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Feedlots

THE IMPACT OF FEEDLOT INVESTMENT

Project Number FLOT.404
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GLOSSARY OF INPUT-OUTPUT TERMINOLOGY

Consumption-induced effects are additional output, employment and income resulting from re-spending by households that receive income from employment in direct and indirect activities. Consumption-induced effects are sometimes referred to as “induced effects”.

Direct effects are the initial round of output, employment and income generated by an economic activity.

Direct impacts of feedlot operations is the on-going operation of a feedlot creates economic activity measured by the dimensions of the enterprise e.g. employment, turnover and value added.

Employment is the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent jobs.

Flow-on effects are the sum of the production-induced effects and the consumption-induced effects.

Gross regional (or State) product is a measure of value added on a regional basis. It can be calculated using two methods. The income method calculates GRP as household income plus other value added. The expenditure method calculates GRP as household expenditure plus other final demand, that is, in total, gross regional expenditure, plus exports less imports.

Household income is wages and salaries and other payments to labour including overtime payments and income tax, but excluding payroll tax.

Impact of feedlot establishment (or expansion), while the principal focus is on the on-going feedlot operation, estimates are made of the economic impact of the construction and establishment of a feedlot.

Indirect impacts of feedlot operations is the on-going operation of the feedlot creates demands for goods and services from other firms, which in turn generate similar demand for more labour and more goods and services. Collectively these are known as flow-on or multiplier effects and can be estimated with the aid of input-output analysis.

Input-output analysis is an accounting system of inter-industry transactions based on the notion that no industry exists in isolation.

Input-output table is a transactions table that illustrates and quantifies the purchases and sales of goods and services taking place in an economy at a given point in time. It provides a numerical picture of the size and shape of the economy and its essential features. Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

***Local economy** is* the immediate area about the feedlot and source of the majority of labour, services and feedstuffs, simulates a shire or local government area (LGA) in which the feedlot is located. The study assumes the local economy is an area within the 75km radius of the feedlot.

Multiplier is an index (ratio) indicating the overall change in the level of activity that results from an initial change in economic activity. They are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. They can be used to estimate the impact of a change in that particular sector on the rest of the economy.

Other Final Demand includes government expenditure, private and public sector investment (gross fixed capital formation) and change in stocks (inventories).

Other Value Added includes gross operating surplus and all taxes, less subsidies.

Output is gross revenue of goods and services produced by commercial organisations plus gross expenditure by government agencies.

Production-induced effects are additional output, employment and income resulting from re-spending by firms that receive income from the sale of goods and services to firms undertaking, for example, agricultural activities. Production-induced effects are sometimes referred to as “indirect effects”.

Regional economy is an expansion of the local economy and source of the majority of labour, services and feedstuffs, and significant feeder cattle, typifies a statistical division or statistic sub division as defined by the Australian Bureau of Statistics. The study assumes the regional economy is an area within 150km radius of the feedlot.

Standard Cattle Unit (SCU) is an animal with a liveweight at **exit** from the feedlot of 600kg. To allow for various exit weights for different markets, conversion factors have been developed. These factors, which are related to metabolic body weight, hence potential to produce manure and urine are:

Exit weight (kg)	To convert to SCU multiply by
350	0.67
400	0.74
450	0.81
500	0.87
550	0.94
600	1.00
650	1.06
700	1.12
750	1.18

Expressing the approved/licensed capacity in SCUs allows change to production management to target changing markets, while maintaining a similar environmental impact. The advantage of this is that numbers of cattle can be significantly changed as long as total capacity, expressed in SCU remains the same.

For example, a 50% increase in number of cattle would be possible, if changing from a heavy export market product to a domestic product, without requiring a variation in the conditions of development

consent. This gives management flexibility, without requiring fresh approvals.

SCUs can be used for new developments but if existing operations wish to change their existing approval to SCUs, conditions of consent need to be renegotiated with the appropriate consent authority.

State and national economies are the further expansion of local and regional areas to state and national boundaries.

Total impact is the sum of the direct effects and the flow-on effects.

Type I multiplier is calculated as (direct effects + production induced effects)/direct effects.

Type II multiplier is calculated as (direct effects + production induced effects + consumption induced effects)/direct effects.

Value added is calculated as the value of output less the cost of goods and services (including imports) used in producing the output. It represents payments to the primary inputs of production (labour, capital and land). Value added is consistent with standard measures of economic activity, such as gross domestic, State or regional product and it provides an assessment of the net contribution to regional economic growth of a particular enterprise or activity.

ABSTRACT

The study estimates the direct, indirect and flow-on effects of a feedlot establishment and operations and was undertaken to provide a snapshot of the contribution of the feedlot industry to local, regional, state and Australian national economies in FY 2002.

Feedlots in Queensland and New South Wales were surveyed to provide FY 2002 capacity data as a basis for quantitative models of hypothetical 5,000, 15,000, and 30,000 standard cattle units (SCU) capacity feedlots.

Australian feedlots in aggregate were estimated to directly generate approximately 1,570 full-time equivalent jobs (fte), over 80 percent of which were in Queensland and NSW. Household expenditure by these employees and expenditure by feedlots on cattle, feedstuffs and transport services was estimated to generate a further 6,990 fte jobs in other sectors of the national economy from a turnover of $2,966m. Total value added generated by feedlots nationally was estimated to be approximately $806m, $188m in direct value added and $618m in flow-on value added. The major contributors to the total national value added impact were Queensland (44 percent) and NSW (30 percent).

The study determined multipliers and also estimated the costs of environmental compliance and road attrition due to feedlot operation.

The study outcomes may be used by feedlot operators, the feedlot industry and local, state and federal government agencies in planning and decision making for future feedlot industry development and expansion.

EXECUTIVE SUMMARY

This research has been commissioned by Meat & Livestock Australia (MLA) and the Australian Lot Feeders Association (ALFA). The goal of the study is to provide clear, sensible indications of benefits or other wise of the development of feedlots of various sizes on the local, regional, state and national economies.

Three model feedlots based on case-study analysis were developed to represent the characteristics of typical feedlot developments in Eastern Australia, namely a small development of 5,000 SCU capacity, a medium of 15,000 SCU capacity and a large 30,000 SCU capacity, based on case study analysis. Their indicative establishment development costs have been determined to be in the order of $1,300, $1,210 and $1,070 per SCU of capacity, excluding land (FY 2002).

The ***local*** economy, the immediate area about the feedlot and source of the majority of labour, services and feedstuffs, simulates a shire or local government area (LGA) in which the feedlot is located. The study assumes the local economy is an area within the 75km radius of the feedlot.

The ***regional*** economy, an expansion of the local economy and source of the majority of labour, services and feedstuffs, and significant feeder cattle, typifies a statistical division or statistic sub division as defined by the Australian Bureau of Statistics. The study assumes the regional economy is an area within 150km radius of the feedlot.

The ***state*** and ***national*** economies are likewise further expansions of these areas to state and national boundaries.

The magnitude and relativity of source and/or destination of principal feedlot inputs and outputs have been determined in relation to each of these economies of interest. In measuring the economic impact of a feedlot development consideration was given to their several dimensions, namely:

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

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

Quantifiable Economic Impacts

Estimates were made of the economic impact of the construction and operation of each of a 5,000, 15,000 and 30,000 SCU capacity feedlots, measured in terms of value added and employment.

For a 30,000 SCU capacity feedlot, a two-year period of construction would create upward of 30 jobs in the local economy and around 80 jobs in the regional economy on average in each year. Even greater impacts would be felt at the state and national levels.

The on-going operation of a feedlot creates direct and indirect economic activity. In a 30,000 SCU capacity feedlot, the direct *value added* from the on-going operation of the feedlot over a 12 month period was estimated to be $5.0m. This includes wage and salary payments of $1.5m, with the remaining

$3.5m comprised of interest payments, depreciation, taxes, and net profit to the feedlot. The flow-on value added impacts were estimated at over $4m at the local level, $8m at the regional level, $17m at the state level and almost $20m at the national level.

The *work force* in a feedlot is typically comprised of full-time and part-time employees. A 30,000 SCU capacity feedlot requires approximately 44 equivalent full-time employees of which around 42 would be full-time positions. The work force includes management, administration, office staff, stockmen, plant operators and maintenance personnel. The flow-on value employment was estimated at almost 50 jobs at the local level, 130 at the regional level and over 200 at the state and national levels.

The flow-on effects from the feedlot operation, at the local level, are concentrated in three sectors, namely agriculture, transport and trade. At the regional, state and national level, flow-on effects are also significant in the manufacturing and finance and business services sectors.

Non-Quantifiable Economic Impacts

There are a number of non-quantifiable economic benefits that accrue from feedlot development and operation at local, regional, state and national levels which are either difficult to quantify or outside the scope of this report but nevertheless important. Locally and regionally, these include:

Establishment of new feed supply industries;
New markets for agro-industrial by-products;
Expanded and constant demand for feeder stock;
Market continuity during drought;
Ability to remove cattle off land during drought and reduction in land degradation;
Reduced soil degradation;
Catalyst for improving local infrastructure;
Consolidates and expands employment opportunities; and
Provides risk minimisation opportunities.

Feedlot Investment Sensitivities

The magnitude of the impacts of feedlot investment are largely proportional to the size of the investment.

There are however minor decreases in the significance of impacts per unit of capacity as overall development size increases associated with the economies of scale. This is of greatest significance during the initial construction stages as compared to the ongoing operational stages. During operations the impact of the major input measures, namely feedstuffs, feeder cattle, and transport services, is constant per unit of capacity, while the relative impact of employment declines with increasing size.

Feedlot profitability is a component in determining the value adding impact, as operating surplus. The greater the profitability the greater the impact.

A locality with a robust diverse local economy capable of supplying a majority of the development's requirements receives a greater proportion of impact benefits compared to a relatively small open economy where inputs have to be largely sourced from further afield. When inputs are sourced from further afield the impact benefits are then enjoyed further afield, regionally, state, or interstate.

Impact of Feedlot Operations on Local Road Network

Feedlots have a direct impact on their local road network. This is illustrated for the study model examples where direct construction costs to upgrade the (model) 20km local gravel road to an all-weather sealed road incur capital costs of:

5,000 SCU	$2,000,000
15,000 SCU	$2,200,000
30,000 SCU	$2,400,000

The ongoing direct annual maintenance costs associated with this upgraded local road can be compared to the pre-development situation. The comparative annual road maintenance attrition costs for each model feedlot are assessed to be:

5,000 SCU	$30,000 annual saving that does not have to be spent on unsealed road maintenance
15,000 SCU	$30,000 annually
30,000 SCU	$90,000 annually

The indirect costs, in practical terms largely non-quantifiable for the assumed model scenarios, are beneficial. The upgrading of the local road reducing the previous demand for capital items of plant and equipment, and the overheads associated with the road and plant operation and management.

The impact of feedlots on the local road network, whilst real, has to be viewed in the overall context of the benefit the development creates locally and regionally.

Economic Impacts of Environmental Compliance

The direct costs for environmental compliance for feedlots of 5,000, 15,000 and 30,000 SCU capacity has been assessed at $2.35 per SCU of capacity. This appears to have been relatively constant since the early 1990s. Of the expenditure, 15 percent is locally and 90 percent within the state.

The proactive efforts of ALFA and MLA has enhanced industry awareness and procedures for efficient environmental management by developing appropriate codes of practice and accreditation programs, and promoting and supporting research relating to environmental and animal welfare issues.

The Australian Feedlot Industry – National Impacts

The Australian feedlot industry has a significant national impact. The direct effects in FY 2002 are estimated as capital investment $1,006.8m; annual expenditure of $2,774.3m, and sales of $2,966.3m. Feedlots in aggregate were estimated to directly generate approximately 1,570 fte jobs, over 80 percent of which were in Queensland and NSW. Household expenditure by these employees and expenditure by feedlots on cattle, feedstuffs and transport services was estimated to generate a further 6,990 fte jobs in other sectors of the national economy from turnover of $2,966m.

Total value added generated by feedlots nationally was estimated to be approximately $806m, $188m in direct value added and $618m in flow-on value added. The major contributors to the total national value added impact were Queensland (44 percent) and NSW (30 percent).

The feedlot industry also delivers non-quantifiable benefits to the national beef industry and has been the catalyst for a number of significant advances including:

Marketing cattle at younger ages;
Improved herd productivity;
Expanding beef industry markets;
Stabilises domestic market demand;
Improved co-product values; and
Aids live cattle exports.

1. INTRODUCTION

This research was commissioned by Meat and Livestock Australia (MLA) and the Australian Lot Feeders Association (ALFA). The goal of the study is to provide clear, sensible indications of benefits or other wise of the development of feedlots of various sizes on local, regional, state and national economies.

In 1994, the then Meat Research Corporation (MRC) commissioned a study (M.558) to investigate the regional impact of feedlot investment. Since publication that report has served the feedlot industry in demonstrating the economic impacts of feedlot development at a local and regional level.

1.1 The Australian Lot Feeding Industry In Overview

1.1.1 Historic Baseline

The Australian feedlot industry has developed significantly since 1983 when ALFA first attempted to estimate the economic impacts of the industry to the beef industry and the economy (ALFA, 1984). That study observed that there were two predominant types of operation (commercial and opportunity feedlots) servicing the domestic market trade and that:-

- Total industry capacity was 350,00 head with commercial feedlots and opportunity feedlots having capacities of 250,000 and 100,00 head respectively;
- Average industry turnoff for the FY 1981, 1982 and 1983 years was 529,600 head valued at $173.7 million, of which some 80 percent was for the domestic market;
- For the above years feedlots utilised annually on average 519,000 tonnes of feed valued at a cost of $58.3 million. Grain use was 312,500 tonnes valued at $41.1 million;
- Transport costs were valued at $14.1 million;
- Average total labour input was valued at $5.9 million;
- Total capital invested in the industry was $40.7 million and $84.2 million on a 1984 market value and replacement value basis respectively.

1.1.2 The Lot Feeding Industry in 2002

In 2002, the Australian lot feeding industry has grown significantly as illustrated in Table 1.1 and has shown resilience in difficult times for the world beef industry. The export market has expanded and comprises the major component of the industry as regards capacity utilisation.

Table 1.1 *A Profile of the Australian Feedlot Industry - June 2002*

Breakdown By Feedlot Size In Australia	*Feedlot Capacity*	*Cattle on Feed*
Less than 500	83,350	47,179
500-1000 head	100,223	81,098
1,000-10,000	301,168	252,073
over 10,000	409,790	354,316
Number of Cattle on Feed (Head)	894,531	734,666
Capacity Utilisation	82%	
Market Destination Of Feedlot Cattle		
Japan	48.6%	
Korea	2.7%	
Other Export	2.7%	
Domestic	42.4%	
Unknown	3.5%	
Total Turn Off year ending Dec. 2001	2,034,278 head	

Source: ALFA/ MLA 2002

The feedlot industry finishes significant numbers of cattle to market requirements and is a significant user of agricultural inputs. Cattle on feed for export markets at June 2002 were 397,637 head utilising 54.1% of capacity. Cattle on feed for the domestic market were 311,203 head utilising 42.4% of capacity. Previous studies have indicated that feedlots use approximately 1.8 million tonnes of grain and 1.1 million tonnes of other feedstuffs annually (MLA, unpublished report 1998).

The terms of reference for the study are found in Appendix 1.

2. APPROACH TO STUDY

2.1 Background

The Australian feedlot industry is characterised by some 83% of its capacity being within Queensland and NSW, increasing to in excess of 90% when Victoria is included (ALFA/MLA 2002). The feedlot industry is a major purchaser of feed commodities and feeder cattle, and source of finished cattle for processing. As such it is a significant component of the Australian beef industry and of Australian agriculture positively impacting on the national economy.

Individual operational feedlots have capacities ranging from less than 1,000 standard cattle units (SCU) to 60,000 SCU. These feedlots have considerable homogeneity in basic structure, infrastructure, the nature of their input/output components, resource requirements and utilisation, their *modus operandi* and their impact on the local, regional, state and national economies.

This study examines the impact of feedlot investment on the local, regional, state and national economies. Three model feedlots are developed to represent the characteristics of typical feedlot developments in eastern Australia, namely a small development of 5,000 SCU capacity, a medium development of 15,000 SCU capacity and a large development of 30,000 SCU capacity. The impacts of these three models are assessed individually to illustrate the impact of typical feedlot investments.

2.2 Data Sourcing

The three model feedlots meaningfully represent the characteristics and influence of typical feedlot developments, but for confidentiality reasons do not mirror any actual existing development.

The modelling is based on:

- Case study analysis of co-operating feedlots spread through the principal industry areas of Queensland and NSW following site visits. Additionally, government agencies (local, environmental, educational) and service providers (transport, feedstuff agencies, abattoir, storage providers) were contacted directly as necessary as information sources.
- Specialist information available to the study team.
- General information available in the public arena, and in industry and associated industry surveys and studies.

2.3 Model Feedlot Specifications

The model feedlots are:

A	5,000 SCU	small size
B	15,000 SCU	medium size
C	30,000 SCU	large size

centrally located within the eastern Australian feedlot regions.

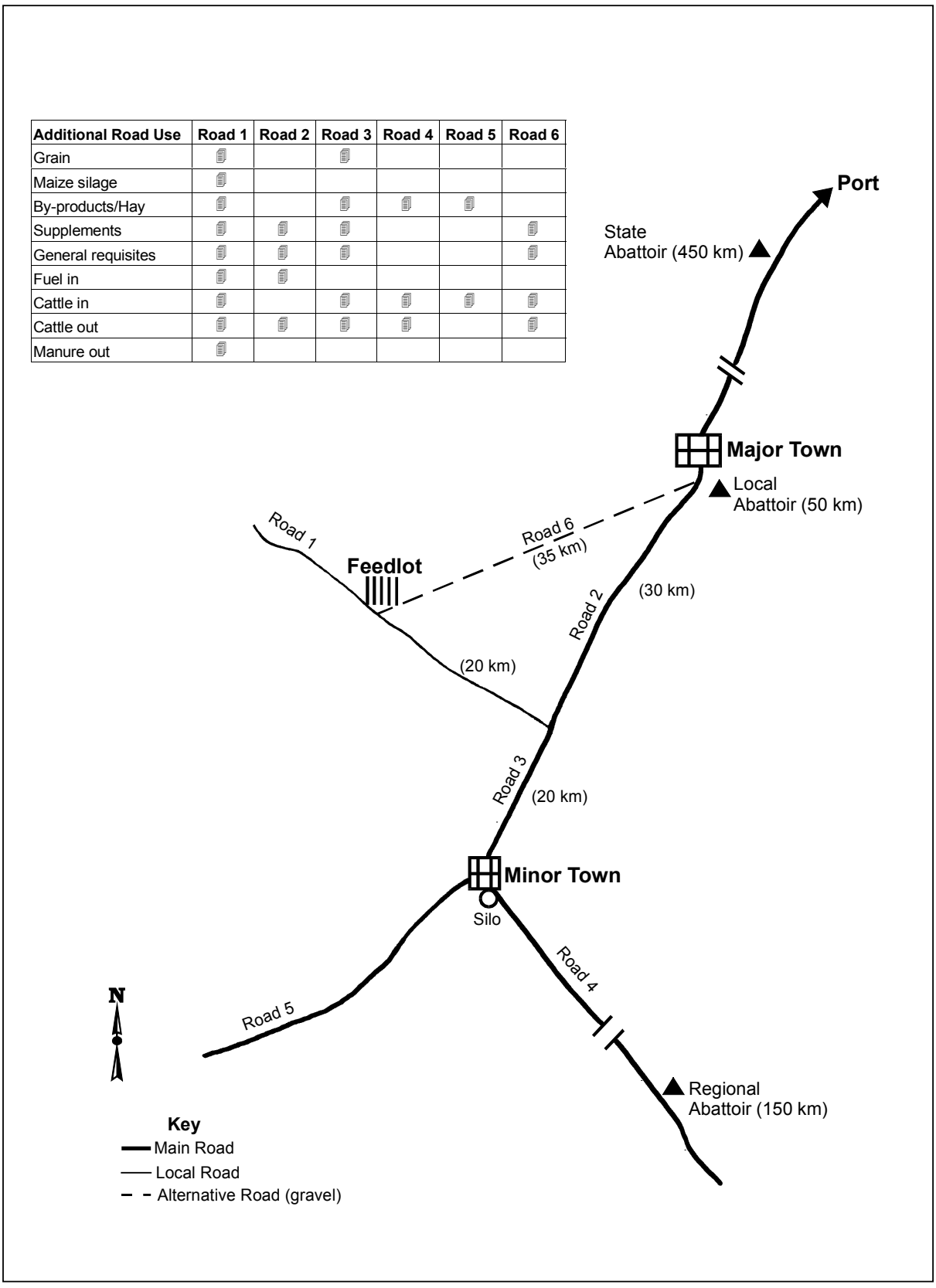
The model feedlot is characteristically sited on a local sealed road 20km from the nearest main

road/highway intersection as portrayed in Figure 2.1. The additional road use associated with the development is outlined. The local road has been upgraded to a bitumen sealed formation to handle the additional feedlot traffic, from a shallow depth gravel formation (Appendix 2). The main road distance to the nearest minor town/city is a further 20km and to the nearest major town/city which is the local economic centre 30km, in all 50km from the feedlot. There is also a secondary gravel local road of 35km connecting the feedlot to the major town. Abattoirs exist locally (50km), regionally (150km), and beyond within the state (450km) where the feedlot output is processed.

The surrounding terrain is undulating, the principal roads all-weather bitumen, the local bitumen sealed road width is 5-7m depending on feedlot size, and the main road width a minimum of 7m plus shoulders. The gravel road is 3-4m wide. Roads are drained and well maintained, but subject to flooding.

Figure 2.1 *Model feedlot location*

Additional Road Use	Road 1	Road 2	Road 3	Road 4	Road 5	Road 6
Grain	✓		✓			
Maize silage	✓					
By-products/Hay	✓		✓	✓	✓	
Supplements	✓	✓	✓			✓
General requisites	✓	✓	✓			✓
Fuel in	✓	✓				
Cattle in	✓		✓	✓	✓	✓
Cattle out	✓	✓	✓	✓		✓
Manure out	✓					



The initial feedlot development costs relate in particular to site-specific factors, the scale of the development, the design and quality of the infrastructure and facilities, and the quality of plant and equipment. There are economies of scale associated with larger developments, of similar quality design, construction and equipment in comparison with smaller developments.

The indicative model feedlot **development** costs are based on actual industry data, excluding the site specific land cost. The model represents a well designed, soundly and adequately constructed and equipped conventional industry development (Table 2.1).

Table 2.1 *Indicative feedlot development costs (excluding land) FY 2002*

Feedlot	*Capacity (SCU)*	*Cost*	
		Average $/SCU	*Marginal $/SCU*
A	5,000	$1,305	n/a
B	15,000	$1,211	$1,114
C	30,000	$1,072	$933

The all-inclusive development costs (excluding land) embrace the preliminaries, site preparation, construction, infrastructure and equipment, services and project management.

The ongoing **operational** costs will be significantly influenced by the efficiency of the development's design, the soundness and nature of its construction, and the quality of its equipment. Within reasonable limits, the additional capital costs associated with ensuring a sound and efficient development design, suitably constructed and equipped, enabling an efficient operation, can lessen ongoing operational costs and enhance profitability.

The model feedlot operational costs are based on actual industry data, for a well designed, soundly constructed and adequately equipped conventionally operated feedlot in FY 2002.

The feedlot caters for domestic and export markets, finishing cattle to market specifications on its own account and for customers on a custom feeding basis. The inward-outward liveweights are similar for each sized feedlot regardless of the feeding program, and for simplicity a nil mortality rate is assumed.

All feedstuffs are sourced off site. The average "as is" ration fed comprises a mixture of grains (65%), roughages (25%), supplements and other minor components (10%). Roughage comprises approximately 68% maize silage, and 32% industry by-products (eg. cotton industry) and/or hays. The supplements and other, representing some 10% of total feedstuffs, incorporate molasses and/or molasses based feedstuffs, meals, micro-elements and additives.

Livestock, feedstuffs and operational requisites are transported onto site and finished cattle (and manure) are transported out.

The principal feedlot operating specifications and characteristics are summarised in Table 2.2.

Table 2.2 *Principal feedlot operating specifications (FY 2002)*

	Feedlot		
	A	*B*	*C*
Capacity (SCU):	5,000	15,000	30,000
Average capacity utilisation:	90%	90%	90%
Application of capacity:			
• Up to 100 DOF			
Feedlot	30%	30%	25%
Custom feeder	20%	15%	15%
• 100-160 DOF			
Feedlot	30%	30%	25%
Custom feeder	20%	15%	10%
• 160+ DOF			
Feedlot	-	10%	25%
Custom feeder	-	-	-
Annual cattle placements/turnoff:			
• Up to 100 DOF Average In – 340kg Average Out – 460kg	11,732 hd	31,677 hd	56,314 hd
• 100-160 DOF Average In – 420kg Average Out – 660kg	5,475 hd	14,783 hd	22,995 hd
• 160+ DOF Average In – 420kg Average Out – 720kg	-	2,190 hd	10,950 hd
• Valuations (FY 2002)			
Placements ($m)	11.00	31.32	58.46
Turnoff at gate ($m)[a]	17.12	49.38	93.82
Annual feedstuff purchases: ('As is' tonnes)			
• Grain (65%)	14,372 t	44,827 t	94,170 t
• Roughage (25%)	5,528 t	17,241 t	36,219 t
• Supplements and other (10%)	2,211 t	6,896 t	14,488 t
• Valuation (FY 2002) ($m)	3.84	11.99	25.19

[a] Excludes sales of manure

The economic impact of the development is assessed in regard to the local, regional, state and national economies in a normal year.

The ***local*** economy, the immediate area about the feedlot and source of the majority of labour, services and feedstuffs, simulates a shire or local government area (LGA) in which the feedlot is located. The study assumes the local economy is an area within the 75km radius of the feedlot.

The ***regional*** economy, an expansion of the local economy and source of the majority of labour, services and feedstuffs, and significant feeder cattle, typifies a statistical division or statistic sub division as defined by the Australian Bureau of Statistics. The study assumes the regional economy is an area within 150km radius of the feedlot.

The ***state*** and ***national*** economies are likewise further expansions of these areas to state and national boundaries.

The impacts are determined on the nature, magnitude and value of each of the inputs and outputs. Their source and destination are partially illustrated in Table 2.3 for the principal components, namely the livestock and feedstuffs. The study has similarly assessed **all** model inputs and outputs for the initial feedlot development, and its ongoing operation.

Table 2.3 *Example of relativity of source and/or destination of principal feedlot inputs and outputs*

	Local 0-75km	*Regional 0-150km*	*State*	*National*
Cattle				
• Sources – feeders				
Feedlot	5%	20%	95%	100%
Custom feeder	5%	50%	95%	100%
• Destination				
Abattoir	33%	67%	100%	100%
Feedstuffs				
• Grain	50%	82%	100%	100%
• Roughage				
silage	100%	100%	100%	100%
by-products	30%	70%	100%	100%
hay	60%	80%	100%	100%
• Supplements and other	-	25%	60%	100%

2.4 Analytical Method

The analytical method used in this study was input-output analysis. 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. The table can also used for the calculation of sector multipliers and the estimation of economic impacts arising from some change in the local economy.

To estimate the economic impact of the feedlot industry the software package, “Input-Output Analysis Version 7.1” (GRIMP), developed by West (1993) was used. The software was applied to edit local, regional, state and national economic models (input-output transactions tables). It was also used to incorporate the feedlot sector (construction and operation for each model feedlot) to calculate industry multipliers and estimate the economic impact of feedlot developments at local, regional, state and national levels.

The main economic indicators estimated utilising the input-output models were employment and value added (i.e. gross regional product, gross state product, etc.). The input-output method is outlined in Appendix 3, where reference is made to more detailed texts and reference material on the subject.

3. IMPACT OF FEEDLOT INVESTMENT

3.1 Quantifiable Economic Impacts

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

- **The impact of feedlot establishment (or expansion):** While the principal focus is on the on-going feedlot operation, estimates are made of the economic impact of the construction and establishment of a feedlot.
- **The direct impacts of feedlot operations:** The on-going operation of a feedlot 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 operation of the feedlot creates demands for goods and services from other firms, which in turn generate similar demand for more labour and more goods and services. Collectively these are known as flow-on or multiplier effects and can be estimated with the aid of input-output analysis.

3.1.1 The Impact of Establishment or Expansion of Representative Feedlots

The establishment of a fully equipped commercial feedlot currently costs in the range $1,000-$1,300/SCU. For a 30,000 SCU capacity feedlot this involves an investment of around $31.5m[1]. Investigations indicated approximately 33 percent of the investment would be spent locally, a further 20 percent within the broader regional economy, 38 percent within the state economy and 9 percent within the national economy.

Estimates of the impact of the establishment of a 5,000, 15,000 and 30,000 SCU capacity feedlot at the local, regional, state and national levels are presented in Tables 3.1 to 3.3, respectively.

For a 30,000 SCU capacity feedlot establishment, a two-year period of construction would create upward of 30 jobs in the local economy and around 80 jobs in the regional economy on average in each year. Even greater impacts would be felt at the state and national levels (Tables 3.1 to 3.3).

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 those indicated in Tables 3.1 to 3.3, but continuing over a number of years.

[1] Excluding investment in fully-imported equipment. Capital expenditure occurs but does not have any flow-on impact to local, regional, state or national economies.

Table 3.1 *Impacts of construction of a 5,000 SCU capacity feedlot*

	Value added ($m)	*Employment (av jobs/an)* [a]
Local	2.1	6
Regional	3.1	16
State	5.6	26
National	6.2	27

[a] Two year construction period.

Table 3.2 *Impacts of construction of a 15,000 SCU capacity feedlot*

	Value added ($m)	*Employment (av jobs/an)* [a]
Local	5.9	17
Regional	8.8	45
State	15.8	74
National	17.6	77

[a] Two year construction period.

Table 3.3 *Impacts of construction of a 30,000 SCU capacity feedlot*

	Value added ($m)	*Employment (av jobs/an)* [a]
Local	10.5	30
Regional	15.8	80
State	28.3	132
National	31.5	138

[a] Two year construction period.

3.1.2 The Direct Impacts of Representative Feedlot Operations

The on-going operation of a feedlot creates direct and indirect economic activity. The direct economic impacts can be measured by the dimensions of the enterprise itself (e.g. employment, turnover, household income and value added) and are presented in Table 3.4 for the three representative feedlots (5,000, 15,000 and 30,000 SCU capacity).

In a 30,000 SCU capacity feedlot, for example, annual *turnover* ($94.2m) is calculated on the basis that some 90,000 cattle are turned off annually (refer Table 2.2), and manure sales are included.

Table 3.4 *Direct economic impacts of the representative feedlots*

Measure	*5,000 SCU*	*15,000 SCU*	*30,000 SCU*
Turnover [a] ($m)	17.2	49.6	94.2
Household Income ($m)	0.4	0.9	1.5
Value Added ($m)	1.2	3.1	5.0
Value Added/SCU ($)	243	209	167
Employment [b] (no. of jobs)			
Full-time	10	24	42
Part-time	1	2	3
Total full-time equivalent	11	25	44

[a] Turnover includes sales of manure.

[b] Estimates of employment have been rounded to the nearest job.

In a 30,000 SCU capacity feedlot, the *value added* from the on-going operation of the feedlot over a 12 month period is estimated to be $5.0m, comprising the difference between the value of output and the cost of cattle, feedstuffs, and other goods 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 $5.0m includes wage and salary payments of $1.5m, with the remaining $3.5m being comprised of interest payments, depreciation, taxes, and net profit to the feedlot. On a per SCU basis, the direct contribution of the feedlot to the economy is estimated to be approximately $167/SCU annually.

Value added is consistent with standard measures of economic activity, such as gross domestic product and 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 30,000 SCU capacity feedlot requires approximately 44 full-time equivalent (fte) employees of which around 42 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 the drawings of an owner operator. Given the skills and experience required, the representative feedlot work force of around 44 full-time employees earns approximately $1.5 million per annum.

3.1.3 The Total (Direct plus Indirect) Impacts of Representative Feedlot Operations

The operation of a feedlot 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 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 by 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., 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 services with subsequent 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 and employment.

Input-output tables have been used for a Local Government Area (the local economy), Statistical Division (regional economy)[2] and state and national economies to estimate the indirect impact of feedlot operations.

The compiled input-output tables include a separate sector to represent the operations of the representative feedlots. 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 the tables, the impact of the feedlot activity was estimated by applying the usual input-output modelling procedures.

The direct and indirect (or flow-on) impacts of the operation of a feedlot and the value added and employment multipliers for each of the economic parameters determined for the representative feedlots are detailed below.

Table 3.5 *The value added impacts of a 5,000 SCU capacity feedlot ($m)*

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Local	1.2	0.8	2.0
Regional	1.2	1.5	2.7
State	1.2	3.1	4.3
National	1.2	3.6	4.8

[2] These tables are considered to be representative of the structure of local and regional economies in the feedlotting areas of eastern Australia.

Table 3.6 *The employment impacts of a 5,000 SCU capacity feedlot* [a]

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Local	10	9	19
Regional	10	23	33
State	10	38	48
National	11	40	51

[a] Number of jobs (full-time equivalent).

Table 3.7 *Multipliers for a 5,000 SCU capacity feedlot*

Measure	*Value Added*	*Employment*
Local	1.7	1.9
Regional	2.2	3.3
State	3.5	4.8
National	3.9	4.6

Although the interpretation of the multipliers is straightforward, **care is required in their application**. For example, the regional economy value added multiplier of 2.2 (Table 3.7) indicates that for each $1 of value added in the feedlot operation, there is an extra $1.20 of value added created in other sectors of the regional economy. That is, given that the value added for the representative 5,000 SCU capacity feedlot is estimated to approximate $1.2 million (Table 3.5), the feedlot operation is estimated to create a further $1.5 million of value added elsewhere in the regional economy.

Similarly, the regional economy employment multiplier of 3.3 (Table 3.7) indicates that for each person employed in the feedlot operation, 2.3 jobs are created in other sectors of the regional economy. Given that there are 10 full-time equivalent jobs in the representative feedlot, this infers an additional 23 jobs (Table 3.6) are generated in other sectors of the regional economy.

Care is needed in the use of these multipliers, 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) feedlot will employ more than 10 people and generate more flow-on jobs in the local economy than estimated here (Table 3.6), 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 could be short lived.

Similar interpretation of the value added and employment impacts and the associated multipliers can be applied to the representative 15,000 SCU capacity feedlot (Tables 3.8 to 3.10) and the 30,000 SCU capacity feedlot (Tables 3.11 to 3.13).

Table 3.8 *The value added impacts of a 15,000 SCU capacity feedlot ($m)*

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Local	3.1	2.2	5.3
Regional	3.1	4.2	7.3
State	3.1	8.8	11.9
National	3.1	10.3	13.4

Table 3.9 *The employment impacts of a 15,000 SCU capacity feedlot* [a]

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Local	24	25	49
Regional	24	67	91
State	24	110	134
National	25	116	141

[a] Number of jobs (full-time equivalent).

Table 3.10 *Multipliers for a 15,000 SCU capacity feedlot*

Measure	*Value Added*	*Employment*
Local	1.7	2.0
Regional	2.3	3.8
State	3.8	5.6
National	4.3	5.6

Table 3.11 *The value added impacts of a 30,000 SCU capacity feedlot ($m)*

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Local	5.0	4.3	9.3
Regional	5.0	8.3	13.3
State	5.0	17.4	22.4
National	5.0	19.8	24.8

Table 3.12 *The employment impacts of a 30,000 SCU capacity feedlot* [a]

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Local	42	49	91
Regional	42	134	176
State	43	220	263
National	44	225	269

[a] Number of jobs (full-time equivalent).

Table 3.13 *Multipliers for a 30,000 SCU capacity feedlot*

Measure	*Value Added*	*Employment*
Local	1.9	2.2
Regional	2.7	4.2
State	4.5	6.1
National	4.9	6.1

The input-output model can be used to estimate the magnitude of indirect or flow-on effects of a particular activity, and also to identify the sectors of the economy where the flow-on effects will occur.

The sectoral distribution of the flow-on effects on the local, regional, state and national economies resulting from activities based on the operation of a feedlot are presented in Tables 3.14 and 3.15. It needs to be noted 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.

The flow-on effects from the feedlot operation, at the local level, are concentrated in three sectors, namely agriculture, transport and trade. At the regional, state and national level, in addition to the flow-ons in these three sectors, the flow-on effects in the manufacturing and finance and business services sectors are also significant.

The impacts on the agriculture sector result from the demand for feedstuffs. The impacts on the transport sector result from the high demands for transport services, primarily in moving cattle and feedstuffs to and from the feedlot site.

Table 3.14 *The sectoral distribution of value added flow-on effects from a 30,000 SCU capacity feedlot*

	Local		*Regional*		*State*		*National*	
	$m	*%*	*$m*	*%*	*$m*	*%*	*$m*	*%*
Agriculture	1.4	33%	2.3	27%	3.3	19%	5.1	26%
Mining	0.0	0%	0.0	0%	0.1	1%	0.3	2%
Manufacturing	0.3	8%	0.5	6%	2.2	12%	2.0	10%
Utilities	0.2	4%	0.3	4%	0.6	4%	0.6	3%
Building and Const'n	0.1	3%	0.3	3%	0.4	2%	0.2	1%
Trade	0.8	18%	1.3	16%	2.5	14%	2.4	12%
Transport	0.8	18%	1.5	18%	2.4	14%	2.5	13%
Comm'n Sevices	0.0	1%	0.2	2%	0.5	3%	0.5	3%
Finance and Bus Serv	0.3	8%	1.3	16%	4.2	24%	4.8	24%
Public Admin	0.0	1%	0.0	0%	0.1	0%	0.2	1%
Community Services	0.2	5%	0.4	5%	0.7	4%	0.5	3%
Entert.and Rec. Serv	0.1	2%	0.1	2%	0.3	2%	0.5	2%
Total Flow-ons	**4.3**	**100%**	**8.3**	**100%**	**17.4**	**100%**	**19.8**	**100%**

Note: components may not sum to totals due to rounding.

Table 3.15 The sectoral distribution of employment flow-on effects from a 30,000 SCU *capacity feedlot*

	Local		*Regional*		*State*		*National*	
	fte [a]	*%*	*fte* [a]	*%*	*fte* [a]	*%*	*fte* [a]	*%*
Agriculture	12	25%	47	35%	64	29%	77	34%
Mining	0	0%	0	0%	1	0%	1	0%
Manufacturing	4	8%	8	6%	22	10%	24	11%
Utilities	1	1%	2	1%	3	1%	2	1%
Building and Const'n	1	2%	6	4%	6	3%	3	1%
Trade	13	26%	31	23%	47	21%	45	20%
Transport	7	15%	16	12%	19	9%	22	10%
Comm'n Sevices	0	1%	2	2%	4	2%	4	2%
Finance and Bus Serv	4	7%	10	8%	32	14%	28	13%
Public Admin	1	1%	0	0%	1	1%	2	1%
Community Services	4	9%	8	6%	14	7%	9	4%
Entert.and Rec. Serv	2	4%	4	3%	7	3%	7	3%
Total Flow-ons	**49**	**100%**	**134**	**100%**	**220**	**100%**	**225**	**100%**

Note: components may not sum to totals due to rounding.

[a] Number of full-time equivalent jobs.

The impacts on the trade sector result 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 were made.

- First, the grain and cattle supplied to the feedlot would have been produced regardless of the existence of the feedlot. The estimated impacts, therefore, do not include the employment, value added and household income generated in producing the grain and cattle.

- 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. 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) that would not otherwise be brought in; (2) inputs 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). In the calculation of the impacts, the expenditure on transport of cattle and grain to the feedlot was excluded from the impact. All other transport expenditures were included in the calculations.

The impacts on the manufacturing sector result, principally, from the demand for chemicals, veterinary supplies and materials for repairs and maintenance. The impacts on the finance and business services sector result from the demand for a range of services including, veterinary services, accounting and legal services, insurance, loans, etc.

3.1.4 Summary

Estimates were made of the economic impact of the construction and operation of 5,000, 15,000 and 30,000 SCU capacity feedlots at the local, regional, state and national levels. Impacts were measured in terms of value added and employment.

For a 30,000 SCU capacity feedlot, a two-year period of construction would create upward of 30 jobs in the local economy and around 80 jobs in the regional economy on average in each year. Even greater impacts would be felt at the state and national levels.

The on-going operation of a feedlot creates direct and indirect economic activity. In a 30,000 SCU capacity feedlot, the direct *value added* from the on-going operation of the feedlot over a 12 month period was estimated to be $5.0m. This includes wage and salary payments of $1.5m, with the remaining $3.5m comprised of interest payments, depreciation, taxes, and net profit to the feedlot. The flow-on value added impacts were estimated at over $4m at the local level, $8m at the regional level, $17m at the state level and almost $20m at the national level.

The *work force* in a feedlot is typically comprised of full-time and part-time employees. A 30,000 SCU capacity feedlot requires approximately 44 full-time equivalent employees. The work force includes management, administration, office staff, stockmen, plant operators and maintenance personnel. The flow-on value employment was estimated at almost 50 jobs at the local level, 130 at the regional level and over 200 at the state and national levels.

The flow-on effects from the feedlot operation, at the local level, are concentrated in three sectors, namely agriculture, transport and trade. At the regional, state and national level, flow-on effects are also significant in the manufacturing and finance and business services sectors.

3.2 Non-Quantifiable Economic Impacts

There are a number of non-quantifiable benefits that accrue from feedlot development and operations at the local, regional, state and national economic levels which are either difficult to quantify or outside the scope of this report.

3.2.1 Local & Regional Impacts

- **Establishment of new feed supply industries**: Feedlots compete actively for feedstuffs with other intensive industries such as grain processing, pork, poultry and dairy industries. This sustained demand has led to the further development of the feed barley and more lately the feed wheat industry. As the feedlot industry further develops grain farmers and the grains industry, in general, have seen the feedlot sector as offering a new and significant growth opportunity for their developing products in the domestic market. Similarly, a feedlot development frequently creates a local demand for maize green chop for silage, offering a local opportunity for a new high return crop to be grown on a contractual arrangement.

- **New markets for agro-industrial by-products:** There are various agriculture and agro-industrial by-products suitable for use in feedlot rations. The continued growth of the feedlot industry has seen the development of new higher value markets for a range these of by-products including white cotton seed, cotton seed hulls, brewers grains, fruit and vegetable processing wastes, fats and oils, and molasses.

- **Expanded and constant demand for feeder stock**: The lot feeding industry provides a substantial market for feeder stock which has seen the development of a backgrounding industry to supply cattle of known weight and condition to feedlot specifications. This has enabled producers to further diversify and reduce risk by way of forward marketing arrangements.

- **Market continuity during drought**: Until recently drought events in Australia saw large sell-offs and slaughter of drought affected cattle then destined for commodity beef markets. There are still sell offs and increased slaughter rates for aged breeding stock and calves but, the lot feeding industry has mitigated drought impacts on the supply of finished cattle for domestic and export markets. The feedlot industry enables meat processors and marketers to continue to process and market grain fed beef irrespective of seasonal conditions, whilst feedstuffs remain available at world parity prices.

- **Reduced soil degradation**: The feedlot industry, in drought times, enables cattle to be turned off grass at an earlier stage thus reducing soil degradation.

  The recycled dry waste and liquid effluent by-products of the feedlot industry has maintained/improved soil structure with the return of organic matter and essential nutrients to agricultural lands, partly substituting for chemical fertilisers.

- **Catalyst for improving local infrastructure**: The development of a feedlot is frequently the local catalyst for improved roads, services, transport facilities and a demand base for community services such as medical and hospital, education and local government. With these secured or improved, completely independent industries may be attracted to an area.

- **Consolidates and expands employment opportunities**: Full time feedlot operations reduce the seasonability in regional areas for direct employees and in the flow-on industries, for example local engineering works, veterinarians, rural produce and hardware suppliers, transport industries, and local and regional abattoirs. Additionally, the industry introduces the need locally for specific skills in management, animal husbandry, foodstuff processing, office and administration offering higher paid upskilled workplace opportunities.

- **Provides risk minimisation opportunities:** In reducing their own operating risk, feedlots frequently offer fixed price forward buying opportunities to suppliers of feedstuffs and livestock. This enables producers and suppliers to the feedlot to also reduce risk with forward market arrangements as convenient, adding security to their operations.

3.2.2 Summary

There are a number of non-quantifiable economic impacts at a local, regional, state and national levels accruing from a feedlot development, which although difficult to quantify or outside the scope of this report are nevertheless important in considering the Australian economy. Non-quantifiable impacts, at the local and regional levels, for example:-

Establishment of new feed supply industries;
New markets for agro-industrial by-products;
Expanded and constant demand for feeder stock;
Market continuity during drought;
Reduced soil degradation;
Catalyst for improving local infrastructure;
Consolidates and expands employment opportunities; and
Provides risk minimisation opportunities.

3.3 Feedlot Investment Sensitivity Factors

The magnitude and location of the impact of a feedlot investment is sensitive to a range of factors, the principal being the size of the development, its profitability and the structure of local and regional economies.

3.3.1 Feedlot Size

The value added impact of a feedlot investment is relative to size; the larger the feedlot the larger the impact. There are also economies of scale associated with unit feedlot capacity. This is demonstrated by the financial parameters of the model feedlots where the indicative total and marginal development costs ($/SCU) decline with increasing capacity (Table 2.1).

The effect of feedlot size on the value added and employment impact of construction, in relation to capacity (impact/1000 SCU), is further illustrated in Table 3.16.

Table 3.16 *The effect of development size on the value added and impact of construction*

	Value Added[a] ($m)			*Employment[a] (Av jobs/annum)*		
Feedlot	*A*	*B*	*C*	*A*	*B*	*C*
SCU	*5,000*	*15,000*	*30,000*	*5,000*	*15,000*	*30,000*
Total Construction Impact						
Local	2.10	5.90	10.50	6	17	30
Regional	3.10	8.80	15.80	16	45	80
State	5.60	15.80	28.30	26	74	132
National	6.20	17.60	31.50	27	77	138
Impact / 1000 SCU						
Local	0.42	0.39	0.35	1.20	1.13	1.00
Regional	0.62	0.59	0.53	3.20	3.00	2.67
State	1.12	1.05	0.94	5.20	4.93	4.40
National	1.24	1.17	1.05	5.40	5.13	4.60

[a] 2 year construction period

Following establishment, the on-going operational factors with greatest impact are the purchases of feedstuffs, feeder cattle, and transport services and the value of output produced. The impact of these factors is proportional to feedlot size, and remains constant on a SCU capacity basis as size increases. Employment (and associated household income), another significant indicator of economic impact, is however influenced by scale, its impact declining per unit of capacity (impact/SCU) as size increases, as illustrated in Table 3.17.

Table 3.17 *The effect of operational size on direct, flow-on and total employment impacts*

Employment Impact – Full-time Equivalent (number of jobs)									
	Direct Effects			*Flow-on Effects*			*Total Impacts*		
Feedlot SCU	*A*	*B*	*C*	*A*	*B*	*C*	*A*	*B*	*C*
	5,000	*15,000*	*30,000*	*5,000*	*15,000*	*30,000*	*5,000*	*15,000*	*30,000*
Development									
Local	10	24	42	9	25	49	19	49	91
Regional	10	24	42	23	67	134	33	91	176
State	10	24	43	38	110	220	48	134	263
National	11	25	44	40	116	225	51	141	269
/1000 SCU									
Local	2.00	1.60	1.40	1.80	1.67	1.63	3.80	3.27	3.03
Regional	2.00	1.60	1.40	4.60	4.47	4.47	6.60	6.07	5.87
State	2.00	1.60	1.43	7.60	7.33	7.33	9.60	8.93	8.77
National	2.20	1.67	1.47	8.00	7.73	7.50	10.20	9.40	8.97

3.3.2 Feedlot Profitability

One component of a feedlot's value added is operating surplus. The greater the operating surplus (and hence profitability) the greater the value added impact.

The key factors influencing a feedlot's operating surplus are the relativities between the cost of feedstuffs, the cost of feeder cattle and the feedlot gate sale price of marketed cattle. As this relationship oscillates, the feedlot's profitability and value added impact similarly oscillates. Should the development become unprofitable, and in the extreme cease operation, the value added impact would likewise cease.

3.3.3 Structure of Local and Regional Economies

The structure of an economy around a feedlot site and the capacity of the area to fulfil the feedlot's input demands (feedstuffs, livestock, goods and services) significantly influences the magnitude and location of the development's impacts. A robust, diverse local economy capable of supplying a major proportion of the input requirements will be significantly impacted. In contrast, a relatively open, small local economy producing few of the required inputs and services will necessitate the development drawing its inputs from further afield. As a consequence, the impact from a development in this context will be greater in the broader regional and state economies and relatively small in the local area economy.

3.3.4 Summary

The magnitude of the impacts of feedlot investment are largely proportional to the size of the investment.

There are however minor decreases in the significance of impacts per unit of capacity as overall development size increases associated with economies of scale. This is of greatest significance during the initial construction stages as compared to the ongoing operational stages. During operations the impact of the major input measures, namely feedstuffs, feeder cattle, and transport services, is constant per unit of capacity, while the relative impact of employment declines with increasing size.

Feedlot profitability (operating surplus) is a significant determinant of the magnitude of the value added impact. The greater the profitability of the feedlot, the greater the value added impact.

A locality with a robust, diverse local economy capable of supplying a majority of a feedlot development's requirements receives a greater proportion of impacts compared to a relatively small, open economy where inputs have to be largely sourced from further afield. When inputs are sourced from further afield the impacts are then enjoyed further afield, regionally, elsewhere in the state or even interstate.

3.4 Impact of Feedlot Operations on Local Road Network

The local government authority (LGA) is responsible for local roads, depicted in Figure 2.1 as roads 1 (20km) and 6 (35km), connecting to the main roads 2 and 3, state responsibilities.

The feedlot development incurs additional heavy traffic on road 1, which is proportional to the development's size, necessitating its upgrading and sealing to meet the increased road use demand (Appendix 2).

Table 3.18 portrays the additional heavy vehicular traffic for each size model in comparison to the situation pre-feedlot development. Development introduces an additional 322 heavy vehicles annually for model feedlot A and 7,678 and 18,876 respectively for B and C. The extra traffic is principally associated with the movement of foodstuffs (50-54%) and livestock (37-33%).

The upgraded road specifications for each of the model feedlots is presented in Table 3.19 together with the estimated road capacity capabilities (AADT – Average Annual Daily Traffic) for each upgrade. In each case the design capabilities for the upgraded roads exceed the assessed extra vehicular traffic. For example, for Model A the upgraded road capability is in the order of 50 heavy vehicles (33% of 150 vehicles) AADT in comparison with the actual estimated at 10 (Table 3.18), a five times margin. Similarly for Model B, the margin is four times, and for Model C three times.

3.4.1 Direct Impacts

The direct impact of the model feedlots on the local road network in financial terms are:

- the construction cost to upgrade local road 1 (Figure 2.1), the alternative local road 6 remaining gravel.
- the annual marginal road maintenance cost associated with the developments upgraded road and the alternative not upgraded road in its absence. This can also be summarised as the annual road maintenance attrition cost due to the development.

These are represented in Table 3.20.

3.4.2 Indirect Impacts

There are positive indirect impacts enjoyed by each LGA as a result of road upgrade and sealing. Gravel roads, by their nature, require a greater amount of plant and equipment (eg. graders) for their management and for regular ongoing maintenance. Once sealed, maintenance then comprising largely of resheeting, can be principally contracted out, thus lessening the LGA plant and equipment needs, and the management of its operation.

This benefit, whilst real, is difficult to reliably determine in the model examples.

3.4.3 Summary

Feedlots have a direct impact on their local road network. This is illustrated for the study model examples where direct construction costs to upgrade the 20km local gravel road to an all-weather sealed road incur capital costs of:

5,000 SCU	$2,000,000
15,000 SCU	$2,200,000
30,000 SCU	$2,400,000

The ongoing direct annual maintenance costs associated with this upgraded local road can be compared to the pre-development situation. The comparative annual road maintenance attrition costs for each model feedlot are assessed to be:

5,000 SCU	$30,000 annual saving that does not have to be spent on unsealed road maintenance
15,000 SCU	$30,000 annually
30,000 SCU	$90,000 annually

The indirect costs, in practical terms largely non-quantifiable for the assumed model scenarios, are beneficial, the upgrading of the local road reducing the demand for capital items of plant and equipment, and the overheads associated with the road and plant operation and management.

The impact of feedlots on the local road network, whilst real, has to be viewed in the overall context of the benefit the development creates locally and regionally as illustrated previously (refer section 3.1 and 3.2).

Table 3.18 *Estimated annual vehicle tonnages and truck movements on local roads for model feedlot scenarios*

	Pre Feedlot Development	*Feedlot*		
		A 5,000 SCU	*B 15,000 SCU*	*C 30,000 SCU*
Road Vehicle Tonnages due to Feedlot Operations[a]				
Cattle (in/out)	n/a	26,844 t	76,994 t	145,273 t
Grain (in)	n/a	23,960 t	74,720 t	156,960 t
Roughage (in)	n/a	9,200 t	28,720 t	60,360 t
Supplements (in)	n/a	3,680 t	11,520 t	24,160 t
Fuel (in) (allow 28t GVW)	n/a	588 t	1,736 t	4,032 t
Manure (out) (allow 30t GVW)	n/a	5,200 t	15,625 t	31,250 t
Miscellaneous (in)	n/a	1,750 t	5,250 t	10,500 t
Return Empty (allow 15t tare)	n/a	27,417 t	82,588 t	166,572 t
Comparative Pre Feedlot Operations				
Produce (out) (allow 30t GVW)	50,000 t			
Return empty (allow 12t Tare)	20,000 t			
Estimated Annual Tonnages				
Comparative Totals	70,000 t (over 6 weeks)	98,639 t	297,153 t	599,108 t
Truck Movements				
Basic - Total/annum	3,333	3,656	11,012	22,210
- Average/day	n/a	10	30	61
Additional due to Development				
- Total/annum	n/a	322	7,678	18,876

[a] Assume gross vehicle weight (GVW) of 40 tonne, except where noted otherwise.

Source: Appendix 2

Table 3.19 *Comparative construction standards, road use capabilities, and construction and maintenance costs of local roads for model feedlot scenarios*

	Pre-Feedlot Development	*Feedlot*		
		A 5,000 SCU	*B 15,000 SCU*	*C 30,000 SCU*
Road Specifications				
Surface Type	Gravel	Bitumen	Bitumen	Bitumen
Surface Width	3-4m	5m	6m	7m
Shoulders	3-4m	1.5m each side	1.5m each side	1.0m each side (sealed)
Design Speed	80 kph	80 kph	100 kph	100 kph
Drainage	Gravel Inverts	Concrete Inverts	Pipes	Pipes, Bridges
Linemarking	No	No	Possibly	Yes
Estimated Road Capacity Standard (AADT) [a]				
Vehicles	50-100	150	400	600 [b]
Heavy Vehicle	10%	33%	33%	30%
Harvest Season Vehicles	200	n/a	n/a	n/a
Harvest Season Heavy Vehs	90% (road failure occurs)			
Road Construction and Maintenance Costs				
Construction/km	$12,000	$100,000	$110,000	$120,000 [c]
Maintenance/km [d]	$7,000	$3,000	$3,000	$3,500
Resheeting/Resealing/km	$1,500-$2,000	$2,500-$3,000	$3,000-$4,000	$4,000-$5,000

[a] Road use capabilities in general terms. AADT – Average Annual Daily Traffic.
[b] Extensive curve and intersection improvements required.
[c] Plus bridge works.
[d] Annualised.

Source: Appendix 2

Table 3.20 *Comparative road construction costs, annual maintenance costs, and annual road maintenance attrition costs for model feedlot scenarios*

Factor	*Pre-Feedlot Development*	*Feedlot*		
		A 5,000 SCU	*B 15,000 SCU*	*C 30,000 SCU*
Construction Cost				
Road 1 - Bitumen (20km)	$240,000	$2,000,000	$2,200,000	$2,400,000
Road 6 - Alternative gravel - dry weather 30% movements (35km)	nil	nil	nil	nil
Total Construction Costs	**$240,000**	**$2,000,000**	**$2,200,000**	**$2,400,000**
Annual Maintenance Cost				
Road 1 - Gravel (20km)	$150,000			
Road 1 - Bitumen (20km)		$120,000	$140,000	$160,000
Road 6 - Gravel (as above) allow	$40,000	$40,000	$80,000	$120,000
Total Annual Maintenance Cost	**$190,000**	**$160,000**	**$220,000**	**$280,000**
Comparative Annual Road Maintenance Attrition Cost	**n/a**	**-$30,000**	**$30,000**	**$90,000**

Source: Appendix 2

3.5 Impact of Environmental Compliance on Feedlot Operations

3.5.1 Introduction

There has been increasing awareness of environmental issues within the Australian, and indeed international community in recent years. A broad range of industries and infrastructure facilities are required to review and manage their operations with respect to the environmental care aspects, not least of all Australian agriculture and in this case the Australian feedlot industry.

The industry, since the late 1970s, has been subjected to an emerging regulatory background, which has to some extent differed in its application between states. A previous study (Ridley et al, 1994) examined the cost of complying with feedlot environmental regulations, imposed during establishment and during ongoing operations.

Ridley et al found interstate differences with average environmental related establishment costs of $41.00 (NSW) and $27.00 (Queensland) per head of capacity or six percent and four percent respectively of development costs. The principal expenditure was on earthworks, drainage and holding ponds. The majority of feedlot managers responding (12/15) accepted the environmental regulations as necessary for industry stability.

The industry accepts its responsibility as an appreciative guardian of the environment. ALFA has been proactive to aid the standardisation of industry environmental regulatory requirements and to promote a healthy working relationship with the various regulatory agencies with respect to the development and operation of feedlots. The initiatives have included:

- The National Guidelines for Beef Cattle Feedlots in Australia (Second Edit. 1997)
- The National Feedlot Accreditation Scheme
- The Development of Codes of Practice for the Safe Use of Veterinary Chemicals and the Welfare of Animals
- The National Beef Cattle Feedlot Environmental Code of Practice.

Additionally, ALFA and MLC have actively supported and financed a series of research projects related to environmental and animal welfare issues.

3.5.2 Direct Impacts

Based on the case study surveys the direct environmental compliance costs for a 5,000, 15,000 and 30,000 SCU capacity feedlot is estimated at $2.35 per SCU annually. The components are presented in Table 3.21:

Table 3.21 *Direct environmental compliance costs*

Annual Cost Item	*A*	*B*	*C*
	5,000 SCU	*15,000 SCU*	*30,000 SCU*
External professional services, time and materials	$6,650	$19,950	$39,900
Internal Staff Time	$4,500	$13,500	$27,000
Internal Materials	$0	$0	$0
Other	$600	$1,800	$3,600
Total	**$11,750**	**$35,250**	**$70,500**

The annual $2.35 per SCU environmental compliance cost determined in this analysis compares with the Ridley et al (1994) study recurrent monitoring program costs of $0 - $4.00 per head capacity in NSW, and $0 - $1.00 per head in Queensland (1991 dollars). There appears to have been no increase in annual environmental compliance costs since 1991, probably aided by the proactive efforts of ALFA and MLA.

The study identified anecdotal evidence of a healthy symbiotic relationship between the LGA, the community and the feedlot, where feedlots have been established and operating for a period.

Occasionally local community elements (usually minor) and possibly even LGA's have opposed the establishment of a feedlot when first proposed. However, once the feedlot has been able to meet the regulatory requirements and has been developed and commissioned, community and LGA attitudes have become supportive of its development.

3.5.3 Relativity and Source of Environmental Compliance Inputs

The direct environmental compliance costs were found to be quite constant, irrespective of feedlot size, at $2.35 per SCU of capacity.

The expenditure is largely within the state. Expenditure was 15 percent locally and regionally and 90 percent within the state. All expenditure (100 percent) was within the nation.

This reflects the expenditure on visiting professional support services and relevant state government agencies administering the legislation.

3.5.4 Summary

The direct costs for environmental compliance for feedlots of 5,000, 15,000 and 30,000 SCU capacity has been assessed at $2.35 per SCU of capacity. This appears to have been relatively constant since the early 1990s. Of the expenditure, 15 percent is locally and 90 percent within the state.

The proactive efforts of ALFA and MLA has enhanced industry awareness and procedures for efficient environmental management by developing appropriate codes of practice and accreditation programs, and promoting and supporting research relating to environmental and animal welfare issues.

4. AUSTRALIAN FEEDLOT INDUSTRY

4.1 Estimates of Quantifiable Impacts

4.1.1 Impact of Feedlot Operations at the State and National Levels

The information presented in the previous sections on direct and indirect impacts (refer section 3.1) for representative feedlots can be aggregated to give the *total* impact of feedlots at the state and national levels. The results are presented in Table 4.1 for direct effects at the national level and Tables 4.2 and 4.3 for direct and flow-on value added and employment effects at the state and national levels.

Table 4.1 *The direct effects of feedlots [a] at the national level (FY 2002)*

Investment:	
Capital Investment (replacement value) ($m)	1,006.8
Expenditure:	
Cattle Purchased ($m)	1,820.1
Feedstuff Purchased ($m)	652.6
Expenditure on Transport Services ($m)	194.5
Aggregate Wages & Salaries ($m)	54.7
Environmental Compliance Costs ($m)	2.1
Product Monitoring Costs ($m)	2.7
Local Government Road Maintenance Costs ($m)	17.6
Sales:	
Value of Cattle at Feedlot Gate ($m)	2,966.3
Jobs:	
Direct Employment (# of jobs, fte)	1,570

[a] Based on feedlot capacity and national feedlot structure as reported in the ALFA/MLA Survey for June 2002 (ALFA/MLA 2002), an average capacity utilisation of 90 percent and costs and returns for model feedlots as described in Section 2 of this report.

At the national level, feedlots in aggregate were estimated to directly generate approximately 1,570 fte jobs (Table 4.1 and 4.3), over 80 percent of which were in Queensland and NSW. Household expenditure by these employees and expenditure by feedlots on cattle, feedstuffs and transport services was estimated to generate a further 6,990 fte jobs in other sectors of the national economy from turnover of $2,966m.

Total value added generated by feedlots nationally was estimated to be approximately $806m, $188m in direct value added and $618m in flow-on value added (Table 4.2). The major contributors to the total national value added impact were Queensland (44 percent) and NSW (30 percent).

Table 4.2 *The value added impacts of feedlots at the state and national levels ($m) (FY 2002)*

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
New South Wales	62.0	182.8	244.9
Queensland	94.8	261.8	356.6
Victoria	11.5	33.9	45.5
South Australia	8.9	23.0	31.9
Western Australia	11.5	30.1	41.5
Australia	188.5	617.6	806.1

Note: Feedlots in Tasmania and the Northern Territory have been excluded from the impact analysis. Estimates of direct impacts for other states based on capacity as reported in the ALFA Survey for June 2002, an average capacity utilisation of 90 percent and costs and returns for model feedlots as described in Section 2 of this report.

Table 4.3 *The employment impacts of feedlots at the state and national levels (FY 2002)* [a]

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
New South Wales	511	2,294	2,804
Queensland	789	3,267	4,056
Victoria	95	425	521
South Australia	76	286	361
Western Australia	96	374	469
Australia	1,570	6,992	8,561

[a] Number of jobs (full-time equivalent).

Note: Feedlots in Tasmania and the Northern Territory have been excluded from the impact analysis. Estimates of direct impacts for other states based on capacity as reported in the ALFA/MLA Survey for June 2002 (ALFA/MLA 2002), an average capacity utilisation of 90 percent and costs and returns for model feedlots as described in Section 2 of this report.

4.2 National Non-Quantifiable Economic Impacts

The feedlot industry has a number of non-quantifiable impacts on the national Australian beef industry, and has been the catalyst for significant change in the production and marketing of beef. These include:

- **Marketing cattle at younger ages:** The ongoing development of the feedlot industry has and continues to change the beef production and marketing systems in Australia. There is increasing specialisation into breeding, backgrounding and finishing production operations supported by extensive specialist transport services to quickly move livestock. Cattle are increasingly marketed at younger average ages speeding up national herd inventory turnover. Growth achieved is maintained and weight losses during seasonal dry or drought conditions are minimised.

- **Improved herd productivity:** The marketing of cattle at younger ages has enabled the national herd to comprise of a higher relative proportion of breeders, so increasing herd productivity. Reproduction rates and growth rates are also more readily optimised relative to the seasonal conditions, and overall national herd efficiency improves, as is the utilisation of the limiting pasture resource.

- **Expanding beef industry markets:** The advent of the lot feeding industry has enabled a broader range of beef to be produced tailored to expanded domestic and export markets specifications, so reducing risk.

- **Stabilises domestic market demand:** The ability to supply improved quality beef to domestic markets irrespective of seasonal conditions has stabilised demand and, it appears, reversed previously declining demand, thus assisting the national industry.

- **Improved co-product value:** Feedlot finished cattle have higher quality hides (heavier, less damage) and offals as a result of the value adding process, improving marketing opportunities and value.

- **Aids northern live cattle exports:** There has been considerable technical, management, marketing and administration skills and expertise gained and developed in the Australian feedlot industry transferred (with local adaption) to the growing South East Asia feedlot industry. This has been by way of Australian feedlot industry professionals and practitioners visiting Asia and vice versa and Australian industry trained persons occupying management positions in Asia. The South East Asia feedlot industry, in its varied forms, is a most vital component in the export of live cattle from Northern Australia. The transfer of skills and expertise to support this industry has significantly aided the national marketing and export of live cattle, which was some 590,000 head to Asia in FY 2001 (MLA 2002), and the national beef industry overall.

4.3 Summary

The Australian feedlot industry has a significant national impact. The direct effects in FY 2002 are estimated as capital investment $1,006.8m; and annual expenditure of $2,774.3m, and sales of $2,966.3m. Feedlots in aggregate were estimated to directly generate approximately 1,570 fte jobs, over 80 percent of which were in Queensland and NSW. Household expenditure by these employees and expenditure by feedlots on cattle, feedstuffs and transport services was estimated to generate a further 6,990 fte jobs in other sectors of the national economy from turnover of $2,966m.

Total value added generated by feedlots nationally was estimated to be approximately $806m, $188m in direct value added and $618m in flow-on value added. The major contributors to the total national value added impact were Queensland (44 percent) and NSW (30 percent).

The feedlot industry also delivers non quantifiable benefits to the national beef industry and has been the catalyst for a number of significant advances including:

Marketing cattle at younger ages;
Improved herd productivity;
Expanding beef industry markets;
Stabilises domestic market demand;
Improved co-product values; and
Aids live cattle exports.

5. BIBLIOGRAPHY

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APPENDICES

APPENDIX 1. TERMS OF REFERENCE

REGIONAL IMPACT OF FEEDLOT INVESTMENT

THE CONSULTANCY SERVICES

BACKGROUND

The 1994 Meat Research Corporation funded project M.558 identified, in a consistent and methodically sound manner, 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, which were then, for confidentiality reasons, modelled to represent the characteristics and influence of a typical feedlot development located and sited in Eastern Australia.

In the period since the initial study was undertaken some significant changes have occurred within the industry. These include changes in the balance of supply to the domestic and export markets, changes in the genotype of cattle being sourced, impacts of alternate land use and exchange rate variations.

In addition, the industry has been through a period of consolidation since the original study was undertaken enabling clearer definition of the economic impact at local and regional levels. Industry has requested that this study be commissioned at this time to provide updated factual information on the local and regional benefits and costs of feedlot development.

OBJECTIVES

The objective of this research is to provide factual information regarding the impact on a defined region of feedlot investment, so that an accurate picture of costs and benefits can be drawn up.

The study should address, but is not limited to, the following points:

- Assessment of the economic multiplier effect of Australian feedlot investment;
- Analysis of additional economic activity generated by feedlot investment in adjoining regions;
- Analysis of the ways in which a feedlot, through local value adding of primary products, affects the direction of economic activity;
- Effect of feedlot investment on regional employment;

- Net impact of feedlot investment on Government revenue (Commonwealth, State and Local), both collected and potentially available;
- Objective assessment of road attrition directly attributed to feedlot investment relative to other road users; and,
- Objective assessment of the impact and cost of compliance with environmental regulations on feedlot activity and resultant flow-on effects.

REQUIREMENTS UNDER THE CONSULTANCY

Scope and Methodology

It is envisaged that a multi-disciplinary team, including economists, engineers and Industry practitioners, would be best suited to carry out this project. The project would involve several case study analyses, as well as economic modelling to estimate regional economic impacts. Consultants need to define their proposed methodology and work plan for addressing the project objectives.

Project Management

This project is a component of the MLA Feedlot Program, which has Advisory Committee of Industry operators that will oversight the project and provide an ongoing guidance.

The outcome of this project will be referred to the Advisory Committee for endorsement prior to acceptance of the Final Report.

Output

The output of the project will be a Report that will be presented, in the first instance, as a Draft Final Report for the consideration and comments of MLA and the Advisory Committee.

The Report will be revised to address comments made on the Draft Final Report and be re-presented to MLA as a Final Report.

Two (2) bound copies, and one (1) unbound copy, of the Draft Final and Final Reports will be provided to MLA, as well as an electronic copy of the Final Report using agreed software. MLA has guidelines for presentation of Final Reports, which will be provided to the successful Consultant at the commencement of the project.

Notwithstanding the requirements set out in the MLA guidelines, the Final Report will contain:

- An Executive Summary (2-8 pages), which will, as far as possible, read as a stand-alone document that effectively summarises the full document in a form suitable for Industry.
- A section detailing the implications to Industry of the findings of the report and conclusions drawn.
- An appendix detailing a list of contacts interviewed during the course of the project.
- An appendix containing the Terms of Reference for the project.

If the Consultant has access to commercial-in-confidence data, germane to the project outcome, MLA would not require this to be presented in the Final Report, nor sources identified. Subject to agreement between the parties involved, such commercial-in-confidence data may be presented in an unpublished, Part 2 document.

Consultants should be aware that the Final Report may be reproduced in MLA format with due acknowledgment to their involvement in its preparation.

Access to Information

Where information is available which may assist the Consultant in meeting the requirements of this project, such information will be provided to the Consultant on a confidential, or other basis as indicated, by MLA. Confidential information would not be reproduced in the Report, consistent with the caveats mentioned under 'Output'.

Timing

MLA is anticipating that a contract to proceed with the project will be finalised with the Consultant by 12 October 2001. An elapse time of 3 months to complete the project is envisaged with the Final Report being delivered to MLA by 25 January 2002.

Within the first fortnight of the project, the Consultant will deliver a brief Inception Report detailing suggestions (if any) on fine-tuning of the project scope and potential outcomes for consideration by MLA and the Advisory Committee.

Experience/Qualifications of Researcher(s)

The successful applicant(s) will have significant experience in this area of work, and a demonstrated record of high quality review achievements. Documentation supporting the credentials and experience of the review team should accompany the project proposal.

Costing

MLA seeks a quotation for the complete project to be conducted under these Terms of Reference. The quotation will provide details of the proposed methodology for conduct of the project and costing of each project component.

The details of costing provided to MLA will include professional fees, calculated on a daily rate for each person, or party involved, and will cover professional services of the Consultant, provision of office facilities, electricity, local telephone and facsimile calls, postage, clerical/secretarial services and indirect costs (overheads).

Out-of-pocket expenses will be reimbursed at cost for travel and accommodation, long distance telephone and facsimile calls and external costs of report preparation. Air travel costs will be reimbursed at a maximum of full economy rates. Estimates of expenses will be provided in the project proposal.

The details of the project content, methodology and costing may be adjusted with the agreement of MLA, following initial assessment of the project proposal. The project proposal should be submitted in the format outlined in the Research Proposal Preparation Guidelines attached.

Consultative Group Meetings

Consultants need to make provision for two (2) half-day meetings, if required, with the Advisory Committee. The initial meeting will be held at the commencement of the project and the second at Draft Final Report delivery stage. These will be separately identified and costed within the project proposal. Costings should be based on attendance at meetings in Brisbane.

Industry Presentations

Consultants also need to make provision for presentation of the project findings to an appropriate forum, if so requested by MLA. The costing of such presentation will be separately identified and costed within the project proposal. Allowance of one (1) day and travel to Sydney should be provided for.

Payment

MLA will make progress payments against completion of the components of the project identified, with milestones agreed to by MLA.

Final payment for the project will be subject to written acceptance of the Report by MLA. All payments will be subject to receipt of invoices and appropriate supporting documentation from the Consultant.

Subcontracting

The Consultant may wish to subcontract certain activities and analyses to other parties. In this case full details of the party or parties to be subcontracted, their capabilities and background and the activities or analysis that they would perform in the context of this project will also be provided to MLA. Notwithstanding this, the responsibility for the performance of the subcontractor will rest completely with the Consultant, with whom MLA would be contracted.

Reporting and Liaison

The Consultant will report to MLA through Mr. Des Rinehart. In addition to the Inception Report at the end of the first fortnight, the Consultant will provide a brief statement of progress with the project (by letter or facsimile) at the end of each month.

Confidentiality

The Consultant may divulge that the project is being undertaken at the request of MLA. Otherwise, the specification of the project, contents and conclusions of the project and the Report produced are strictly confidential. The Consultant may not disclose any details or information in respect of the project to any party without the prior consent of MLA.

Proposals may be lodged by post or electronically:

Des Rinehart

Feedlot Program Coordinator

Meat & Livestock Australia

9 Girral Road

THAGOONA QLD 4306

Email: rinehart@gil.com.au

Proposals must be received by **COB 21 September 2001**.

Appendix 2. Impact of Feedlots on the Local Road Network

1. INTRODUCTION

Case study reviews were conducted with feedlot operators in various locations in NSW and Queensland to ascertain the impacts on the local rural road networks, which can be directly attributed to the development of feedlots. The road standards, conditions and usage were addressed by the operators. In addition, interviews were held with officers of the local government authorities (LGA) in which the case study feedlots are located, to ascertain their opinion and some quantitative data of the impact of the development of feedlots on the rural and local road networks within their local authority areas.

The local rural roads are those controlled and maintained by the LGA. Other regional roads such as main roads and highways are controlled by the state authorities and have not been factored into this assessment as these are designed to carry the heavy loads from rural industries such as feedlots.

With the collected data the local road upgrading and maintenance costs and life expectancy rates have been developed to show the impact of the development of the study's three model feedlots in comparison with the pre-feedlot development status, namely:

1. Pre-feedlot development – typical local/rural road servicing grain, crops or pastoral lands;
2. Model Feedlot A of 5,000 SCU;
3. Model Feedlot B of 15,000 SCU; and
4. Model Feedlot C of 30,000 SCU.

The assumptions used for the pre-feedlot development estimates are based on experience of LGA officers over many years, and for the feedlot developments are based on actual data and costs available attributable to the development of each sized model feedlot.

Comparable and relative information is included in the following sections.

2. TYPICAL PRE-FEEDLOT RURAL ROAD CONSTRUCTION AND MAINTENANCE

The study model feedlots are located in an area previously used for agricultural grain, crops and/or pasture production.

These particular established agricultural pursuits all require very little heavy transport usage during most of the year and the local road network is principally only used for heavy transport at harvest time for relatively short periods of time (five to six weeks each season or year). In general, these low-use rural roads are of shallow depth gravel pavement in a natural earthworks formation and are basically designed and constructed for light vehicle traffic only (often single lane) and primarily only used in periods of dry weather.

Before the commencement of the harvest season, these roads would have substantial maintenance carried out (sometimes the only maintenance for that year) by the LGA, to enable the road to last in relatively fair condition for as long as the harvest season, subject to the seasonal climatic conditions allowing.

The design standards for these roads generally have a formation width of 8-10 metres (all driveable in dry conditions) with a centrally located wet-weather gravel pavement of 3-4 metres wide with 150mm compacted gravel depth. These roads are designed for up to 50 cars, utilities and light trucks (namely farm owners and their families) and about 5-10 heavy trucks per day in dry weather and about ten (10) 4-wheel-drive vehicles in wet weather. The construction cost of these gravel rural roads to the above standards is $10,000-15,000/km and maintenance cost $6,000-8,000/km/annum, most of which is undertaken immediately prior to the harvest season, and, upgraded on harvest completion, with gravel resheeting required each 5-7 years costing $7,000-8,000/km.

3. THE IMPACT OF THE FEEDLOT ON ROAD STANDARDS

Unlike the established less intense agricultural pursuits which largely incurred heavy traffic only for a seasonal harvest period each year when the produce was taken away from the farm, feedlot operations have a continuous two-way heavy and intense traffic pattern. In addition, there is an external workforce travelling to and from the feedlot site, as well as flow-on travelling to schools, local towns, etc by feedlot employees and their families on a daily basis. This impact requires a complete change in the implementation of local rural road funding, and the construction and maintenance standards and programs for the concerned local roads by the LGA.

The total local road usage is reassessed and provision made for new road design and construction standards to meet the increased road use demand. The following aspects are considered.

- All-weather road (bitumen sealed road);
- Road formation and pavement design to provide continuous seven day/week high axle load usage by semi-trailer and B-double type heavy trucks;
- Substantial increase in car, utility, small truck, school bus usage of these roads;
- Improved bridge load and width requirements (where applicable) and drainage of roads to meet the all-weather requirements; and
- Highway standard safety conditions (in relation to road visibility conditions and speed requirements).

Many LGAs have adopted the relevant State Roads Standard for Rural Highways or Regional Roads to attain a serviceable standard for these local roads experiencing the extra usage associated with a feedlot development. For example the upgraded road standard for a Model C Feedlot access road is:

- Two lane x 3.5 metre wide bitumen sealed road;
- One metre wide bitumen sealed shoulder each side;
- 100kph speed (non-residential) and 50kph speed (residential) limits;
- Designed to carry 600-1000 vehicles per day (AADT) (with up to 30% heavy vehicles);
- Cross drainage to meet site standard stormwater design requirements;
- Lighting at major intersections and railway level crossings;
- Improved intersections with highway to allow for B-double turning;
- Road edge guide posts and Australian Standard signage and line marking.

All case study feedlots currently have bitumen sealed access from the closest state highway and accordingly all-weather access between the feedlot gate and the nearest town.

As a comparison the road standards for each model feedlot A, B and C are compared with the pre-feedlot development status in Table 1. The heavy vehicle tonnages and their movements for each model feedlot size are compared with the pre-feedlot development status in Table 2.

4. COMPARATIVE CONSTRUCTION AND DEVELOPMENT COSTS

A typical feedlot location scenario is illustrated in Figure 1 attached developed for the study model feedlot. This scenario locates a feedlot on an existing local shire road 20kms from the nearest state highway (bitumen) and 40kms from the nearest town being a minor town from where grain can be sourced. This existing local road is gravel and not all-weather and has been developed to cope with the grain harvest over a period of five to six weeks in early summer. An alternative local gravel road to a larger town some 35kms away exists which is in very poor condition for 15kms closer to the feedlot location, with the remainder in fair to reasonable condition.

The feedlot is developed and the local gravel road to the highway (20km) upgraded to bitumen, providing all-weather access to both towns and bitumen road access to all required suppliers and facilities, eg local, regional and state abattoirs, sources of fuel, grain and other feedstuffs, and livestock, as well as access to shops, schools, etc.

The shorter length of gravel road to the larger town is not upgraded, as an alternative all-weather combined local and state road route is available. This is a typical scenario occurring throughout eastern Australia in areas where feedlots have been established.

While most heavy trucks and practically all cars, utilities and other lighter vehicles travel the 50kms on bitumen roads to the major town, some 30% of heavy truck drivers use the shorter and rougher 35km local gravel road, causing unnecessary damage to the road in periods of wet weather and shortening the life of materials in the construction of this road.

The comparative road construction costs, annual maintenance costs and annual road maintenance attrition costs are developed for the pre-feedlot development state, and for each model feedlot situation (Table 3).

The development of good quality bitumen sealed roads to feedlots and other intense agricultural pursuits provides an asset to the community, a cost effective option in relation to maintenance, and a more safe road for all types of vehicles to travel on.

5. GENERAL COMMENTS BY LOCAL AUTHORITIES

The interviews with the LGA officers in the case study feedlot areas confirm the feedlot operators reported co-operative approach to the development of their access roads and their current condition. All LGA interviews indicated a most positive response by the authority and community to the acceptance of the feedlots established in their local areas.

LGA officers interviewed considered the feedlot development a definite positive for the community/region at large and with the experience now gained supported the development of more labour intensive operations such as feedlots, providing regular employment in the area. It was repeatedly stated, whilst the development of roadworks may deplete, in the short term, the LGA funding for current and future road construction and maintenance, there are positive outcomes for the region. This is especially so for the local towns and is related to the extra direct local employment, and the spending of external money in the local community as a result of the development more than compensating for this road expenditure.

It was also stated that local authorities frequently now compete amongst each other for the development of high labour intensive rural industries into their areas. The industries offer a productive approach to local and regional unemployment situations, especially during time of drought, balance out seasonal unemployment, and generate flow-on effects for other local businesses.

6. SUMMARY OF FINDINGS

The following has been drawn from the information received and derived relating to the direct effect of establishing feedlots at various locations in eastern Australia and their impact on the local road network.

a. The LGAs involved in areas where high intensity rural industrial pursuits, such as feedlots, have been established have had to reassess their funding, construction and maintenance programs for the affected local rural road network. This is as a result of the considerably higher traffic density and higher axle loadings and loading repetitions using these roads, and how these relate to the continuing safety of the road user, and the additional costs involved in maintaining adequate standards to meet the needs of the users.

b. The local rural roads accessing feedlots have had their standards of design and construction dramatically improved over the past 5-10 years to cater for the increase in traffic volumes, especially heavy traffic. For the study model feedlots the access roads from the local town or regional centre are all-weather bitumen sealed roads, and the secondary access roads are original gravel formation or narrow bitumen seal (light or seasonal traffic capability) which require considerable additional LGA maintenance funding.

c. The feedlot incurs increases in daily traffic which are estimated, depending on feedlot size and alternative routes to the feedlot, at:

   - Heavy vehicles generally 2 to 12 times
   - Light traffic (cars, utes, etc) 5 to 10 times

   The LGA, in its provision of all-weather roads, needs to address the new improved level of road construction required to cater for these increases.

d. The costs of access road are altered as a result of the increased daily traffic of heavy vehicles.

   - The construction cost is increased by 8-10 times to $100,000-120,000/km for an all-weather bitumen sealed road, plus an allowance for bridge replacement etc.
   - The annual maintenance costs are reduced for small feedlots with bitumen access roads (for the study model A costs are reduced by some 15%), and increased for the more heavily used roads associated with a large feedlot (for the study model C costs are increased by some 50%). This includes annualised allowances for a bitumen-resealing program (not previously required) currently at $15,000/km every 8-10 years.

e. The LGA adopt general bitumen sealed all-weather road standards intended to meet the current study model feedlot sizes. Once the general threshold of about 10-12 heavy vehicles per day mixed with 40-50 light vehicles, school buses etc has been identified, then generally the access road is required to be all-weather bitumen. The mix of vehicles, terrain, existing road alignment and visibility of oncoming traffic etc, all provide the basis for this decision.

   The decision to widen an existing gravel rural road to an 8(+) metre width (including shoulders) and to provide an improved pavement depth and bitumen sealed running surface, needs consider the structural aspects of the load carrying capacity of the road as well as the safety issues and the cost of the upgrading program.

f. The development of all-weather bitumen sealed access roads to feedlots, in addition to providing the feedlot with the necessary improved access, also contributes to the permanent employment of the local community, in particular during droughts and outside times of seasonal work, and benefits the community with additional prosperity over and above that previously provided by the traditional more extensive rural pursuits.

Table 1

Comparative construction standards, road use capabilities, and construction and maintenance costs of local roads for model feedlot scenarios

Factor	Pre-Feedlot Development	Model Feedlot A 5,000 SCU	Model Feedlot B 15,000 SCU	Model Feedlot C 30,000 SCU
Road Specifications				
Surface Type	Gravel	Bitumen	Bitumen	Bitumen
Surface Width	3-4m	5m	6m	7m
Shoulders	3-4m	1.5m each side	1.5m each side	1.0m each side (sealed)
Design Speed	80 kph	80 kph	100 kph	100 kph
Drainage	Gravel Inverts	Concrete Inverts	Pipes	Pipes, Bridges
Linemarking	No	No	Possibly	Yes
Estimated Road Capacity Standard (AADT) *				
Vehicles	50-100	150	400	600 **
Heavy Vehicle	10%	33%	33%	30%
Harvest Season Vehicles	200	n/a	n/a	n/a
Harvest Season Heavy Vehs	90% (road failure occurs)			
Road Construction and Maintenance Costs				
Construction/km	$12,000	$100,000	$110,000	$120,000 ***
Maintenance/km ****	$7,000	$3,000	$3,000	$3,500
Resheeting/Resealing/km	$1,500-$2,000	$2,500-$3,000	$3,000-$4,000	$4,000-$5,000

* Road use capabilities in general terms. AADT – Average Annual Daily Traffic.
** Extensive curve and intersection improvements required.
*** Plus bridge works.
**** Annualised.

Table 2

Estimated annual vehicle tonnages and truck movements on local roads for model feedlot scenarios

Factor	Pre Feedlot Development	Model Feedlot A 5,000 SCU	Model Feedlot B 15,000 SCU	Model Feedlot C 30,000 SCU
Road Vehicle Tonnages due to Feedlot Operations*				
Cattle (in/out)	n/a	26,844	76,994	145,273
Grain (in)	n/a	23,960	74,720	156,960
Roughage (in)	n/a	9,200	28,720	60,360
Supplements (in)	n/a	3,680	11,520	24,160
Fuel (in) (allow 28t GVW)	n/a	588	1,736	4,032
Manure (out) (allow 30t GVW)	n/a	5,200	15,625	31,250
Miscellaneous (in)	n/a	1,750	5,250	10,500
Return Empty (allow 15t tare)	n/a	27,417	82,588	166,572
Comparative Pre Feedlot Operations				
Produce (out) (allow 30t GVW)	50,000			
Return empty (allow 12t Tare)	20,000			
Estimated Annual Tonnages				
Comparative Totals	70,000 (over 6 weeks)	98,639	297,153	599,108
Truck Movements				
Basic - Total/annum	3,333	3,656	11,012	22,210
- Average/day	n/a	10	30	61
Additional due to Development - Total/annum	n/a	322	7,678	18,876

* Assume gross vehicle weight (GVW) of 40 tonne, except where noted otherwise.

Table 3

Comparative road construction costs, annual maintenance costs, and annual road maintenance attrition costs for model feedlot scenarios

Factor	Pre-Feedlot Development	Model Feedlot A 5,000 SCU	Model Feedlot B 15,000 SCU	Model Feedlot C 30,000 SCU
Construction Cost				
Road 1 - Bitumen (20km)	$240,000	$2,000,000	$2,200,000	$2,400,000
Road 6 - Alternative gravel - dry weather 30% movements (35km)	nil	nil	nil	nil
Total Construction Costs:	**$240,000**	**$2,000,000**	**$2,200,000**	**$2,400,000**
Annual Maintenance Cost				
Road 1 - Gravel (20km)	$150,000			
Road 1 - Bitumen (20km)		$120,000	$140,000	$160,000
Road 6 - Gravel (as above) allow	$40,000	$40,000	$80,000	$120,000
Total Annual Maintenance Costs:	**$190,000**	**$160,000**	**$220,000**	**$280,000**
Comparative Annual Road Maintenance Attrition Cost	**n/a**	**-$30,000**	**$30,000**	**$90,000**

Appendix 3. Input-Output Analysis Methodology

Overview of Input-Output Analysis

Input-output analysis provides a comprehensive economic framework that is extremely useful in the resource planning process. Broadly, there are two ways in which the input-output method can be used.

First, the input-output table provides a numerical picture of the size and shape of the economy and its essential features. The input-output transactions table can be used to describe some of the important features of an economy, the interrelationships between sectors, and the relative importance of the individual sectors.

Second, input-output analysis provides a standard approach for the estimation of the economic impact of a particular activity. The input-output model is used to calculate industry multipliers that can then be applied to various development scenarios.

Linkages between sectors

The standard approach for the estimation of the regional economic impact of a particular activity, such as wine production, 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 winery that, in the course of its operation, purchases goods and services from other sectors. These goods and services would include grapes, bottles, and corks and, of course, labour. 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 winery, the other sectors in the state economy engage in their own expenditures. For example, as a consequence of winning a contract for work with a winery, a bottle manufacturer 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 winery on the regional or state economy. They must be added to the *direct effects* (which are expenditures made in immediate support of the winery itself) in order to arrive at a measure of the total impact of the winery.

It may be thought that these indirect effects go on indefinitely, and that their amount adds up without limit, the presence of *leakages*, however, prevents this from occurring. In the context of the impact on a *regional or state* economy, an important leakage is expenditure on imports, that is, products or services that originate from *outside the region, state or country* (e.g. French oak barrels).

Thus some of the expenditure for imports to the 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 various expenditures and where they occur. Also needed is information on how the sectors that 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 winery employees on food, clothing, entertainment, and so on, as it is impracticable to measure these effects for an individual case, here the winery.

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 percent of their income on food and non-alcoholic beverages, it is assumed that those working in wineries do likewise. Indeed, the effects of all expenditure rounds after the first are calculated by using such standard proportions (*multiplier* calculations).

Multipliers

Multipliers are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. As well, they can be used to estimate the impact of a change in that particular sector on the rest of the economy. As noted above, detailed explanations on calculating input-output multipliers (and the underlying assumptions) are provided in any regional economics or input-output analysis textbook (see for example Hewings (1985), Jensen and West (1986), Midmore and Harrison-Mayfield (1996), Powell et al. (1985), and West (1993)). Suffice to note that they are calculated through a routine set of mathematical operations based on coefficients derived from the input-output transactions table.

Input-output transactions table

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

This assumes, 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 transactions table is a convenient way to illustrate the purchases and sales of goods and services taking place in an economy at a given time.

Input-output tables provide 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 the 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. The table is also used for the calculation of sector multipliers and the estimation of economic impacts arising from some change in the local economy.