social impacts; and odour and other environmental issues.

The magnitude of the economic impact of a feedlot is sensitive to a number of factors, in particular, feedlot size, sourcing of inputs, structure of the local and regional economies, and the follow-on benefits as a result of services developed such as in the transport and meat processing sectors.

It is concluded while the impacts of a feedlot development are many and varied, two aspects in particular make major positive contributions to sustained regional economic development, namely *value added* (in the further "processing" of locally produced agricultural commodities) and *employment*.

1.   INTRODUCTION

The Australian Feedlot Industry is experiencing significant growth in response to increasing market demand for quality beef produced on an on-going reliable basis, irrespective of seasonal conditions.

The Australian Feedlot Industry annual turnoff currently represents approximately 20 per cent of Australia's total cattle kill and 25 per cent of beef production, with value in 1993 exceeding $1.1 billion (ALFA, Pers Comm). Market assessments and projections (AMLC, Pers Comm) indicate a further strong expansion in demand for feedlot produced beef and potential for the current industry to more than double in size by the end of the decade, if demand is to be satisfied. Currently, some 70 per cent of feedlot capacity is applied to export production and 30 per cent to domestic production.

In 1992/93 the industry consumed in excess of 1.5 million tonnes of feedstuffs of which grain exceeded 1 million tonnes (ALFA/AMLC 1993 National Feedlot Survey). Current consumption exceeds 2 million tonnes of feedstuffs and could reach 3.5 million tonnes by the end of the decade.

The growth in the Australian feedlot industry, particularly since 1988, has meant a dramatic growth in investment in feedlot capacity. These investments have occurred in rural and regional Australia and have been associated with new demands for physical inputs (cattle, feedstuffs, plant and equipment, energy, etc.) and services (transport, repairs and maintenance, professional, etc). The demand for these goods and services and the employment generated in the feedlots and associated industries, create significant economic and social impacts in the regions concerned.

The aim in this study is to identify, in a consistent and methodically sound way, the magnitude and distribution of the impacts associated with a feedlot development in a region. In the following, the general approach to the study is described and quantitative and non-quantifiable results of a representative feedlot are presented and considered. The implications of the results for the industry and their sensitivity to changes in key parameters are discussed and conclusions drawn.

2.   STUDY APPROACH

The presence of a large enterprise has considerable effects on the character of the local economy in which it is embedded. In the case of a feedlot development, the enterprise to support its own activities, makes purchases of cattle, feedstuffs, other material inputs, labour, energy and services. Much of the expenditure goes to persons and companies situated in the local region.

The principle of this expenditure dependence is clearly defined, namely: if feedlot activity were to cease, there would be consequent reductions in the gross revenues of other sectors locally and regionally. Conversely, if feedlot activity were to increase, there would be increases in the gross revenues of other sectors. The present extent of that type of economic impact can be measured through input-output modelling. This study applies input-output analytical procedures to measure the impact of a feedlot investment on a region (refer 6.1).

This research was commissioned by the Meat Research Corporation and the Australian Lot Feeders Association in conjunction with the Local Government Association. The goal of this study is to provide clear, sensible indications of the regional benefits or otherwise of a feedlot development in an area. This can be done through examples, multipliers and balance sheets that can be held up as models easily replicated for other areas.

The research involved case study examinations of established feedlot operations in eastern Australia. The co-operating feedlots requested strict confidentiality be maintained. Maintaining this confidentiality of information collected means specific examples can not be used to illustrate the impacts they actually have on their local and regional economies. As a consequence the approach taken has been to develop a set of data representative of the demands and interactions of a typical feedlot in a regional economy. The representative feedlot is described in the following section, along with estimates of the economic impacts of such a feedlot

3.   ASSESSED IMPACT OF THE REPRESENTATIVE FEEDLOT

3.1   Specification of the Representative Feedlot

The specifications for the representative feedlot have been based on information gathered from case study feedlots, discussions with Local Government representatives, participants in the transport industry, and general knowledge of the feedlot industry. It provides for a distribution of input sourcing and access to services, and for a mix of product for markets typical of a feedlot of this scale established in eastern Australia. The main assumptions relating to the operation of the representative feedlot are presented in   Table 1.

Table 1:   Representative Feedlot Specifications and Assumptions

Feedlot capacity	25 000 hd
Annual average capacity utilisation	90%
Application of capacity:	
100 DOF program	25%
150 DOF program	50%
300 DOF program	25%
Annual cattle purchases:	
100 DOF (av 480kg)	20 500 hd
150 DOF (av 450kg)	27 400 hd
300 DOF (av 310kg)	6 800 hd
Annual cattle sales:	
100 DOF (av 650kg)	20 300 hd
150 DOF (av 675kg)	27 100 hd
300 DOF (av 700kg)	6 700 hd
Annual feedstuff purchases:	
Grain	86 000t
Roughage	34 000t
Other	10 000t

The representative feedlot, which caters for the export market, has a capacity of 25,000 head with an annual average utilisation of 90 per cent. Half the capacity is used for cattle fed 150 day programs (150 DOF) while the other half is divided evenly between 100 and 300 DOF programs. The average finishing weights are assumed to be similar regardless of the feeding program (average 650kg for 100 DOF, 675kg for 150 DOF, 700kg for 300 DOF).

It is assumed the feedlot owns all the cattle fed and is not providing custom feeding services. The feedlot does not produce any feedstuffs, rather its requirements are acquired off site and transported onto the feedlot. Rations fed comprise a mixture of grains, roughages and concentrates. Roughages are assumed to be made up of approximately one-third industry by-products (e.g. cotton industry) and/or hays, and two-thirds corn silage.

In assessing an economic impact it is necessary to specify the area affected. The economic impact of feedlot activity is considered here in regard two geographical areas, namely at the *local* and *regional* economy levels.

The *local* economy is the immediate vicinity of the feedlot, the district where a majority of the feedlot employees live and the area that provides a large proportion of the services utilised by the feedlot. The local economy will usually be the Shire or Local Government Area (LGA) in which the feedlot is located.

The *regional* economy is the broader area with the capacity to provide more of the material inputs to the feedlot as well as additional services. Most feedlots are situated in grain producing areas, where the regional economy is defined as the area providing a majority of the feed requirements of the feedlot in a normal year. The regional economy will generally be akin to larger (than LGA) administrative areas, such as a Statistical Division or a Statistical Sub-division, as defined by the Australian Bureau of Statistics.

In this study, when calculating input availability and the associated transport considerations, the *local* economy is defined as the area within a 50 kilometre radius of the feedlot and the *regional* economy as the area within a 100 kilometre radius.

The assumed relativity of the sources of feedstuffs and cattle are detailed in Table 2. The majority of feedstuffs are supplied from within the region while feeder cattle are primarily sourced outside the local and regional economies.

Table 2:   Source of Feedstuffs and Cattle (%)

	Local Economy (0-50km)	Regional Economy (50-100km)	Other (100km plus)
Feedstuffs			
Grain	40.0	50.0	10.0
Roughage	82.4	-	17.6
Other	-	-	100.0
Cattle	5.0	10.0	85.0

3.2   Quantifiable Economic Impacts

In measuring the economic impact of a feedlot development at local and regional levels, consideration is given to their several dimensions, namely:

- **The impact of a feedlot establishment (or expansion):** While the principal focus is on the on-going feedlot operation, mention is made of the initial construction and establishment of a feedlot.

- **The direct impacts of feedlot operations:** The on-going feedlot operation creates economic activity measured by the dimensions of the enterprise e.g. employment, turnover and value added.

- **The indirect impacts of feedlot operations:** The on-going feedlot operation creates demands for goods and services from other firms, which in turn generate similar demand for more labour and more goods and more services. Collectively these are known as flow-on or multiplier effects and can be estimated with the aid of input-output analysis. Road attrition as a result of transport considerations is considered an indirect impact.

- **The non-quantifiable impacts:** The input-output model to be used is only able to identify some quantifiable economic parameters (employment, turnover, value added, household income). There are other indirect consequences of feedlot operations (e.g. reduced market uncertainty for local grain producers; odour events affecting neighbouring farms and nearby towns) which need to be spelt out.

The first three of these more quantifiable impacts of a feedlot investment are considered below, whilst the non-quantifiable impacts are considered in the following section.

The Impact of a Feedlot Establishment (or Expansion)

The establishment of a fully equipped commercial feedlot currently costs in the range $600-$800/head capacity. For a 25,000 head capacity feedlot this involves an investment of between $15m and $20m. Investigations indicate approximately 50 per cent of the investment would be spent locally (within shire boundaries) and a further 30 per cent within the broader regional economy (for example, the statistical division of New England in New South Wales).

The impact of the establishment of a 25,000 head feedlot is presented (Table 3) indicating the likely range of expenditure and employment associated with the development. In the building and construction industry of a regional economy it is accepted there are (normally) approximately 10-12 jobs per annum per $1m of expenditure (direct and indirect). For this feedlot establishment, a two year period of construction would create upward of 37 jobs in the local economy and a further 22 jobs in the regional economy on average in each year.

The timing of the construction processes will influence the number of jobs, their duration and the economic impacts. If the feedlot is constructed to final capacity in the first instance, there will be a large economic impact felt over a short period of time (possibly less than two years). Typically, however, feedlots are developed in stages and the impacts in a given year would be smaller than indicated in Table 3, but continuing over a greater number of years.

Table 3:   **Construction Impacts of a 25,000 Head Feedlot (2-year construction period)**

	Expenditure ($'m)		Employment (av jobs/an)	
	Low Cost	High Cost	Low Cost	High Cost
Local (0-50km)	7.5	10.0	37	50
Regionalª (50-100km)	4.5	6.0	22	30
Other (100km plus)	3.0	4.0	na	na
Total	15.0	20.0	na	na

ª Excludes local economy impacts.

The Direct Impacts of Feedlot Operations

The on-going feedlot operation creates direct and indirect economic activity. The direct economic impact can be measured by the dimensions of the enterprise itself (e.g. employment, turnover and value added) and is presented in Table 4 for the representative feedlot.

Annual sales *turnover* ($60.7 million) is calculated on the basis that 54,100 cattle are turned off annually (Refer Table 1), returning on average 160, 170 and 180 cents/kg liveweight ex the feedlot.

The representative feedlot is assumed to be the proprietor of all cattle fed and marketed. Clearly, if there is a custom feeding component, the greater the proportion being custom fed the lower the feedlot turnover. This illustrates the problem of using turnover as the indicator of economic activity. Two feedlots of the same size may contribute virtually the same in an area in terms of value added activity, but one, by virtue of buying and selling cattle on its own account, will have a significantly higher turnover than the other which custom feeds cattle owned by interests external to the feedlot.

Table 4:   **Direct Economic Impact of the Representative 25,000 head Feedlot***

	Impact Size
Turnover	$60.65m
Household income	$1.38m
Value Added (wages and salaries, depreciation, profits, taxes, interest payments, etc.)	$8.20m
Value Added/Head capacity	$328
Employment (no. of jobs)	
Full-time	45
Part-time	10
Total full-time equivalent	50

*This table, with comparative figures for a 10,000 head capacity feedlot, is included in the sensitivity analysis.

The *value added* from the on-going operation of the feedlot over a 12 month period is estimated to be $8.2m, comprising the difference between the value of output and the cost of goods (including cattle) and services used in the production of that output. As such it is a measure of the value generated by the labour and capital employed by the firm. The *value added* of $8.2m includes wage and salary payments of $1.38m, with the remaining $6.82m being comprised of interest payments, depreciation, taxes, and net profit to the feedlot. On a per head basis, the direct contribution of the feedlot to the regional economy is estimated to be approximately $328/head.

Value added is consistent with standard measures of economic activity, such as gross domestic product an gross state product, and it provides an assessment of the net contribution to regional economic growth of a particular enterprise or activity.

The *work force* in a feedlot is typically comprised of full-time and part-time employees. A 25,000 head feedlot requires approximately 50 equivalent full-time employees of which around 45 would be full-time positions. The work force includes management, administration, office staff, stockmen, plant operators and maintenance personnel.

Household income comprises the wages and salaries earned by feedlot employees and includes the drawings of an owner operator. Given the skills and experience required, the representative feedlot work force of around 50 full-time employees earn approximately $1.38 million per annum.

The Indirect Impacts of Feedlot Operations

The feedlot operation creates demands for goods and services from other firms, typically categorised as either *production* or *consumption* related demands.

- Among the **production** related demands, the most important are for the cattle and the various feedstuffs. Also significant are demands for inputs such as transport services, energy (electricity, fuel, etc.), financial and business services (accounting, legal, etc.), animal health products and services, repair and maintenance services, and materials such as concrete and steel for on-going repairs and facility upgrading.

- The **consumption** related demands comprise those arising from the expenditure of the feedlot employees, and of those in related industries (transport, energy, building, financial and business services, repairs and maintenance, etc.). These people spend their incomes on groceries, household services (electricity, telephone, water, gas, council rates) travel, entertainment, household goods, etc., so generating extra business for local firms and organisations supplying these goods and services.

These demands (both production and consumption related), in turn, generate demand for more labour, more goods and more services, with subsequent further flow-on effects. Collectively, the aggregate impact of these demands is known as the flow-on or multiplier effect and can be estimated with the aid of input-output analysis, in terms of key economic parameters such as value added, employment and household income.

Input-output tables have been constructed for a Local Government Area (the local economy) and a Statistical Division (regional economy) to estimate the indirect impact of feedlot operations. These tables are considered to be representative of the structure of local and regional economies in the feedlotting areas of eastern Australia (refer 6.1).

The compiled input-output tables include a separate sector to represent the operations of the representative 25,000 head capacity feedlot. The data required to specify the separate feedlot sector (details on purchasing patterns of goods and services, and sales patterns of feedlot products) were collected from the co-operating case study feedlots. With the separate feedlot sector specified in both the local and regional tables, the impact of the feedlot activity can be estimated by applying the usual input-output modelling procedures.

The indirect impacts of a feedlot operation and the multipliers for each of the economic parameters determined for the 25,000 head capacity representative feedlot, are detailed in Table 5. It needs to be noted that these impacts are in addition to the direct impacts presented in Table 4.

Table 5: Indirect Impacts of the Feedlot Operations

	Value Added		Employment		Household Income	
	Multiplier	($m)	Multiplier	(no. jobs)	Multiplier	($m)
Local Economy	1.24	2.0	1.9	44	1.8	1.1
Regional Economy[a]	1.42	3.5	2.4	72	2.3	3.2

[a] Includes local economy impacts.

Although the interpretation of the multipliers is straightfo. ward, care is required in their application. The regional economy value added multiplier of 1.42 indicates that for each $1 of value added in the feedlot operation, there are an extra 42 cents of value added created in other sectors of the regional economy. Given that the value added for the representative 25,000 head feedlot is estimated to approximate $8.2 million, the feedlot operation is estimated to create a further $3.5 million of value added elsewhere in the regional economy.

Similarly, the regional economy employment multiplier of 2.4 indicates that for each person employed in the feedlot operation, 1.4 jobs are created in the regional economy. Given that there are 50 full-time equivalent jobs in the representative feedlot, this infers an additional 72 jobs are generated in other sectors of the regional economy.

Care is needed in the use of these multipliers, presented in units of value added, employment and household income respectively, as they are, strictly speaking, ratios not indicators of direct causation. For example, employment in the feedlot itself does not generate additional employment, rather it is the *demand* for the products produced by the feedlot that ultimately generates employment in other sectors of the economy. Whilst, for example, it may be that a labour intensive (but less efficient) 25,000 head feedlot will employ more than 50 people and generate more flow-on jobs in the local economy than estimated here (Table 5), as long as the market is competitive, it will be difficult for this less efficient producer to survive in the medium- to long-term and so the relatively high employment impacts of such an enterprise will be short lived.

The input-output model can estimate the magnitude of indirect or flow-on effects of a particular activity, and also identify the sectors of the economy where the flow-on effects will occur. The sectoral distribution of the flow-on effects on the local and regional economies resulting from activities based on the feedlot operation are presented in Table 6. It needs to be noted that the absolute size of these impacts will depend on:

- the size of the feedlot operation; and

- the capacity of the economy to meet the feedlot operation's demands for goods and services. Generally, the larger the economy and more diverse its economic structure, the better it will be able to meet these demands and hence the greater the total impact of the feedlot operation.

Table 6:   **Sectoral Distribution of Flow-on Effects: Local and Regional Economies**

Sector	Value Added ($m)		Employment (No. of jobs)		Household Income ($m)	
	Local	Regional[a]	Local	Regional[a]	Local	Regional[a]
Agriculture	0.1	0.1	1	2	0.02	0.03
Forestry	-	-	-	-	-	-
Mining	-	-	-	-	-	-
Manufacturing	0.1	0.2	3	5	0.06	0.12
Elec, Gas, Water	0.1	0.1	1	1	0.02	0.03
Building & Const'n	0.1	0.1	1	1	0.02	0.2
Trade	0.4	0.6	12	18	0.22	0.33
Transport, Comm'n	0.8	1.4	13	21	0.38	0.62
Finance	0.2	0.4	3	7	0.10	0.21
Public Admin	-	-	1	1	0.02	0.03
Comm Services	0.2	0.3	7	12	0.19	0.30
Ent, Recreation	0.1	0.2	4	6	0.06	0.09
Total	**2.0**	**3.5**	**44**	**72**	**1.08**	**1.78**

[a] Includes local economy impacts.

The flow-on effects from the feedlot operation are concentrated in two sectors, namely Transport and Communications, and Trade. The impacts on the Transport and Communications sector result from the high demands for transport services, primarily in moving cattle and feedstuffs to and from the feedlot site.

The Trade sector is the second most affected with linkages from both production and consumption related expenditures. On the production side, the feedlot uses the services of firms in the trade sector for repairs and maintenance, purchasing fuel, and buying in parts and materials. On the consumption side, many household transactions also involve the firms in the local trade sector, be it buying weekly items such as groceries, fruit and meat or more durable items such as clothing, household appliances and motor vehicles.

In making these determinations two important assumptions are made.

- First, the feedstuffs and cattle supplied to the feedlot from within the region would have been produced regardless of the existence of the feedlot. The estimated i. .pacts, therefore, do not include the employment, value added and household income generated in producing the feedstuffs and cattle in the region. In reality, for the representative feedlot corn green chop is produced off site for silage, almost certainly creating a new local activity, which would have additional impacts on the local economy, directly and indirectly.

- Second, the other material inputs and services supplied to the feedlot (business and financial services, transport services, energy, etc.) were assumed to be new demands that would not have occurred without the presence of the feedlot. In the case of transport services, the net effect is not altogether clear and will vary between regions. A general finding was that while not all the feedlot demand for commercial transport services would be "new", there would be a substantial increase in demand arising from: (1) inputs (cattle and feedstuffs) coming into the region that would not otherwise be brought in; (2) inputs produced in the local and regional economies being transported further than they otherwise would be; and (3) a substitution of commercial carriers (farm to feedlot) for farm provided transport (farm to silo/saleyards). .

A major consequence of the impact of the feedlot operation's demand for transport services, in both local and regional economies, is the impact on local and regional roads. In order that this might be quantified an example of road attrition caused by the representative feedlot development, was determined from the industry case studies and discussion with Local Government Authority engineers (Refer 6.2).

Road attrition is caused by loaded heavy vehicles carrying feedstuffs, cattle, supplies and waste to and/or from the feedlot. The extent of the attrition is related to the road's type and construction. Main Roads of superior construction were found to be unaffected by feedlot generated traffic, the additional heavy vehicles an insignificant proportion of total heavy vehicle movements on these roads. On the other hand Local Rural Roads, designed for low volumes of heavy vehicle traffic and light traffic principally were found to experience a 50 per cent reduction in their economic life for the example study.

This reduction in economic life is estimated to cost $8,334 per kilometre annually, possibly to some extent offset by Commonwealth fuel excise levied on heavy vehicles, if distributed proportionally to the Local Government Authorities.

There is, however, a positive beneficial flow-on effect from the representative feedlot development associated with the establishment and/or expansion locally of transport businesses to provide the necessary transport services.

3.3   Non-quantifiable Economic Impacts

The input-output model is able to identify a number of quantifiable economic parameters (employment, turnover, value added, household income) on local and regional economies. Quantitative estimates can also be made of the impact of feedlot operations on road conditions. There are, however, other consequences of a feedlot operation more difficult to quantify but which are in no manner less important. For example....

Increased market stability for feed and cattle producers: An obvious advantage for a locality arising from a feedlot development is the ready market for the major inputs used by the feedlot, in particular grain and cattle. When a cluster of substantial feedlots exist in a region, they collectively provide a significant market for locally produced feedstuffs and cattle. As a consequence, local producers have increased market options, enabling for example, in the case of grain, a lesser dependence on markets external to the region and the vagaries of such as the international market. The presence of a feedlot(s) in the region will provide local producers the opportunity to forward sell crops (part or whole) which, although not ensuring a premium price, may provide against the risk of a price drop between planting and harvest.

Price premiums for grain and cattle: Although the magnitude of premiums, if any, paid to producers is difficult to quantify, there is a general perception that prices in regions where feedlot demand exists can, at times, exceed those elsewhere. Part of this effect (for grains) arises because producers can share in the reduced transport costs to the feedlot and/or can deliver off farm, compared to delivery to a centralised receival silo for eventual export. A premium may also be paid to cattle producers for supplying feeder cattle of the type preferred by the feedlot (on the basis of breed, size and condition) and delivered direct from paddock at a predetermined time. The size of any premiums paid will usually depend on the prevailing market conditions and the negotiating skills of producers or their agent.

New market opportunities: The establishment of a large feedlot does provide for a diverse range of goods and services required on an on-going basis. Silage is an obvious agricultural example. Corn green chop or similar is not normally produced in large quantities due to its high moisture content, with resultant relatively high transportation costs and yet low value per tonne. However, producers located nearby a feedlot, who have the capacity to produce corn green chop will benefit in diversifying their enterprise base and producing a higher value crop per unit area than most alternatives.

In addition to new agricultural enterprise opportunities, it is clear from the case studies conducted that a number of businesses in each of the regions had become established because of the presence of the feedlots. These include service providers to the feedlot (electricians, veterinary services, transport services, repairs and maintenance services) as well as input and material suppliers to the feedlot and related businesses (tyre dealers, concrete suppliers, engineering firms).

Maintaining Existing Businesses: The establishment of a large feedlot creates new opportunities for new enterprises, and also generates income for existing businesses which in the current financial climate may otherwise be in financial difficulty. The quantitative analysis (refer 3.2) demonstrated how a large feedlot has strong local and regional linkages and impacts upon regional product and employment. The raw numbers, however, do not always indicate how the demand for goods and services by a feedlot can be critical to the continued operation of individual established firms, and this can be a feedlot's vital contribution.

Maintaining Local Services: The trend in many small to medium sized towns in rural Australia is one of declining population, declining business opportunities and a corresponding decline in public and private services (health, education, banking). A common theme in discussions in each of the case study regions was that, although the local economy was not necessarily growing at a breathtaking pace, it was not (like many similar neighbouring local and regional economies) in decline. In all cases this is attributed, in part, to the presence of a large feedlot(s) in the region. By providing employment, directly and indirectly, and contributing to the maintenance (or even growth) of the local population, existing infrastructure continues to be utilised (schools, hospitals, public amenities) which concurrently assists in the prevention of the further overutilisation of such infrastructure in larger urban areas where population may otherwise "drift".

For the case study presented the following impacts on local services could be anticipated:

* 122 jobs created for people between the age of 18 and 40, half of which will be married, one third of the total will have two school aged children. The feedlot will therefore contribute approximately 180 adult persons and 80 school aged children to a district service centre town of some 6,000 people.

* The resultant 4% increase in population (assuming jobs are filled from outside the region or people are prevented from leaving it) will not normally result in additional doctors being provided to the town. However, given there is a large number of children (80) there would probably be an increase in immunisation requirements. A position for one additional nurse would be probable.

- If the assumption is made that district schools are likely to be operating without surplus teaching capacity (as is in most instances the case) the addition of 80 school aged children to the district population would realistically result in the creation of at least one and possibly two additional full time equivalent teaching positions.

- A 4% increase (or for that matter decrease) in population in a district service centre would not normally result in additional (or reduced) police staffing.

  By the very individual nature of the feedlot business in each instance the analysis provided above can be indicative only. For this reason it is included as a non-quantifiable.

Nature of employment: The successful operation of a feedlot demands a wide range of skills and experience among the feedlot employees, who in the case studies were relatively young (under 40 years old). Discussions with feedlot operators, Local Government representatives and others in the community confirmed feedlots are providing opportunities for young local people who would otherwise leave the district. Feedlots employ a number of professionals on staff (management, animal nutritionists, etc.) and require ready access to professional services (agronomy, veterinary, computer technicians, etc.) which encourages a greater depth of skills in the local economy.

Social Impacts: Many of the social implications of feedlot investment have already been alluded to such as the opportunity for young people to stay in their local community and the maintenance of community facilities and services such as health, education, and police. The provision of these employment opportunities and the maintenance of these types of services together allow for the maintenance of lifestyle and social structures that would otherwise be lost or seriously degraded in many areas. The cultural and social fabric of most rural communities is dependent upon the community maintaining a population base that can be supported by productive employment. A typical feedlot development makes a significant impact on local employment, both directly and indirectly, and thereby contributes to the economic and social well being of the community.

Contribution to Government Revenue: The contribution of a feedlot to government revenue is not insubstantial, the following would be anticipated:

- 122 jobs created with a typical salary level of $27,500 (feedlot field research finding) would result in an annual PAYE income tax contribution of $5,700 per job. A Commonwealth Government revenue generation of $695,400 per annum.

- If it is assumed that 50% of the jobs created are in organisations with more than 26 employees then the contribution to state based payroll tax revenue will be $117,425 if the feedlot is located in NSW (where the tax is levied at 7% for payrolls above $500,000) and $83,875 if the feedlot is located in Queensland (where the tax is levied at 5% for payrolls above $700,000).

- Sales tax and excise is not levied on feedlot purchased inputs.

- Local government rates are levied on the improved capital value of the land and do not increase from their previous level if the land usage changes to feedlot purposes.

By the very nature of the feedlot business in each instance the above can be indicative only. It is for this reason that it is included as a non quantifiable.

Odour and Other Environmental Issues: The feedlot industry Quality Assurance Program is self regulatory in assuring the industry as a whole, and individual establishments on their own account, have minimal adverse environmental impacts. In contrast to earlier times, there is now enhanced industry knowledge in feedlot design and operation, to ensure minimal likelihood of the representative feedlot development having an adverse economic impact by way of excessive "odour events", or environmental contamination or degradation occurrences.

The recycling of nutrients with feedlot wastes used as fertilisers has positive benefits on the environment via maintenance of soil fertility and structure. In substituting for artificial fertilisers there is a reduction in the possible total haulage impact of the farming community operations, reducing total artificial fertilisers transported to farms.

4.   SENSITIVITY OF IMPACTS

The magnitude of the economic impact of a feedlot is sensitive to a number of factors. The following provides a brief description of some of these factors, namely: the presence of an abattoir; structure of the local and regional economies; sourcing of inputs; and feedlot size.

Abattoir

The fattening of cattle in a feedlot is just one step, albeit an important one, in the production, processing and marketing of grain fed beef. Another important step, which can generate significant economic impacts, is the slaughter/processing/packing of beef that takes place in an abattoir. Investigations indicated that two feedlots, each the size and throughput of the 25,000 head capacity representative feedlot, would be sufficient to support a commercial abattoir. Such an abattoir would have a work force of between 200 and 250 employees and, through the expenditure of their income in the region (consumption effects) and the purchase of goods and services by the abattoir (production effects), would generate considerable additional employment and value added impacts.

Although outside the brief of this study to quantify the impacts the operation of an abattoir has on local and regional economies, it is clear that if an abattoir is established in conjunction with a feedlot(s) development then the flow-on employment impacts of the feedlot development, at least, would be substantially higher.

To illustrate part of the impact, it is estimated (conservatively) that the jobs of 100 abattoir employees result from the throughput provided by a 25,000 head capacity feedlot. The indirect impact these jobs have on the regional economy arise from the expenditure of income earned by abattoir employees. These impacts are referred to as *consumption-induced* effects and are shown in Table 8 below.

Table 7:   Consumption-Induced Impacts of Abattoir Employment (Local and Regional)

	Value Added ($m)	Household Income ($m)	Employment (No. of jobs)
Direct	?	2.7	100
Indirect (Consumption-Induced	3.7	2.1	94

The abattoir-related impacts are in addition to those detailed in Table 7. Without further investigation (eg. survey of abattoirs), it is not possible to estimate the direct value added of abattoir operations. The estimated indirect impacts, in terms of value added ($3.7m), household income ($2.1m) and employment (94 jobs), are all conservative as non included the *production-induced* flow-ons from abattoir operations.

Structure of local and regional economies

The impact of a feedlot development on a local or regional economy will depend, in part, upon the capacity of the economy to meet the feedlot's demands for goods and services. The definition of a *local* economy given earlier as the area in a 50 kilometre radius of the feedlot will, for administrative and data gathering purposes, often be defined as the Local Government Area. The economic structure of LGAs, however, can vary considerably according to population level and the size and scope of industry in the main town(s) of the LGA. The LGA used as the basis for *local* impact estimates (refer 3.2), is a relatively open, small economy providing just a basic level of services to the feedlot, and for this reason, the local economy estimates could be considered at the lower end of the range of possible *local* economy impacts.

Similarly, the economic structure of regional economies can vary considerably, depending on the boundaries chosen. The *regional* economy used as the basis for *regional* impact estimates (refer 3.2), is a relatively self-sufficient, large economy providing an extensive range of material inputs and services to the feedlot. Consequently, the regional economy estimates could be considered at the upper end of the range of possible *regional* economy impacts.

Sourcing of Inputs (cattle and feedstuffs)

In estimating the economic impact of an operating feedlot it is assumed the cattle and feedstuffs used in the feedlot would have been produced regardless of the feedlot's operation. For this reason, changes to the sourcing of feedlot inputs (refer Table 2) will not have a significant impact on the local and regional economies. For long-term feedlot profitability, however, there will be benefits of readily accessible (low transport cost) inputs. The ongoing ready availability of these inputs sustain the impact created by the feedlot in the local and regional economies.

Feedlot Size

The estimated local and regional economic impacts related to a feedlot of 25,000 head capacity (refer Table 2). Clearly, these impacts will vary according to the size of the feedlot although they will not necessarily vary in a direct or linear way. The impacts are generated by the feedlot's demand for goods and services, and labour. Some of these (feedstuffs, cattle, transport services) will vary *directly* in proportion to the scale of operation, while others (notably labour) may not. It is likely a feedlot twice the size (50,000 head capacity) would have slightly less than twice the economic impact (e.g. less than twice the labour required) due to economies of scale, and a feedlot half the size would have an economic impact of slightly more than half (due to diseconomies of scale).

To illustrate how the impacts may vary according to the capacity of the feedlot, estimates of the magnitude of economic impact were made for a 10,000 head capacity feedlot. The feedlot specifications and assumptions, as detailed in Table 1 for a 25,000 head capacity feedlot, were adjusted on a directly proportional basis. The major (non-linear) change to the feedlot specifications for the 10,000 head capacity feedlot is that employment per head of capacity is assumed to be 10 per cent higher than for the 25,000 head capacity feedlot. Wage and salary payments are also assumed to be 10 per cent higher on a per head of capacity basis.

The estimated total regional impact (direct plus indirect) of a 10,000 head capacity feedlot are shown in Table 9. The value added generated in the region from the operation of the 10,000 head feedlot is estimated to total $4.8m ($3.3m direct impact plus $1.5m indirect impact). Associated with this generation of regional product will be approximately 51 full-time equivalent jobs.

Table 8:   **Total Impact of Feedlot Operation (10,000 head capacity): Local and Regional Economies**

	Value Added ($m)	Value Added/Head ($)	Employment (No. of jobs)
Direct	3.3	328	22
Indirect	1.5	149	29
Total	**4.8**	**477**	**51**

Comparison with Table 7 shows the impact per head capacity is slightly higher for the smaller feedlot. Because employment in the 10,000 head capacity feedlot is proportionally higher, wage and salary payments are also higher, and these in turn induce higher flow-on impacts in terms of value added (and employment) to the regional economy.

It would be imprudent to apply these estimated (per head of capacity) impacts to feedlots significantly smaller than 10,000 head capacity. This is because the structure of the feedlot, in terms of plant and equipment, usage of support services (especially transport), quantity and skills of labour, and seasonality of operation, may be substantially different to that of larger capacity feedlots. Because of these differences, the linkages the feedlot has with the local and regional economies will be different, and the measurable economic flow-on effects could differ substantially as well.

5. CONCLUSIONS

The establishment and operation of a feedlot in a region will create a variety of economic and social impacts. The magnitude and nature of the impacts will vary according to the size and specifications of the feedlot operations, and the size and structure of the economy. The results of this study have shown for a relatively large feedlot (25,000 head capacity), the impacts, quantifiable and non-quantifiable, are substantial at both the local and regional economy levels.

There are many and varied impacts on a region as a result of a feedlot development, of which two in particular are of a major positive nature, and quantifiable.

Value added: The operation of a feedlot by its very nature involves the adding of value to "raw" largely locally produced agricultural commodities so lifting their value and the net value of production in the region. This generates wealth for the owners of capital (including land) and labour, employed in the feedlot operation (direct impacts) and in many of the sectors which comprise the local and regional economies (indirect impacts). The catch-cries in regional development are "value adding" and "building on our comparative advantage". The study highlights a feedlot operation consuming local and regional inputs, producing for and meeting growing export and domestic markets with a suitable high value product. It is an outstanding example of an activity contributing to regional development, by its value added produce and its utilisation of local comparative advantage.

Employment: A disturbing trend in rural regional Australia is the declining job opportunities (the causes of which are many) with resultant declining population and/or increasing social dislocation and its inherent problems. Rural based industries, utilising local and regional resources and creating employment in the local communities, contribute directly and indirectly to the economic viability of the regions and, importantly, to their social and cultural viability as well.

The establishment and operation of a feedlot development has been clearly demonstrated to create very significant direct labour requirements, locally and regionally, during establishment and when operating. Furthermore, there are indirect (flow-on) jobs created in associated industries, particularly transport, with its further flow-on effects. The case studies illustrated a broad-based impact on local and regional communities, through the professional, recreational, repairs and maintenance, hospitality, educational, health, law enforcement and community services, in all significantly contributing to the improved social and cultural viability of an area.

When a feedlot development is located so it directly increases the usage of Local Rural Roads with heavy vehicular traffic, a possible negative impact associated with the development is a decrease in the life of those roads. Although this can be significant it is overshadowed in the overall picture by the considerable positive impact a feedlot development makes on a region.

The non-quantifiable economic impacts are almost totally positive with respect to their effect on the region. Amongst these, the maintenance of existing businesses and local services are significant and important, as is the corresponding utilisation of infrastructure (school buildings, shops, houses, etc), which reduces over-utilisation and expansion pressures in areas where populations may otherwise drift to.

Over time, as in the USA, the development of further abattoir and meat processing facilities can be expected adjacent to and within the regions where feedlots are established, since with time this is where the greatest number of quality slaughter cattle will be sourced. The pasture lands, on the Coast and Highlands in particular, will be increasing breeding and growing areas supplying feeder cattle for the Feedlot Industry, rather than finishing for killing and processing at coastal abattoirs.

It is probable that the greatest long-term single indirect impact a growing feedlot industry will have on a region will be the ability to attract new abattoir and meat processing facilities to a locality, with the significant direct and indirect value added and employment impacts. These positive flow-on impacts, already evident elsewhere in the world, are now beginning to emerge in rural regions with developing feedlot industries in Australia.

APPENDIX 1:   METHODOLOGY

1.   The Analytical Method: Input-Output Analysis

The standard approach for the estimation of the regional economic impact of a particular activity, such as the operation of a feedlot, is to employ *input-output analysis*. The input-output model conceives the economy of the region as being divided up into a number of sectors, and this allows the analyst to trace expenditure flows. To illustrate this, consider the example of a feedlot which, in the course of its operation, purchases goods and services from other sectors such as feedstuffs, cattle, building requisites and employs its own labour force. The direct employment created is regarded in the model as an expenditure flow into the household sector, which is one of several non-industrial sectors recognised in the input-output model.

Upon receiving expenditure by the feedlot, the other sectors in the regional economy engage in their own expenditures. For example, as a consequence of winning a contract for work at a feedlot, a local construction company buys materials from its suppliers, and labour from its own employees. Suppliers and employees in turn engage in further expenditure, and so on. These *indirect effects*, as they are called, are part of the impact of the feedlot on the regional economy. They must be added to the *direct effects* (which are expenditures made in immediate support of the feedlot activity itself) in order to arrive at a measure of the total impact of the feedlot development.

It may be thought that these indirect effects go on indefinitely, and that their amount adds up without limit but sadly, such alchemy is not possible due to the presence of *leakages*. In the context of the impact on a *local* economy, often that of a relatively small region, an important leakage is expenditure on goods and services that originate from *outside the local region* (imports). For an enterprise in NSW, examples might be boardroom furniture purchased from a Tasmanian manufacturer of high-quality furniture, and sophisticated engineering equipment sourced from a manufacturer in Germany. In both cases, there is little or no return expenditure. The Tasmanian furniture manufacturer (and its suppliers) buy little in NSW; and German imports of goods and services from Australia are as a whole limited, whilst from a NSW region even more so.

Thus some of the local expenditure for imports to the local region, is lost to the local economy. Consequently, the indirect effects get smaller and smaller in successive expenditure rounds, due to this and other leakages. Hence the total expenditure created in the local economy is limited in amount, and so (in principle) it can be measured.

The performance of the input-output analysis calculations require a great deal of information. The analyst needs to know the magnitude of feedlot expenditures and where they occur. Also needed is information on how the sectors receiving this expenditure share *their* expenditures among the various sectors from whom they buy, and so on for the further expenditure rounds.

In applying the input-output model the standard procedure is to determine the direct or first-round expenditures only. No attempt is made to pursue such inquiries on expenditure in subsequent rounds, not even (for example) to trace the effects in the local economy on household expenditures by feedlot employees on food, clothing, entertainment, and so on, as it is impracticable to measure these effects for an individual case, here the feedlot enterprise.

The input-output model is instead based on a set of assumptions about constant and uniform proportions of expenditure. If households in general in the local economy spend (say) 13.3 per cent of their income on food and non-alcoholic beverages, it is assumed feedlot employees do likewise. Indeed, the effects of all expenditure rounds after the first are calculated by using such standard proportions (multiplier calculations).

The structure and linkages of a local economy are described with the aid of input-output analysis. Input-output analysis is an accounting system of inter-industry transactions and is based on the notion that no industry exists in isolation.

This assumes that within any economy each firm depends on the existence of other firms to purchase inputs from, or sell products to for further processing. The firms also depend on final consumers of the product and labour inputs to production. An input-output transaction table is a convenient way to illustrate the purchases and sales of goods and services taking place in an economy at a given time.

The input-output table provides a numerical picture of the size and shape of the economy and its essential features. Products produced in the economy are aggregated into a number of groups of industries and the transactions between them recorded in a transactions table. The rows and columns of the input-output table can be interpreted in the following way:

- The rows of the input-output table illustrate sales for intermediate usage (to other firms) and for final demand (consumers, exports, capital formation). ·

- The columns show the origin of the inputs and hence the purchases made at that time (labour, capital and intermediate inputs).

- Each item is shown as a purchase by one sector and a sale by another thus constructing two sides of a double accounting schedule.

In summary, the input-output transactions table can be used to describe some of the important features of a regional economy, the interrelationships between sectors, and the relative importance of the individual sectors.

Compilation of Input-Output Tables

Input-output tables are constructed in several ways, namely:

(i)   collecting detailed data from all firms in the economy using survey methods;

(ii)   applying various statistical and estimation methods involving essentially no survey work; or

(iii)   any level of combination of both (i) and (ii).

In practise, some form of method (iii) is generally chosen, since....

- detailed surveys are costly in terms of data collection, processing and the length of time before a table is compiled; and

- entire non-survey methods generally lack statistical accuracy and are less than entirely satisfactory despite the table being less expensive and quicker to produce.

There exists in Australia the challenge to find cheaper methods of constructing tables, particularly at the regional level. A research group at the University of Queensland developed the so-called GRIT (Generation of Regional Input-output Tables) method, appropriately termed a "hybrid" method which utilises survey, or superior data, and computer methods to generate tables. It allows the analyst to exercise judgement as to how much "hard" data are needed to construct a suitable table. In addition, analysts can focus resources on the important elements or sectors of the region. This method has come to dominate the construction of regional input-output tables in Australia.

The input-output tables for the study region (local and regional economies) were constructed using the GRIT method supplemented by data gathered from a variety of other sources. The tables should be considered in the context of 'holistic' accuracy, whereby they can be viewed as being generally representative of the sectors of their respective economies although no particular cell may be entirely accurate in itself.

In the study of the 'Regional Impact of a Feedlot Development' the preliminary tables were developed applying the GRIT procedure and subsequently adjusted and refined applying the RAS procedure. The computer program used to make these adjustments was 'Input-Output Analysis Version 7.1', developed by Dr Guy West at the University of Queensland.
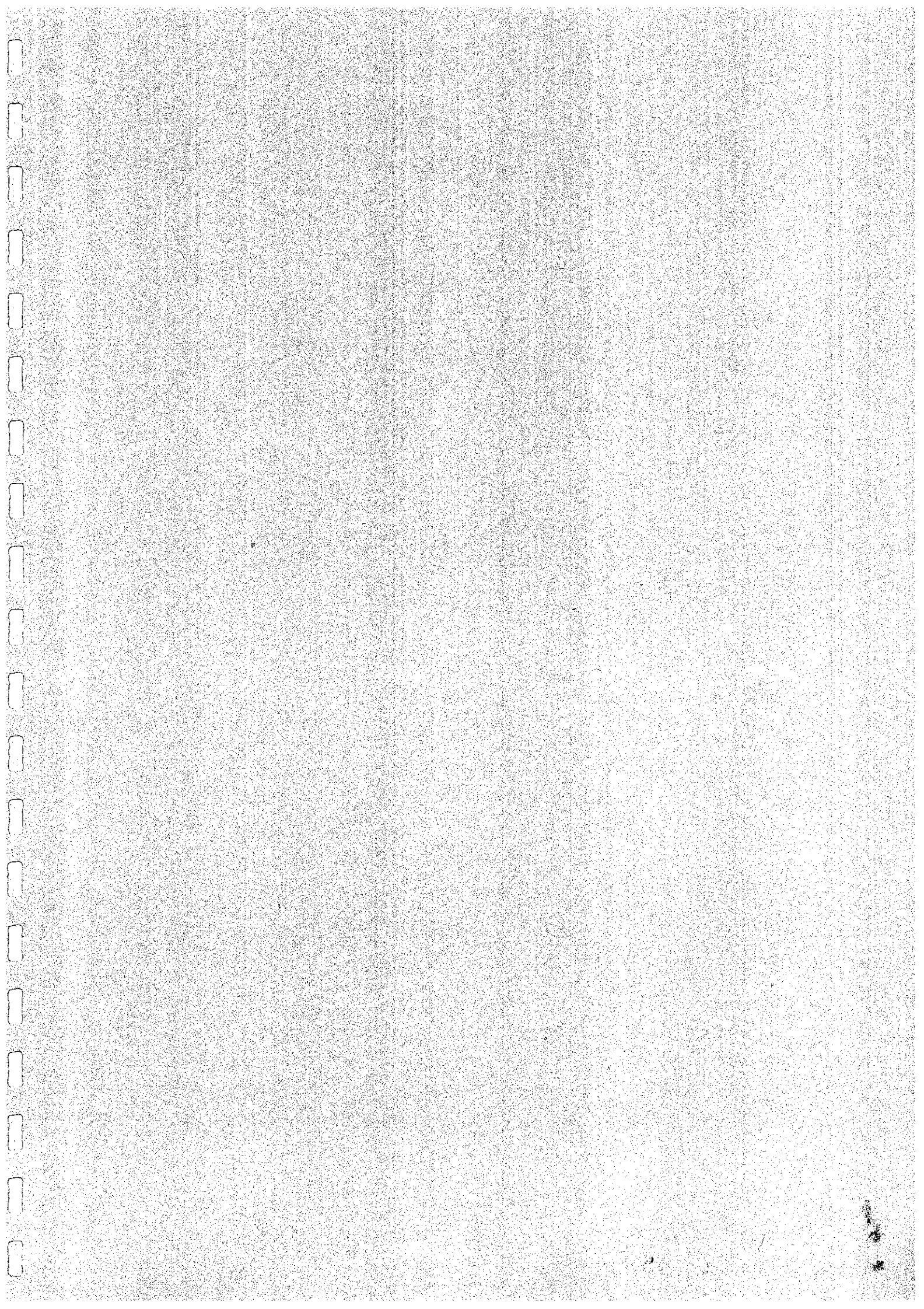
APPENDIX 2:   ROAD ATTRITION COST

1.   *Introduction*

An indicative example of road attrition from the representative feedlot (Refer Principal Study 3.1) has been created following case studies involving visiting typical feedlots in southern NSW, central NSW and southern Queensland and conferring with Local Government representatives, transport operators, grain traders and the retail sector.

The example is based on a feedlot (refer Figure 1) located on a Local Rural Road 10 km off the Main Road system at a town which acts as a district service centre and rail junction with a major grain receival silo for the locality. A Local Rural Road is one that is defined as a non-thoroughfare, traditionally servicing resident farmers driving passenger vehicles and grain haulage vehicles on a seasonal basis.

Fattened feedlot cattle are slaughtered external to the region (ie greater than 100 kms) and are trucked to an abattoir for slaughter.

The impacts on roads described are for the feedlot operating in steady state when fully developed.

2.   *Traffic Associated with Representative Feedlot Development*
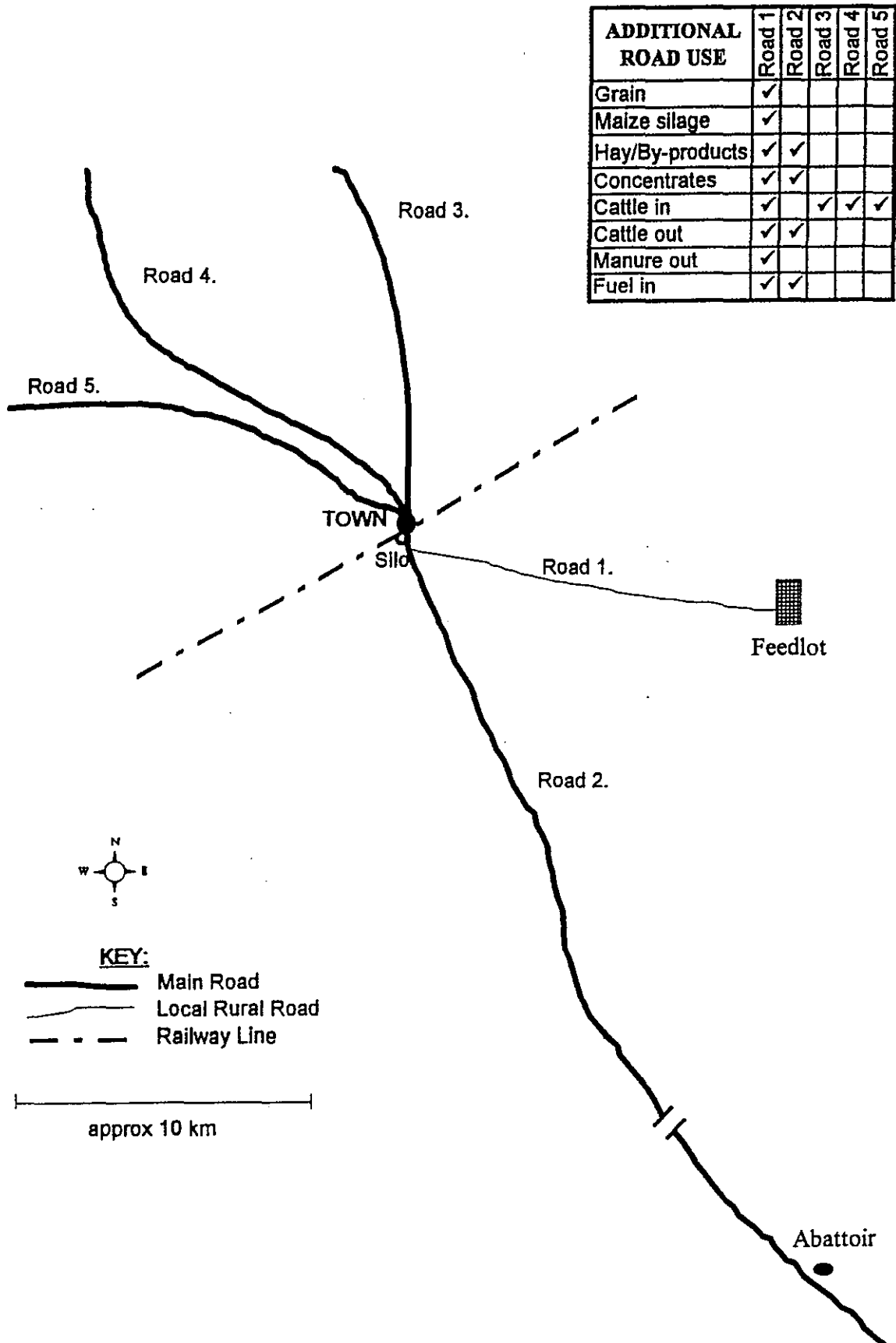
Discussions with local Shire Council representatives revealed in all instances heavy vehicles, ie. those with 3 or more axles and fully loaded, are the principal cause of road attrition. Passenger vehicles and empty heavy vehicles do not contribute significantly to the cost of road repair and maintenance or to the shortening of the road's economic life. Therefore the following analysis confines itself to loaded heavy vehicle movements directly related to the representative feedlot development. Traffic is expressed on an annual basis in terms of Annual Average Daily Traffic (AADT).

Feedstuff Haulage Impact

The representative district in the example is a major grain producer. The feedlot development has not affected the aggregate volume of grain produced in the locality or region, merely rearranging the local pattern of grain movement. Prior to the feedlot development, grain produced to the north and west of the site (refer Figure 1) was trucked via Roads 1, 3,4 and 5 to the locality silo on the railway line at the town, from whence it moved by rail to city consumers and/or export markets.

Following the feedlot development only Rural Road 1 experiences additional heavy vehicle traffic, related to grain.

Figure 1. Road Usage by Heavy Vehicles Servicing Feedlot

ADDITIONAL ROAD USE	Road 1	Road 2	Road 3	Road 4	Road 5
Grain	✓				
Maize silage	✓				
Hay/By-products	✓	✓			
Concentrates	✓	✓			
Cattle in	✓		✓	✓	✓
Cattle out	✓	✓			
Manure out	✓				
Fuel in	✓	✓			

Road 3.

Road 4.

Road 5.

TOWN

Silo

Road 1.

Feedlot

Road 2.

N
W —⊕— E
S

KEY:
——— Main Road
——— Local Rural Road
— - — Railway Line

├──────────────┤
approx 10 km

Abattoir

The feedlot consumes 86,000 tonnes of grain annually delivered in heavy vehicles (25 tonne, 6 axle) involving 3,440 (9.4 AADT) movements. Of this an assumed annual 3,000 (8.2 AADT) movements which would have been delivered to the silo (via Main Roads 3,4 and 5) are now on transported to the feedlot (Local Rural Road 1) and 440 annual (1.2 AADT) movements previously delivering grain to the silo on Local Rural Road 1 now reversed delivering direct to the feedlot with no net effect on total transport numbers. The additional movements on Local Rural Road 1 are 3,000 heavy vehicles per annum.

The representative feedlot has created a demand for locally produced roughage, in this case corn green chop for silage, produced on properties neighbouring the feedlot and delivered on Road 1, the Local Rural Road. It is assumed green chop is produced equally along the road. Total annual greenchop production is 24,000 tonnes transported in 1,200 heavy vehicle (20 tonne, 6 axle) movements which since sourced proportionally along Road 1 equates to an additional annual 600 heavy vehicle movements (1.6 AADT).

There are in addition annually 10,000 tonnes of by-product roughages and hays utilised by the feedlot. By -products are imported into the region and involve additional heavy vehicle traffic on Main Road 2 and Local Rural Road 1. Hays are sourced from farms adjacent to Local Rural Road 1 and delivery to the feedlot adds only to the burden on this Road. Annual by-product roughages usage is assessed to equate to 6,000 tonnes transported in 20 tonne, 6 axle vehicles or 300 movements (0.8 AADT). Hays consumed total 4,000 tonne annually which for the same reasons as for the corn green chop equates to 2,000 tonne transported annually on Local Rural Road 1 in 15 tonne, 6 axle vehicles, a total of 133 heavy vehicle movements per year (0.4 AADT).

Concentrates consumed (meals and/or molasses and/or tallow and/or minerals) are sourced externally to the region travelling along Main Road 2 and Rural Road 1. Annually 5,000 tonnes of concentrates are consumed, representing 200 (25 tonne, 6 axle) heavy vehicle movements annually (0.6 AADT).

Feeder Cattle Haulage Impact

Feeder cattle are sourced 5% locally, 10% regionally beyond the Local Government Area and 85% beyond the region. This represents some 95% of cattle sourced from outside the Local Government Area which without the feedlot development would not normally enter or pass through the region.

The haulage of feeder cattle has a significant impact on the region's Main and Local Rural Roads. Cattle are hauled into the feedlot along 40 kms of Main Road from the north and north west of the town (Roads 3, 4 and 5) and 10 kms of Local Rural Roads (Road 1).

The representative feedlot purchases 54,700 feeder cattle annually (refer 3.1, principal report) which are transported into the feedlot on 6 axle, double deck trucks, a total of 1,079 truck movements annually (3 AADT).

Slaughter Cattle Haulage Impact

Finished cattle are trucked to an abattoir in a neighbouring region travelling 10 kms on Local Rural Road 1 and a further 40 kms on Main Road 2 south to an abattoir in a neighbouring region.

The representative feedlot produces 54,100 finished cattle per annum (refer 3.1 principal report), trucked in 1,607 six axle heavy vehicles per annum (4 AADT).

Fuel/Miscellaneous Haulage Impact

Annual fuel usage by feedmill, vehicles and machinery totals in the order of 600,000 litres, representing 20 heavy vehicle movements. In addition to this are an assumed 30 heavy vehicle movements conveying miscellaneous materials for repairs and maintenance (concrete, steel, etc) to the feedlot, a total of 50 heavy vehicle movements per annum (0.2 AADT). Fuel/miscellaneous deliveries travel along Main Road 2 and Local Rural Road 1.

Solid Waste Haulage Impact

Feedlot solid waste, initially stored on site, is seasonally hauled to neighbouring properties where applied as a fertiliser and/or soil conditioner. The solids are hauled only on Local Rural Road 1 and to a certain extent replaces artificial fertilisers hauled in from external sources.

Of the 32,500 tonnes of solid waste produced annually on the representative feedlot 30,000 tonne representing 1,200 heavy vehicle movements are delivered and used by farms along Local Rural Road 1. This equates to an average of 600 heavy vehicle movements (1.6 AADT) over the entire length of Local Rural Road 1 (refer explanation for corn green chop, 2.1).

Summary of Haulage Impacts

The additional heavy vehicle movements as a result of the representative feedlot development are summarised in Table 1.

Table 1:   Additional Heavy Vehicle Movements Associated with Feedlot Investment

Vehicle Movement Purpose	Additional Heavy Vehicle Traffic			
	Main Roads (Roads 2 to 5)		Local Rural Roads (Road 1)	
	Daily	Annual	Daily	Annual
Feedstuffs supply				
Grain	0	0	8.2	2,993
Roughage	0.8	292	2.8	1,022
Concentrates	0.6	219	0.6	219
Cattle				
Inward	3	1,095	3	1,095
Outward	3	1,095	4	1,460
Dry Waste	0	0	1.6	584
Fuel/Misc. Delivery	0.2	73	0.2	73
TOTAL	7.6	2,774	20.4	7,446

The representative feedlot development incurs an additional annual 2,774 heavy vehicle movements (average 7.6 daily) on Main Roads and an additional annual 7,446 on the Local Rural Road (average 20.4 daily). A Main Road trip is assumed to be 40 kms in addition to the Local Rural Road trip of 10 kms.

3.   Haulage Impact Costs

Local Rural Roads

For the representative feedlot example the Local Rural Road has the following characteristics:

- The road is 5.5m wide, with an all bitumen seal including shoulders, a pavement thickness of 300mm, and a typical subgrade California Bearing Ratio (CBR) of 5.

- There is no growth in road usage other than that directly associated with feedlot development

- There are an additional 20.4 AADT's on the road as a result of feedlot development.

- The road costs $3,000 per km to maintain, a cost which is relatively consistent regardless of the feedlot's existence, and associated traffic patterns.

Although the annual road maintenance cost remains at $3,000 per km after development of the feedlot, the economic life of the road as a result of the feedlot haulage impact is reduced by 50%. In the case studies, Local Government engineers generally agreed the typical Local Rural Road economic life would be reduced from 30 to 15 years.

The annual additional cost associated with reduction in Local Rural Road economic life is $8,334 per kilometre, based on costs suggested by case study Local Government representatives. For the representative feedlot example this equates to $83,340 annually or $0.33 per head of capacity/per annum/per kilometre.

Local Government Authority Main Roads

For the representative feedlot example the Local Government Authority main roads have the following characteristics:

- The road is 7m wide with an all bitumen seal, plus sealed shoulders of 0.5 to 1m, a pavement thickness of 450mm, and a California Bearing Ratio (CBR) of 5.

- There is a customary 3% annual traffic growth.

- Within the Local Government Area the average heavy vehicle movement associated with the representative feedlot, whether in or out, is 40 kms when on a main road. There are annually 2,774 movements (7.6 AADT).

- The annual road maintenance cost is $2,000 per km. The representative feedlot development, in the opinion of case study Local Authority representatives is unlikely to influence the annual maintenance costs or the economic life of Main Roads of this standard.

The additional haulage impact costs on Local Rural and Main Roads is presented in Table 2.

Summary of Costs

Although the annual maintenance cost of Local Rural and Main Roads is not effected by the feedlot development, there is a reduction in the economic life of the Local Rural Road incurring an annual $8,334 per kilometre ($0.33/head of capacity/per annum/per kilometre). In the broader picture the extra traffic attributable to the feedlot development is not considered to reduce Main Road economic life. The additional haulage impact costs associated with the feedlot development and road attrition are presented in Table 2.

Table 2:   **Additional Haulage Impact Cost**

Road type	Length (kms)	Cost of Maintenance ($/km)	Additional Maintenance Cost Result Feedlot ($/km)	Cost to Rebuild ($/km)	Reduction in Economic Life Result of Feedlot (years)	Annual Total Cost ($)	Annual Total Cost per Kilometre ($/km)
Local Rural	10	3,000	0	250,000	15	83,340	8,334
Main	70	2,000	0	375,000	0	0	0

4.   Haulage Fuel Excise

There is a Commonwealth Government diesel fuel excise of $0.18 per litre levied on heavy vehicles for the specific purpose of road maintenance. The additional heavy vehicle traffic in the Local Government Area directly attributable to the feedlot development and their diesel fuel consumed is presented in Table 3.

Table 3:   **Consumption of Diesel Fuel Associated with Heavy Vehicle Traffic Attributed to the Feedlot**

Road Type	Additional Annual Heavy Vehicle Traffic (Trips)	Diesel Fuel Consumed per Trip (litres)	Annual Consumption (litres)
Local Rural	7,446	10.5	78,000
Main Road	2,774	37	103,000
Total			181,000

The excise paid on feedlot fuel relative to the Local Government Area associated with feedlot heavy vehicle movements is $32,580.

5.   Discussion

Quantifiable Impacts

The study shows the quantifiable costs of road attrition attributable to the representative feedlot development to be $83,340 annually in the Local Government Area on Local Rural Roads. To some extent this might be reduced by the additional excise paid of $32,580.

Non Quantifiable Impacts

For the case studies some 55 % of heavy vehicle movements associated with the feedlot development originate in the Local Government Area. There is an indirect contribution to the local economy by these transport businesses and their associated activities, as a result of:

- two viable businesses, involving 12 heavy vehicles dedicated full time to feedlot associated activities which directly employ 25 staff,

- the flow on to the local and regional economies of the 25 staff,

- the local direct expenditure of these businesses annually in the order of $120,000 per vehicle for fuel, tyres, batteries, repairs and maintenance.

These local transport businesses contract to other transport industries wherein heavy vehicles merely pass through the region, their operating expenditure concentrated in the capital cities.

A non-quantifiable beneficial impact of the representative feedlot might be that a greater proportion of grain haulage is by professional carriers, who are less likely to overload trucks (then less well equipped operators), so causing less road attrition.

Another non quantifiable is the reduction of rail haulage out of the rail terminal by an amount equivalent to that delivered to the feedlot. Associated with this reduced rail haulage transport demand is the energy saving and reduced wear and tear on the rail system.

The feedlot development in reality creates a funnel effect in the haulage pattern for cattle, wherein whilst more movements are incurred in the vicinity of the feedlot, there is a reduction elsewhere in the country.

Government Assistance with Roads

As an aside it is worth mentioning in this discussion that the cost of road maintenance need not be met in its entirety by the local community through its shire council. In New South Wales, for example, assistance is available through the Department of Business and Regional Development's Regional Business Development Scheme for contributions to infrastructure type activities that will result in the location of a new industry in a region. Contributions for road developments associated with a new feedlot have been sought and successfully accessed recently from this fund.

Conclusion

The representative feedlot development in this study is a significant contributor to the attrition of Local Rural Roads. Its impact on the Main Road system is insignificant. The cost of attrition to the Local Rural Road is directly related to the shortening of its economic life, in this case to 50%, rather than increased maintenance costs. For the representative feedlot example this has been assessed to be $83,340 annually or $0.33 per head of capacity/per annum/per kilometre in the Local Government Area. The haulage fuel excise paid attributed to the additional heavy vehicle movements is assessed as $32,580 annually. the cost of this attrition impact can be funded from a number of sources including state regional development funds.
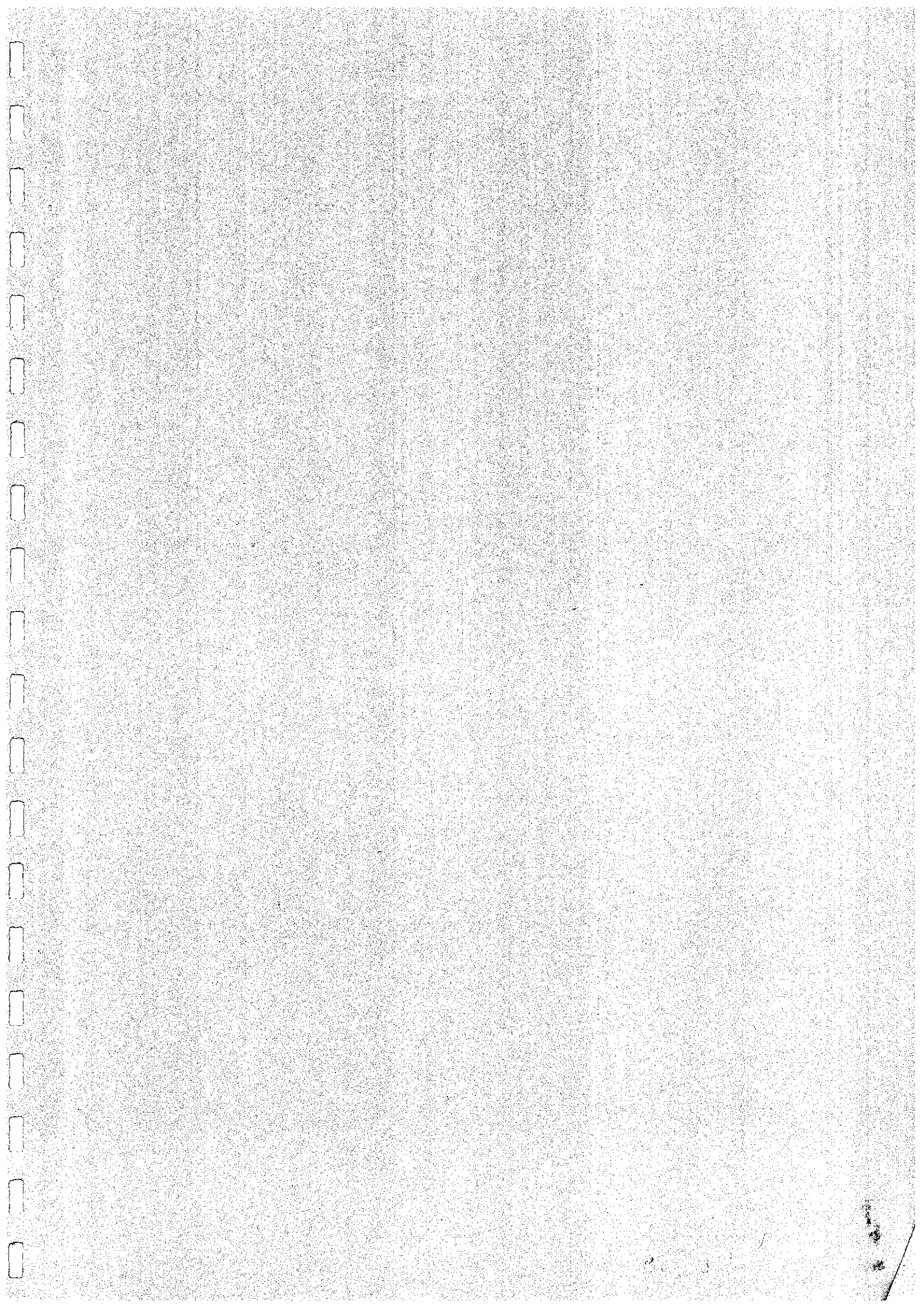
APPENDIX 3: SUMMARY OF ECONOMIC IMPACTS AND THE USE OF MULTIPLIERS IN THEIR ESTIMATION

The following table summarises the assumptions regarding the size and dimensions of the representative feedlot development.

Table A1: Representative Feedlot Specifications and Assumptions

Feedlot capacity	25,000 hd
Annual average capacity utilisation	90%
Cattle purchases: (15% regional economy)	54,700 hd
Cattle sales:	54,100 hd
Grain Purchases: (90% regional economy)	86,000t
Roughage Purchases: (82.4% regional economy)	34,000t
Other Feedstuffs: (0% regional economy)	10,000t

There are a number of economic impacts associated with a development of this magnitude. These will occur during the *construction* phase and the ongoing *operational* phase. The estimated magnitude of the impacts are summarised in the following tables. Construction is assumed to take place over a two-year period.

Table A2: Construction Impacts of a 25,000 Head Feedlot (2-year construction period)

	Expenditure ($m)	Employment (av. jobs/an)
Regional[a] (0-100km)	16.0	80
Other (100km plus)	4.0	na
Total	**20.0**	**na**

[a] Includes local economy impacts

The *direct impacts* (value added, employment, etc.) of feedlot operations are determined by the magnitude of the feedlot and assumptions made about the cost of inputs and prices received.

The *total impacts* are calculated by multiplying the direct impact by the relevant multiplier. In the case of value added impacts, for example, the calculation is simply:

$$\$8.2m * 1.42 = \$11.7m$$

The *indirect impacts* are the difference between the total and direct effects, ie:

$$\$11.7m - \$8.2m = \$3.5m$$

Table A3:   Total Impact of Feedlot Operation (25,000 head capacity): Local and
            Regional Economies

	Value Added	Value Added/Head ($)	Employment (No. of jobs)
Feedlot Multiplier	1.42	-	2.44
Direct Impact	$8.2m	328	50
Indirect Impact	$3.5m	140	72
Total Impact	$11.7m	468	122