MEAT & LIVESTOCK
AUSTRALIA

On farm

Evaluation of Feed Grain Supply and Demand in Australia

Report Critique: "Projection of regional feed demand and supply in Australia"

Project number FLOT.116
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Feedlot Program

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Macarthur Agribusiness

April 2001

Executive summary

This review was commissioned by Meat and Livestock Australia to assess the report "Projection of regional feed demand and supply in Australia" produced by Australian Bureau of Agricultural and Resource Economics (ABARE) and funded by the Grains Research and Development Corporation (GRDC). The project was commissioned as a result of a concern that an inaccurate representation of the feed grain supply and demand situation in Australia could have serious implications for the intensive livestock industries in satisfying industry growth targets, international competitiveness now and into the future.

The outcomes of this review are intended to contribute additional relevant research and information to the feed grain policy debate. It is also hoped that a separate revision of the ABARE model may be possible in the near future to determine the projected feed grain supply and demand balances that may arise as a result of the updated information collected.

Report critique

Using a model of regional feed markets previously developed by ABARE (Hafi and Andrew 1997), the purpose of the research was to project regional supply and demand of feed over five calendar years (2000 to 2004 inclusively) on the basis of four scenarios: (1) BAU 'business as usual' which assumes ABARE's 1999 assessment of medium-term outlook for cropping and livestock industries, (2) HFS 'a higher feed supply' where high-yielding wheat (HYFW) production expands at a faster rate than assumed in the BAU scenario, (3) HFD 'a higher feed demand' where the beef feedlot industry expands rather than contracts as in the BAU, and (4) a 'drought' scenario whereby a drought in eastern Australia, similar to that which occurred in 1994-95 was repeated.

The ABARE Report presents:

- a review of earlier demand projections conducted by the Meyers Strategy Group (MSG).
- results for two years: a 'reference' (baseline) year 1999 and for 2004. For each scenario, the model generates physical levels of usage and availability of generic 'feed' and main ingredients.
- key underlying assumptions.
- provides for high readability and highlights the core findings relevant to the respective grain grower and intensive livestock industries.
- from the point of view of a detailed appraisal of the model and the research methodology, more information than is provided in the Report would be useful, particularly in relation to specific regional assumptions.

For the regional analysis, the Australian feed market is disaggregated into 14 regions: 3 in Western Australia - North East (WANE), Central Sandplain (WACS), South Coast (WASC); 1 in South Australia (SA); 2 in Victoria – Bordertown Wimmera Mallee (VICWM), High Rainfall (VICHR); 5 in New South Wales – North West (NSWNW), North East (NSWNE), Central (NSWC), Northern Livestock (NSWNL), and Southern Livestock (NSWSL); 3 in Queensland – Central (QLDC), South West (QLDSW), and South East (QLDSE). The rationale for these regions is that they "reflect the regional concentration of grains and livestock production systems". Presumably the boundaries align with geographic segmentation used by Australian Bureau of Statistics (ABS) although this is not clear from the Report.

The model accommodates 12 'types' of livestock production comprising 3 pig types (weaner, grower, breeder), 4 poultry types (broiler starter, broiler grower, pullet grower, layer), 4 ruminants (dairy, feedlot cattle, grazing ruminants, live sheep for export) and other. However in the Report feed usage tables consider only 9 'types' reducing pig types to 2 (slaughter, sow) and reducing poultry types to 2 (broiler, layer). Presumably, to generate feed ingredient usage, and due to the complexity of the model, the simplifying assumption is made that the nutritional requirements within each 'type' are the same. This may be a somewhat coarse assumption with respect to the beef cattle feedlot sector.

The critique assessed the assumptions and methodology underpinning the findings of the model and report and has provided useful comment on the substance and contextual discussion points where appropriate. The main findings and points of discussion arising from the critique are presented below:

- The ABARE least-cost-ration approach, might be expected, at face value, to reflect more accurately the disposal of feed ingredients than the set-ration approach used previously by the MSG study. Whether in fact this is true

will depend upon the accuracy of the assumptions made in the ABARE model about nominal farm gate price, transport cost between regions and substitution between feed ingredients which may be substantially constrained by such factors as feed mixing preference of end-user and production penalty cost of switching feed rations. For example, the model output seems to suggest that oats is substituted for other coarse grains in the cattle feedlot industry on a least cost basis, but in reality oats is rarely used in commercial feedlot practice.

- For serious potential users of projections of regional feed demand and supply based on the ABARE model, more comfort with the results might be achieved if the assumptions made for those variables open to conjecture were published with the Report and, if necessary, sensitivity tested. Reporting in such a manner could also possibly lead to future research endeavours and data capture templates which focus on overcoming exposed weaknesses (if any) in input numbers. Apart from the points referred to above, other possible input assumptions open to conjecture might be:

    - how the food/feed grain crop ratio is treated across regions for the BAU scenario;
    - what raw data is used to generate inter-regional trade flows; and
    - what is the agricultural justification of expanding HYFW into 'non traditional wheat growing areas'.

- The Report acknowledges that the model still represents 'some form of abstraction from reality' and cites four main limitations:

    - The assumption of no barriers to inter-regional trade within Australia. Statutory marketing arrangements for the main feed ingredients may restrict this trade.
    - Export market loyalty and commitment to long term export contracts are ignored.
    - Feed mixing preferences of end-users are not incorporated.
    - The assumption of zero transport cost between two points within a region.

- These limitations would differentially affect the usefulness of the model for different purposes. A useful output of the model, probably least affected by the above limitations, is the identification of the surplus/deficit of feed availability and usage by region. Thus, the present Study output and analytical framework could be used for strategic planning by individual feed and livestock producers. Expansion or relocation by livestock producers in surplus regions or diversification by feed producers into higher value crops.

- In light of the model's primary assumptions of no barriers to inter-regional flows and no market loyalty impacts, it is less useful, indeed could be a misleading framework for determining policy settings on reform in the transport and storage sectors and relaxation of quarantine protocols.

- The least-cost approach to ration formulation is a commendable approach but the factors of feed ingredient substitution perhaps need more stringent qualification.

Evaluation of the ABARE regional feed market model

In the absence of appropriate datasets, the need to construct a model that can effectively estimate feed grain flows is a plausible approach and the model in question handles most of the key decision variables influencing feed grain supply and demand from a theoretical context. The ABARE regional feed projection model is a suitable approach for projecting short to medium term trends in future supply and demand profiles for feed grains. However, this assessment is qualified by the need to seek industry validation of exogenous assumptions to ensure model settings adequately reflect industry forecasts prior to finalising model output.

Accuracy of report findings

As a result of desk research of the model structure and opinion from industry experts, it was evident that the ABARE model is a powerful tool and has very useful applications in quantifying feed grain supply and demand changes over time. The model output forecasts large feed grain surpluses over the next five years and that the concerns of intensive livestock industries will be eased as a result. However, the assumptions that underlie these projections appear in many respects to differ from the opinions and sentiment within industry, particularly in relation to expectations on the magnitude and direction of future industry growth at this point in time. To improve the robustness of some assumptions where data is difficult to source, an industry survey of the key players in the

beef, pig, poultry and dairy industries was conducted. The survey intended to broadly satisfy the following objectives:

- To obtain an insight into the future business intentions and responses of the intensive livestock industry to feed grain issues in the context of the BAU "Business as Usual", HFD "High Feed Demand" and "Drought" scenarios as presented in the Report;
- To compare survey results to relevant assumptions and outcomes of the report and relevant desk research;
- To provide industry management and policy makers with a better appreciation of the factors effecting feed grain demand and supply; and
- To build on previous work undertaken in the feed grains industry, and to improve the quality of information currently in the public domain.

The survey findings and the results of desk research were used in examining the ABARE report assumptions and projections. The main differences in assumptions and projections are presented below.

Key findings

Model assumptions

- **Feed grain demand and supply assumptions:** Some of the main assumptions adopted by the ABARE model that were found to be significantly different to the findings of this review include projections of animal numbers for the feedlot and pig sectors, wheat and barley production and the usage of oats in feedlot beef cattle rations. The assumption changes arising from the survey process and desk research are presented and compared to existing ABARE assumptions in Exhibit I.

Exhibit I Comparison of selected ABARE and recommended assumption adjustments based on survey results and desk research

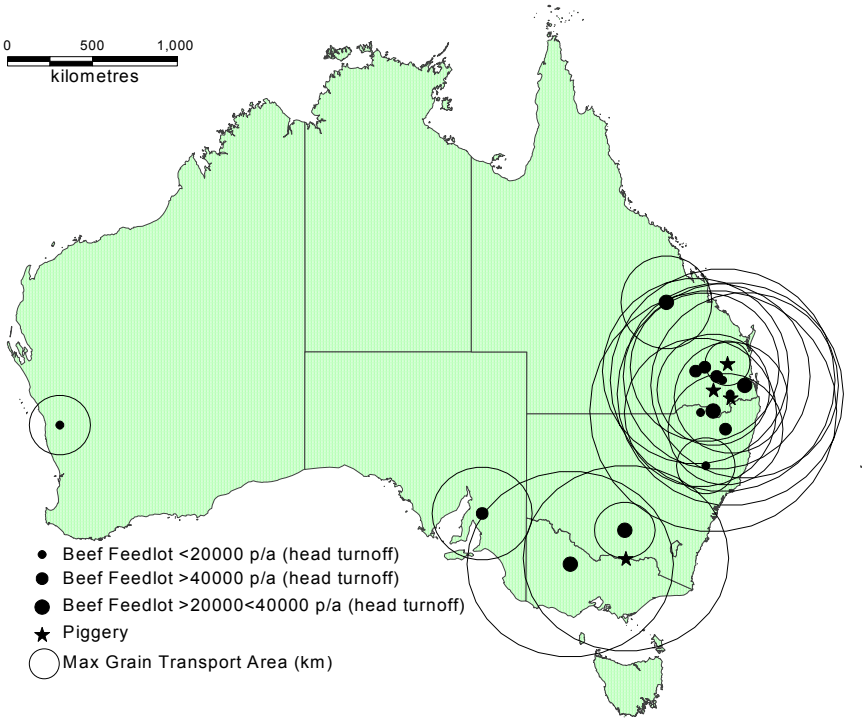
	ABARE			Recommendation		
Assumptions	**BAU**	**HFS**	**HFD**	**BAU**	**HFS**	**HFD**
Feed Grain Supply ***						
Feed Wheat Production	5%	36%	5%	**-2.3%**	**18%**	**-2.3%**
Feed Barley Production	20%	20%	20%	**8%**	**8%**	**8%**
Animal Numbers ***						
Animal Numbers – Beef	-7%	-7%	2.5%	**32%**	**32%**	**31%**
Animal Numbers – Poultry	4%	4%	4%	**N/A**	**N/A**	**N/A**
Animal Numbers – Dairy	1%	1%	1%	**N/A**	**N/A**	**N/A**
Animal Numbers – Pigs	N/A	N/A	N/A	**4%**	**4%**	**3%**
Ration Composition						
Feedlot Ration – Percentage Oats Usage in mix	32% - 40%	39.2%*	35.9%**	**0% - 5%**	**0% - 5%**	**0% - 5%**

N/A = Not available
BAU = Business as usual, HFS – High Feed Supply, HFD = High Feed Demand
**Percent of oats in feedlot ration HFD 2004*
*** Percent of oats in ration Drought 2001*
**** Expressed as percentage change in industry growth between 1999 – 2004.*

Model projections

- **Feed grain flows from Western Australia to the eastern states:** The ABARE model estimated that feed grain would commonly flow from key grain growing regions in Western Australia to feed grain deficit regions in the eastern states. The survey results indicate that general maximum draw areas to secure grain supplies in the eastern states were not generally found to extend across to grain growing regions in Western Australia as suggested by the ABARE findings. Indicative maximum transport distances for each survey respondent to key grain production source regions where grain supplies are commonly secured are presented in Exhibit II.

Exhibit II Indicative Maximum Grain Transport Distance: Australian Beef Feedlots and Piggeries Surveyed February 2001



Source: MLA Feed Grains Survey, 2001

- **Overall feed demand projections:** Growth in overall feed demand projections are considered to be relatively modest (3 percent) due to the "somewhat mixed future prospects for the livestock industries" (Hafi and Rodriguez, pg. 6). The feed demand and supply projections are directly related to the attendant array of assumptions adopted. As demonstrated in Exhibit I, it would appear that the future outlook, particularly for beef, has moved forward substantially since the initial projections were published, and existing model demand assumptions may understate the future domestic feed grain demand situation at this point in time.

- **Feed grain supply projections:** The ABARE report forecast that feed grain supply would outstrip domestic usage over the 1999 – 2004 period. The finding is based on expected increases in the production of wheat which is expected to rise by 5 percent and 36 percent for the BAU and HFS scenarios respectively, and the production of feed barley is expected to increase by 20 percent over the same period. For the HFS scenario, the rapid increase in production of feed wheat is expected to be driven by increased production of high yielding feed wheat (HYFW), however the adoption of these varieties is expected to take longer than initially anticipated due to the delayed emergence of a significant feed grain production sector in Australia, the lack of logistics infrastructure in non traditional wheat growing areas, climatic variation and some problems with stem rust disease in HYFW varieties. The ABARE Outlook 2001 forecast for grains expect wheat and barley production to fall by 2.3 percent and rise by 7.8 percent respectively. In the absence of solid evidence to justify the robustness of assumed increases in feed wheat and barley production, it may be appropriate instead to link feed grain availability to projections in national production, as has been done for demand assumptions for intensive livestock industries.

Recommendations

The recommendations arising from this review deliberately focus on the key sources of model variation where the findings of desk research and industry surveys differed significantly from the original base assumptions. It is not the

intention of this review to seek amendments or to repeal the findings of the original ABARE report. Since the time of the publication, many of the key drivers effecting the intensive livestock and feed grains industries have changed. It is therefore appropriate to consider the following recommendations as an update of factors affecting feed grain supply and demand, and that the additional information produced is intended to contribute to the continued balance in policy debate on these issues. It is hoped that the recommendations provided may be modeled in the near future to take advantage of the currency of the findings, which will assist industry to improve its understanding of the sensitivity of feed grain supply and demand to changes in key market and production variables. The main recommendations as a result of this review are presented below:

- **Feedlot growth assumptions:** The assumed growth in feedlot numbers is considered conservative (2.5 percent growth in feedlot numbers from 1999 – 2004) for the HFD scenario and understated for the BAU and HFS scenarios (7 percent decline in feedlot numbers from 1999 – 2004). Industry surveys indicate that feedlot growth is likely to increase between 1999 and 2004 by over 30 percent, which is consistent with historical industry growth trends.

- **Pig production assumptions:** Pig numbers are assumed to increase, but industry growth assumptions are not clearly quantified by the report. It is also not evident that this assumption changes across scenarios. It is recommended that pig industry assumptions be revised based on more concrete data and observations within the industry, via a key stakeholder survey. Survey responses from a small sample indicate that the pig industry would grow by 4 percent and 3 percent in the BAU and HFD scenarios respectively.

- **Inclusion of oats as a feedlot ration input:** It is recommended that oats be omitted or its use limited to a maximum usage of 5 percent of the total ration volume in line with industry expert opinion and industry survey outcomes.

- **Wheat and barley feed grain production assumptions:** The production of feed wheat is forecast to rise by 5 percent in the BAU scenario and 36 percent in the HFS scenario between 1999 and 2004 and barley is assumed to increase by 20 percent over the same period. It is also assumed that high yielding feed wheat (HYFW) will increase by 1000 percent from current estimates of 100,000 tonnes to 1,000,000 tonnes by 2004. For reasons previously cited, it is recommended that the forecast assumptions for wheat in the HFS scenario be revised down by half from 36% to 18% based on discussions with industry. It is recommended that the assumption for feed wheat in the BAU and HFD be linked to trends in national wheat production which suggest that a modest decline of 2.3 percent is forecast between 1999 and 2004.

- **Scenario methodology:** The review found that the HFD scenario projection comprised of an increase in feedlot industry growth only. The industry livestock growth assumptions for dairy, pigs and poultry do not appear to have changed relative to the BAU and HFD scenarios. It is recommended that a HFD scenario projection is run separately for each intensive livestock industry to determine relative feed grain supply and demand impacts. A consolidated projection should also be run assuming a simultaneous change in industry growth assumptions for each user industry, to provide a realistic upside indication of feed demand possible in a HFD scenario.

- **Feed grain flows from Western Australia to the eastern states:** The transportation of feed grain from Western Australia - Central Sandplains Region (WACS) to Central Queensland (QLDC) for the HFD and HFS scenarios is difficult to sustain based on survey findings at this time. For the HFD scenario, the assumed growth in feedlot numbers is cited as the major reason for the feed deficits in livestock producing regions of New South Wales and Queensland (Page 31). It is not evident from the report which grains were transferred from WACS to QLDC. It is recommended that the detailed interregional feed grain flow data and the per unit transport costs be made available for further scrutiny and comment.

- **It is recommended that assumption changes presented in Exhibit I be submitted to ABARE for further consideration with a view that the revised findings be incorporated into a separate revision of the ABARE model in the near future, for the purposes of providing both industries with an updated projection of Australian feed grain supply and demand balances.**

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List of Exhibits

List of Abbreviations

ABARE:- Australian Bureau of Agriculture and Resource Economics.

ABB:- Australian Barley Board.

ADC: - Australian Dairy Corporation.

ALFA:- Australian Lot Feeder's Association.

AWB:- Australian Wheat Board.

BAU:- Business as Usual.

BSE:- Bovine Spongiform Encephalopathy

DRDC:- Dairy Research and Development Corporation

GCA:- Grains Council of Australia.

GRDC:- Grains Research and Development Corporation.

HFD:- High Feed Demand.

HFS:- High Feed Supply.

HYFW:- High Yielding Feed Wheat.

IFPRI:- International Food Policy Research Institute.

JISG:- Joint Industry Submission Group.

MLA: - Meat and Livestock Australia.

NSW:- New South Wales.

PRDC:- Pig Research and Development Corporation.

QLD:- Queensland.

QLDC: Queensland Central.

WA:- Western Australia.

WACS:- Western Australia Central Sandplains.

1 Introduction

1.1 Background

In May 2000, ABARE, on behalf of GRDC and GCA released a report titled "Projection of regional feed demand and supply in Australia" hereafter referred to as "The Report". The Report is being used by the grains industry to support its policies in the grain security area and could be used by Government in the determination of policy in this area as well.

Meat and Livestock Australia (MLA) is concerned that an inaccurate representation of the feed grain supply and demand situation could have serious implications for the intensive livestock industries: lack of access to adequate feed grains could be prejudicial to the intensive animal industry in satisfying industry growth targets, international competitiveness now and into the future. There may also be major implications for further expansion of the intensive livestock industries on a regional basis.

Intensive feed industries such as the feedlot sector need to have access to grain at world comparative prices to be globally competitive. Any attempt by the grain production sector to limit competition for feed grain supply will have adverse cost consequences on the intensive animal industries. This study is aimed at providing balanced debate on the issue in light of the ABARE report.

The intensive livestock industries have requested that the findings of the Report be further investigated, on the basis that there could be errors in both the scenario analyses on which the study is based and the methodologies employed.

This review (hereafter referred to as "The Critique") is not intended to focus specifically on the outcomes of the Report, rather it is to complement and build on previous research to provide industry management with better information for future policy development. The Critique intends to achieve sufficient justification of key assumptions and model output through industry surveys, discussions with industry experts, and desk research on prices, production trends, and other relevant feed grains research. Importantly, the industry survey will provide an indicative profile of future trends in the intensive livestock industries, which will be applied to the array of assumptions used, and methodologies and scenarios employed. This process will establish a more informed basis for the evaluation of the model outcomes by comparing the future business intentions of the intensive livestock industries and the assumptions used in the model.

1.2 Project Objectives

Pursuant to the Terms of Reference (Appendix 2), the Critique aims to achieve the following objectives:

1. Provide a constructive critique of the ABARE report titled "Projection of regional feed demand and supply in Australia"; with particular reference to its ability to address the requirement of the intensive livestock industries to have access to a secure source of grain at internationally competitive prices at the point of usage.

2. Provide an evaluation of the ABARE regional feed market model, on which the report is based, particularly its ability to handle the effect of supply price elasticity on demand.

3. Establish the accuracy of the findings of the report, and provide alternative corrected findings where required; and,

4. Provide recommendations on actions required to address any identified deficiencies in:
   a. the underlying assumptions on which the ABARE model operates
   b. the methodologies employed in the modelling process;
   c. the scenario analyses employed; and,
   d. the results presented in the report.

2 Report Critique

This is a critique of a Report (May, 2000), titled "Projection of Regional Feed Demand and Supply in Australia" which was the outcome of research undertaken by ABARE with funding from the GRDC.

Using a model of regional feed markets previously developed by ABARE (Hafi and Andrew 1997), the purpose of the research was to project regional supply and demand of feed[1] over five calendar years (2000 to 2004 inclusively)[2] on the basis of four scenarios: (1) BAU 'business as usual' which assumes ABARE's 1999 assessment of medium-term outlook for cropping and livestock industries, (2) HFS 'a higher feed supply' where high-yielding wheat (HYFW) production expands at a faster rate than assumed in the BAU scenario, (3) HFD 'a higher feed demand' where the beef feedlot industry expands rather than contracts as in the BAU, and (4) a 'drought' scenario whereby a drought in eastern Australia, similar to that which occurred in 1994-95 was repeated.

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- key underlying assumptions.
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For the regional analysis, the Australian feed market is disaggregated into 14 regions: 3 in Western Australia - North East (WANE), Central Sandplain (WACS), South Coast (WASC); 1 in South Australia (SA); 2 in Victoria – Bordertown Wimmera Mallee (VICWM), High Rainfall (VICHR); 5 in New South Wales – North West (NSWNW), North East (NSWNE), Central (NSWC), Northern Livestock (NSWNL), and Southern Livestock (NSWSL); 3 in Queensland – Central (QLDC), South West (QLDSW), and South East (QLDSE). The rationale for these regions is that they "reflect the regional concentration of grains and livestock production systems". Presumably the boundaries align with geographic segmentation used by Australian Bureau of Statistics (ABS) although this is not clear from the Report.

The model accommodates 12 'types' of livestock production comprising 3 pig types (weaner, grower, breeder), 4 poultry types (broiler starter, broiler grower, pullet grower, layer), 4 ruminants (dairy, feedlot cattle, grazing ruminants, live sheep for export) and other. However in the Report feed usage tables consider only 9 'types' reducing pig types to 2 (slaughter, sow) and reducing poultry types to 2 (broiler ,layer). Presumably, to generate feed ingredient usage, and due to the complexity of the model, the simplifying assumption is made that the nutritional requirements within each 'type' are the same. This may be a somewhat coarse assumption with respect to the beef cattle feedlot sector.

Earlier research on feed demand (MSG Meyer Strategy Group 1995) provided projections for feed supply and use for the 5-year period 1995-96 to 1999-2000. A review of the MSG work suggests that its usefulness is limited by the aggregate (i.e. whole-of-Australia) nature of the projections, which do not address the more industry-useful regional feed surplus/deficit profile. A further restrictive aspect of the earlier MSG projections cited in the Report was that feed usage was generated on the basis of a constant set of feed proportions whereas farmers and stockfeed manufacturers try to formulate feed on a least-cost basis exploiting the substitution possibilities between different feeds. The ABARE research attempts to redress the non-regional and set-feed-proportion deficiencies of the MSG study in the new model.

The ABARE Report also comments that a major flaw of the MSG analysis was total 'usage' and 'availability' did not match and projected imports for sorghum, maize and soybeans were not supported by the analysis with the 'major policy implication of the study that Australia would continue to import feed grains'.

1 'Feed' in the Report means slightly different things. In the market component of the model it refers to 14 'main feed ingredients' used in the intensive livestock industries comprising: 6 grains (feed wheat, feed barley, sorghum, oats,, maize, triticale), 5 oilseed and oilseed meals (soybean meal, canola meal, sunflower meal, cottonseed meal and cotton seed), 3 pulses (lupins, filed peas, faba bean). However in that part of the model where least cost rations are generated, 30 ingredients are considered as 'feed' , including grain byproducts (e.g. millmix and pollard)

2 1999 was used as the 'reference' or base year for which data common to all scenarios was generated

What appears to be an important issue, for both the MSG and the ABARE research, is that the common-to-both methodology for measuring 'availability' of domestically-sourced feed is to assume that it is the residual after 'deducting from total production, the quantities exported and used for food, seed and for industrial purposes and an estimated change in stock'. On the other hand 'usage' in both studies is basically treated as a function of animal numbers by unit feed consumption, albeit with different approaches to generating feed ingredient usage. Presumably the stock-on-hand of basic feed ingredients at the end of the year is a balancing figure for the difference between calculated disappearance (including domestic 'usage') and 'availability' and would absorb any error in the estimate brought about by wrong assumptions or calculations. Assuming this balancing figure cannot be explicitly estimated, the only way to know if the assumptions are somewhere near the mark is to observe if there is a shift over time (up or down) of the derived balance. It would be useful, for a critical analysis such as this, to know what was the model-generated balance figure in each year for each major feed ingredient.

The other key aspect of the model is the calculation of 'usage' and the intrinsic assumptions made about how the intensive livestock industries dispose of the main feed ingredients in any one year. The ABARE least-cost-ration approach, might be expected, at face value, to reflect more accurately the disposal of feed ingredients than the set-ration approach used previously by the MSG study. Whether in fact this is true will depend upon the accuracy of the assumptions made in the ABARE model about nominal farm gate price, transport cost between regions and substitution between feed ingredients which may be substantially constrained by such factors as feed mixing preference of end-user and production penalty cost of switching feed ration. For example, the model output seems to suggests that oats is substituted for other coarse grains in the cattle feedlot industry on a least cost basis, but in reality oats is rarely used in commercial feedlot practice. At first consideration, this might suggest that the constraints on substitution are not accurately reflected in the model. Of course, it may also suggest that industry fashion is precluding the use of the most profitable feed mix. In the end, the point to this comment is that the apparent sophistication of the ABARE approach over that used by MSG is only useful if the attendant array of input assumptions are robust, otherwise the more simple approach used by MSG may not be less accurate. The published Report does not provide enough data to allow more critical comment on this point.

It is axiomatic that a credible regional, rather than a whole-of-Australia, approach to the 'feed' supply/demand equation is more useful to the concerned industries. However a regional approach requires the use of region-specific data sets which take into account the unique features of the respective regions. These data may be sometimes difficult to obtain but are fundamental to generating a credible 'regional' feed demand and supply outcome.

The delineation of the adopted regions would seem to be appropriate if, as previously mentioned, they are consistent with easily obtained ABS data segmentation. However, a point not clear in the Report is how region-by-region projections on feed availability and usage are disaggregated from ABARE's whole-of-Australia Outlook 99 data. For example, a key element of the BAU scenario is the expected 5-year growth in feed production arising from a predicted Australia-wide increase in cropping areas as a result of the continuing slump in the wool sector. The question is, if wool industry contraction is the main driver to crop expansion, then will this not occur at different rates in different Regions (e.g. higher in parts of NSW sheep/wheat belt than say in Qld)? It is not clear if differential regional crop expansion rates have been applied in the model. Depending upon the assumptions made this could substantially skew the balance of regional feed production.

In the same vein, it is noteworthy that in the HFS scenario only the NSW and Victorian Regions are assumed to benefit from expansion of HYFW. One might ask why only the NSW and Victorian regions were assumed to grow HYFW? Or, for example, has partial substitutability of molasses for energy dense grains (pers. com. R.A. Hunter, CSIRO Rockhampton) been considered for the QLDC and QLDSE Regions where there is a larger concentration of feedlot enterprises?

The point of these comments is that the robustness of the model output is primarily determined by the assumptions made in the translation of national outlook into Regional outlook and the capture of the unique attributes of each region. The Report in its published format does not provide enough data to allow more critical comment on these points. The great advantage of the ABARE model to industry is its regional dimension but it is only useful if the underlying regional assumptions are sound.

For serious potential users of projections of regional feed demand and supply based on the ABARE model, more comfort with the results might be achieved if the assumptions made for those variables open to conjecture were published with the Report and, if necessary, sensitivity tested. Reporting in such a manner could also possibly lead to future research endeavours and data capture templates which focus on overcoming exposed weaknesses (if any) in

input numbers. Apart from the points referred to above, other possible input assumptions open to conjecture might be:

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These limitations would differentially affect the usefulness of the model for different purposes. A useful output of the model, probably least affected by the above limitations, is the identification of the surplus/deficit of feed availability and usage by region. Thus, the present Study output and analytical framework could be used for strategic planning by individual feed and livestock producers. Expansion or relocation by livestock producers in surplus regions or diversification by feed producers into higher value crops.

In light of the model's primary assumptions of no barriers to inter-regional flows and no market loyalty impacts, it is less useful, indeed could be a misleading, framework for determining policy settings on reform in the transport and storage sectors and relaxation of quarantine protocols.

The least-cost approach to ration formulation is a commendable approach but the factors of feed ingredient substitution perhaps need more stringent qualification.

At first consideration, the assumption of zero transport cost between two points within a region is likely to be less of an issue for strategic planning although this comment is qualified by how the inter-region transport costs are generated.

3 Evaluation of the ABARE Regional Feed Market Model

3.1 Model structure and modus operandi

Hafi and Andrews (1997) developed the ABARE Regional Market model as documented in the report "Regional feed markets in Australia". The model solves endogenously for feed demand for all feed ingredients and, for interregional transfer, regional prices, exports and imports of the thirteen main feed ingredients. The model uses exogenous values of regional feed ingredient supplies, interregional transport costs, indicative world prices of the main feed ingredients, regional prices of other ingredients, freight rates for imports from the third countries and port handling charges (Hafi and Andrews, 1997, p 56).

The model incorporates simultaneous achievement of two objectives. First, the objective of meeting feed demand at a minimum cost by mixing different feed ingredients available to a region. Second, the objective of the allocation of the main feed ingredients available to a region between competing demands (demand within the region and demand by other regions and countries) and importation of the main feed ingredients if necessary in a manner consistent with the behaviour of a competitive market. The model, therefore has two components, a feed mixing component and a market component which are linked together (Hafi and Andrews, 1997, p 56).

Hafi and Andrews, 1997, p57 made the following assumptions for the market component of the model:

- Every region is a single and distinct market for each feed.
- Each type of feed is a homogenous product.

- Perfectly competitive behaviour exists between regional traders, exporters and importers.
- Each regional market is represented in the model by a single reference point (or transport node) for the purpose of specifying transport costs between regions and solving for interregional transfers and regional price differences.
- Transport costs per unit moved are incurred in moving feed ingredients between regions, while transport within regions can take place at zero cost.
- Transportation costs are not influenced by the volume of feed movement.
- There are no other costs or limitations, such as government regulations, against movement of feeds between regions.

The model uses a non linear programming methodology (Hafi and Andrews, 1997) and operates on the basis of maximising the net revenue for feed grain production in Australia by identifying the most efficient feed usage pathways for each feed ingredient into each livestock industry and region. The model minimises feed input costs by optimising ration compositions (by nutrient and quantity) to achieve least cost feeding regimes, and optimises inter regional transfers and import and export grain flows according to the status of regional feed grain supply and demand balances.

3.2 Model Evaluation

3.2.1 Model suitability for projecting regional feed grain supply and demand

The ABARE regional feed projection model in the absence of robust historical datasets on feed grain demand and supply variables, is a suitable framework for projecting feed grain supply and demand. However, this assessment is tempered by the need to seek industry validation of the exogenous assumptions to ensure model settings adequately reflect industry forecasts prior to finalising model output.

The model uses a reference simulation based on 1999 financial year information on regional livestock numbers, prices for other ingredients and feed availabilities (Hafi and Andrews, 1997). It is important to note that the reference simulation should not be regarded as an exact replication of the situation in 1999. Rather it provides a base against which the results of alternative simulations can be assessed (Hafi and Andrews, 1999). The interregional transfers for all years and scenarios suggest that feed grain consignments are likely to flow from Southwest Western Australia to Central Queensland. Industry opinion suggests that this finding would rarely occur in reality, therefore the scenario projections from 2000 to 2004 are likely to be less useful if derived off an inappropriately derived base year.

In the absence of appropriate datasets, the need to construct a model that can effectively estimate feed grain flows is a plausible approach and the model in question handles most of the key decision variables influencing feed grain supply and demand from a theoretical context. The ABARE model will provide short to medium estimates of the likely supply and demand profiles for feed grains, provided all assumptions are given due consideration and endorsement by supplier and end user industries.

It is worthy of mention that the model only allows for one average beef feedlot ration (Hafi and Andrews, 1997) which requires an estimate of the average feeding period to be produced based on the distribution of markets for which cattle are being prepared. The number of cattle on feed and utilisation are dependent on total available capacity, stock turns per available capacity which is then contingent on market feeding specifications. It is not clear from the model what the average feeding period is. It appears that the model has limited capacity to handle differing feeding regimes within livestock type of varying time periods (ie. 70 day, 100 day, 120 day and 150+ days).

3.2.2 Capacity to handle supply price elasticities.

As discussed previously, because feed grain prices, and supply and demand assumptions are exogenous to the model, the ABARE model is not ideally suited to handling supply and demand price elasticities. This indicates that supply and demand projections produced by the model are independent (i.e. supply and demand elasticities are not central to the operation of the model). Therefore, the ABARE report conclusions that feed grain production surpluses are likely to occur between 1999 and 2004 across BAU, HFS, HFD and drought scenarios does not

adequately cater for the price sensitivities which would result, forcing quantity supplied and demanded to converge to an equilibrium price more compatible with the projected demand and supply profiles[3].

It is possible to generate indicative rudimentary elasticities (provided model assumptions have been validated) using partial techniques by subjecting the model to incremental changes in feed grain pricing variables and recording resulting model changes at the end of each iteration set. However, the complexity and size of the model makes these changes difficult to administer as each iteration set takes in excess of half a day to run (Brennan, pers. comm., 2000).

Limited research exists on the supply response/elasticities in the feed grains industry. Some state based research has been conducted for the NSW feed grains industry by Campbell, 1994, however, very limited research is available on the national industry. This is an area of research requiring further attention, if feed grain suppliers and end users consider feed grain supply and demand and feed grain security a future strategic priority issue.

4 Accuracy of Report Findings and Model Assumptions

As a result of desk research of the model structure and interviews with industry, it was evident that the ABARE model is a powerful tool and has very useful applications in quantifying feed grain supply and demand changes over time. The model projects that large surpluses of feed grains are likely over the next five years and that the concerns of intensive livestock industries will be eased as a result. However, the assumptions that underlie these projections appear in many respects to differ from the opinions and sentiment of industry, particularly in relation to the expectations of future industry growth at this point in time. To improve the robustness of some assumptions where data are difficult to source, an industry survey of the key players in the beef, pig, poultry and dairy industries was conducted. This section will present selected industry survey outcomes and examine the accuracy of the model assumptions and projections contained in the ABARE report in light of the outcomes from industry surveys and desk research. The survey outcomes are examined in detail in Section 4.1 and the survey template is provided in Appendix 5.

4.1 MLA feed grains industry survey

4.1.1 Introduction

The limited availability of industry data on historical feed grain usage, interregional flows and future business intentions of intensive livestock industry players has been referred to in earlier sections of this review. To improve industry understanding of feed grains industry metrics, an industry survey was conducted of the key players in the beef, pig, poultry and dairy industries. The survey format was intentionally brief to ensure that the survey process was not too onerous on participants, but that the resulting survey output would be useful in contributing more information to the key sections of the project Terms of Reference. The survey intended to broadly satisfy the following objectives:

- To obtain an insight into the future business intentions and responses of the intensive livestock industry to feed grain issues in the context of the BAU "Business as Usual", HFD "High Feed Demand" and "Drought" scenarios as presented in the Report;
- To compare survey outcomes to relevant assumptions and outcomes of the Report and relevant desk research;
- To provide industry management and policy makers with a better appreciation of the factors effecting feed grain demand and supply; and
- To build on previous work undertaken in the feed grains industry, and to improve the quality of information currently in the public domain

The survey content and context are described in the next section, followed by survey results, interpretation and discussion.

[3] In evaluating the ABARE model, discussions were undertaken with Dr Garry Griffith, Senior Research Economist, University of New England, Armidale and Dr John Brennan, Senior Research Scientist (Economics), Wagga Wagga who are both employed by NSW Agriculture. Both individuals have had an association with the ABARE model and have extensive expertise in economic modeling across various agricultural industries.

4.1.2 MLA Feed Grains Survey

The intensive livestock industries were approached to participate in the survey, which included the beef feedlot, pig, poultry and dairy industries. Industry sectors surveyed included, livestock production, feedlot, feedmills and feed wholesalers. A list of people contacted as a part of the project are documented in Appendix 1. Survey participants were asked to; provide data on feed usage for the reference year 1999; forecast estimated feed grain usage to 2004; and were asked to estimate usage under 3 scenarios, BAU, HFD and Drought to remain consistent with ABARE scenario classifications. To remain consistent with the ABARE methodology, it was assumed that the demand assumptions for BAU scenario would be a satisfactory basis for the HFS scenario, therefore the HFS was not included in the survey.

Grain substitution in feed grain rations is a key issue in determining the feasible feed ingredient combinations that are possible across and between intensive livestock industries. An understanding of the relationships between feed inputs and attributes will assist industry in understanding which key feed grain attributes are considered the most important to intensive livestock industries. Survey participants were asked to rank the most important feed grain attributes on a low, medium, high basis, and were then asked to specify which grains are the most commonly substitutable in order to optimize ration cost (refer Appendix 4).

Proximity to a reliable supply of feed grain is essential for continuity of business operation for intensive livestock industries. Survey participants were asked to provide indicative estimates of the generally accepted minimum, average and maximum freight distances to key grain production source regions assuming a "business as usual" scenario. Transport distances generally vary depending on the feed grain type required (as is normally the case), so survey participants were provided the option to include similar transport distance profiles for each feed grain type used.

Other elements of the survey included the assessment of constraints to feed grain supply to intensive livestock industries (refer Appendix 4), and the use of high yielding feed wheat varieties. The key survey results are examined in the Section 4.1.3.

4.1.3 Results

Survey sample

The survey process involved the dissemination of a total of 40 surveys to a list of key intensive livestock industry players endorsed by the project steering committee. Of the original sample, 25 responses were received representing a very strong 62.5 percent response rate. Responses were sought from the main grain production states of QLD, NSW, VIC, SA and WA. Response rates were generally very good for the beef feedlot and pig industries (Exhibit 1). Poor responses were received from the chicken and dairy industries.

Responses generally came from QLD and NSW where a higher concentration of feed grain production and intensive livestock feeding enterprises (particularly beef) exists. The majority of responses were submitted by beef feedlot enterprises (18), with equal response (5) from feedmills and livestock producers (Exhibit 1).

Exhibit 1 Sample Size, State Distribution by Species and Activity

	QLD	NSW	VIC	SA	WA	Total
Species						
Beef	9	5	2	1	1	**18**
Pigs	3	1				**4**
Poultry	1					**1**
Dairy			1			**1**
Total By Species	**13**	**7**	**3**	**1**	**1**	**25**
Activity						
Livestock Producer/Grower	4	1	-	-	-	**5**
Feedlot	9	5	2	1	1	**18**
Feedmill	2	2	1	-	-	**5**
Total By Activity	**15**	**8**	**3**	**1**	**1**	**28**

Source: MLA feed grains survey, 2001
**Two survey participants in QLD and one in NSW were both livestock producers and feedlot/feedmillers.*

Livestock numbers and grain usage estimates

An examination of the survey results revealed that industry sentiment on future growth is much higher than model assumptions would suggest. Feedlot livestock numbers are forecast to increase by 32 percent and 31 percent respectively between 1999 and 2004 for the BAU and HFD scenarios, and 23 percent for the Drought scenario (Exhibit 2). This result contrasts with the assumptions adopted by the ABARE model which anticipates feedlot numbers will fall by 7 percent and increase by 2.5 percent in the BAU and HFD scenarios respectively. Although a small sample size (4) was received from the pig industry, the responses came from substantial industry players who collectively forecast pig industry livestock numbers to increase by 4 percent and 3 percent in the BAU and HFD scenarios respectively. It is not valid to quote statistics for chicken and dairy because only one response was provided for each category.

Exhibit 2 Feed Grain Usage Estimates and Production Growth Australian Intensive Livestock Industries 1999 - 2004

	Reference Year 1999 (Survey) (kt)	Estimated Feed Demand (Survey) (kt)			Estimated growth (%) 1999 – 2004 (Survey)		
	1999	BAU	HFD	Drought	BAU	HFD	Drought
Livestock Turnover (000's) head*							
Feedlot	662.8	873.2	871.0	810.4	**32%**	**31%**	**22%**
Chicken	N/A	N/A	N/A	N/A	**N/A**	**N/A**	**N/A**
Pigs	1,297.4	1,343.8	1,339.2	1,337.1	**4%**	**3%**	**3%**
Dairy	N/A	N/A	N/A	N/A	**N/A**	**N/A**	**N/A**
Grain Usage (kt)							
Wheat	427.6	508.1	493.4	479.1	**19%**	**15%**	**12%**
Barley	521.8	601.4	614.7	527.7	**15%**	**18%**	**1%**
Sorghum	125.3	161.6	177.5	162.6	**29%**	**42%**	**30%**
Oats	7	9.1	9.1	9.1	**30%**	**30%**	**30%**
Maize	39.9	41.4	33.0	29.0	**4%**	**-17%**	**-27%**
Lupins	46.2	48.3	48.4	48.4	**5%**	**5%**	**5%**
Cotton meal	13.0	13.6	13.6	13.6	**5%**	**5%**	**5%**
Canola meal	28.4	32.6	32.5	32.5	**14%**	**14%**	**14%**
Soya meal	2.2	4.8	4.8	4.8	**121%**	**122%**	**121%**

Source: MLA Feed Grains Survey, 2001
**Cannot compare growth in livestock numbers to growth in feed grain usage due to differences in sample size. The sample size for feed grain usage equaled 17 whilst the sample size for animal numbers equaled 20.*
N/A: Not Available.

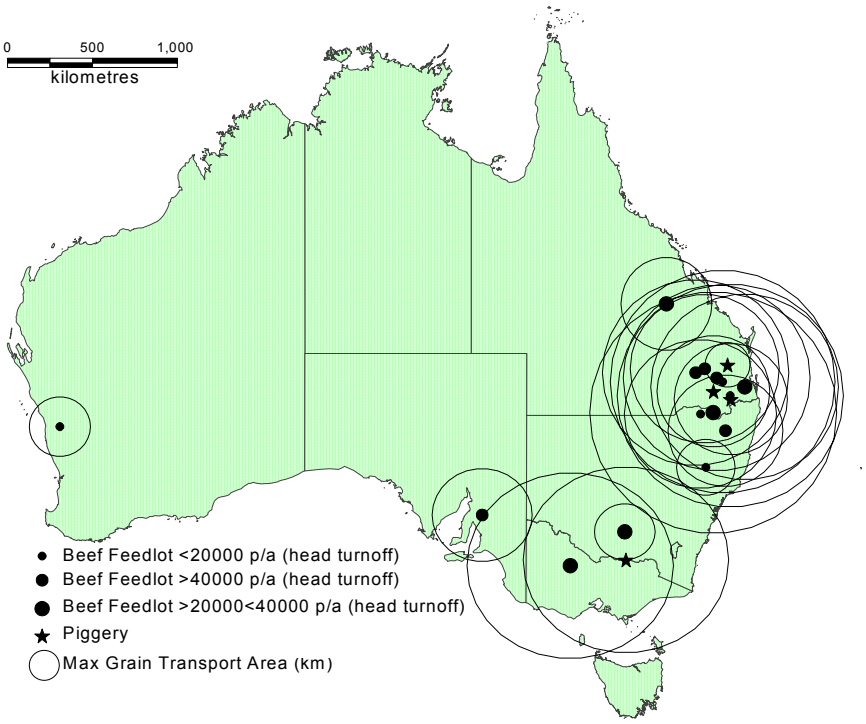
Grain transport: transport distance

An examination of average transport distances to key grain production regions provides a useful insight into the generally accepted areas and distances feed grains can be transported at affordable cost (Exhibit 3). The distances that feed grain can be sourced by intensive livestock industries is influenced by the following:

- location of feed grain required;
- price relativity's of all ingredients in the ration mix
- importance of the feed grain to the ration mix;
- nutritional characteristics of the feed grain relative to the landed cost; and
- transport cost per tonne per kilometre.

Exhibit 3 examines the general maximum transport distances of the beef and pig industry players surveyed. The map indicates that feedlots are generally located to the north, south and within the eastern Australian grain belt, with feed grain in central regions of NSW being within reach of both northern and southern intensive livestock industry players. Smaller maximum transport distances were found where feedlots are located in closer proximity to major grain-growing regions. General maximum draw areas in the eastern states were not found to extend across to major grain growing regions in Western Australia.

Exhibit 3 Indicative Maximum Grain Transport Distance: Australian Beef Feedlots and Piggeries Surveyed February 2001



Source: MLA Feed Grains Survey, 2001

4.2 Review of model assumptions

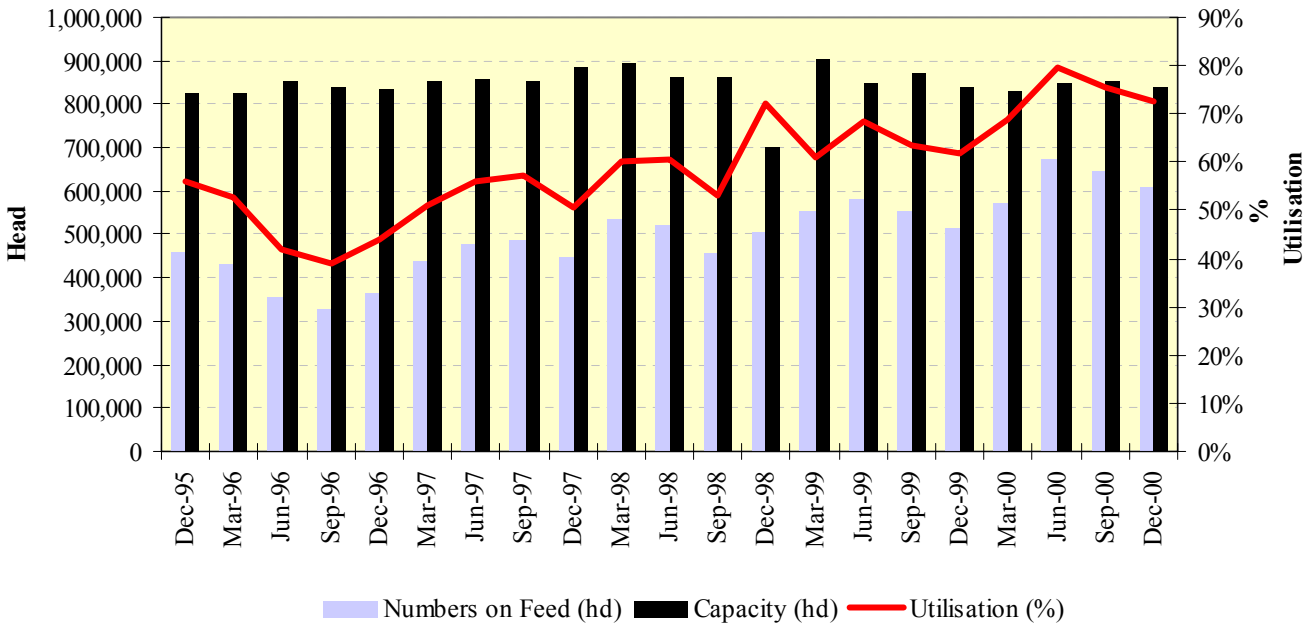
4.2.1 Feedlot and beef industry growth assumptions

The Report assumes that the growth in cattle feedlot numbers between 1999 – 2004 for the HFD scenario will increase by 2.5 percent, and will fall in the BAU scenario by 7 percent (Hafi and Rodriguez, 2000, pg. 7). The number of cattle placed on feed is assumed to increase from 1.7 million head in 1989-99 to around 1.8 million head in 1999-2000 before declining to 1.6 million head by 2003-04 (Hafi and Rodriguez, 2000, pg. 23). These assumptions appear to contrast with historical and future trends. The Australian Lot Feeders Association quarterly feedlot survey indicates that number of cattle on feed in Australian feedlots between December 1995 and September 2000 increased by 25.62 percent, or 6.41 percent per annum to December 2000 (Exhibit 4). Despite difficult market conditions (low beef prices and relatively high feed input prices), particularly in 1995 and 1996, the feedlot sector has experienced solid growth. With the advantage of hindsight and with more up to date information, ABARE's assumption of a 2.5 percent increase (HFD) and 7 percent decline (BAU) in cattle on feed between 1999 – 2004 would indicate the outlook for beef has moved on significantly since the publication of the Report.

Examination of growth assumptions across scenarios would indicate that the HFD scenario comprised of an increase in feedlot growth only. The growth assumptions for dairy, pigs and poultry do not appear to have changed relative to the BAU and HFS scenarios which would suggest that the assumptions underlying the HFD scenario may not fully capture potential forecast changes across intensive livestock industries. It may be appropriate in the future to run the model periodically and to separately determine the effects of an increase in feed demand for each livestock type across reported scenarios.

The model indicates that the feedlot industry's share of total feed grain usage is projected to decline from 27 percent in 1999 to 24 percent, the poultry industries share of total feed grain is projected to increase from 22 percent to 24 percent in the same period. The projected decline is due to an assumed decline in feedlot cattle numbers in the medium term. The recently improved situation for the beef industry would indicate that a revised forecast would be significantly higher compared with similar forecasts made 12 months ago.

Exhibit 4 Number of Cattle in Feedlots and Utilisation Dec – 95 – Dec - 00



Source: Australian Lot feeder's Association. Historically cattle on feed numbers came from a survey of feedlots carrying 500 + head. From 1996/97 onwards the survey includes feedlots carrying less than 500 head of cattle.

The Report suggests that the national herd is expected to peak at around 26.9 million in 2000-01 and then decline to 2003-04. This finding contrasts with the recently updated situation outlook for the Australian cattle industry 1996 – 2004 released by Meat and Livestock Australia which indicates that the industry is expected to grow steadily from 26.6 million head in 1999 to 28.5 million head in 2004. Detailed national industry statistics are presented in Exhibit 5.

Exhibit 5 Situation and outlook for the Australian cattle industry 1996 - 2004

Parameter	1996	1997	1998	1999	2000	2001	2002	2003	2004
Cattle numbers ('000 head)									
as at March 31	26,377	26,780	26,826	26,578	26,600	27,200	27,650	28,100	28,500
Percentage change	2.5%	1.5%	0.2%	-0.9%	0.1%	2.3%	1.7%	1.6%	1.4%

Source: Meat and Livestock Australia, 2000 Update

4.2.2 Dairy industry growth assumptions

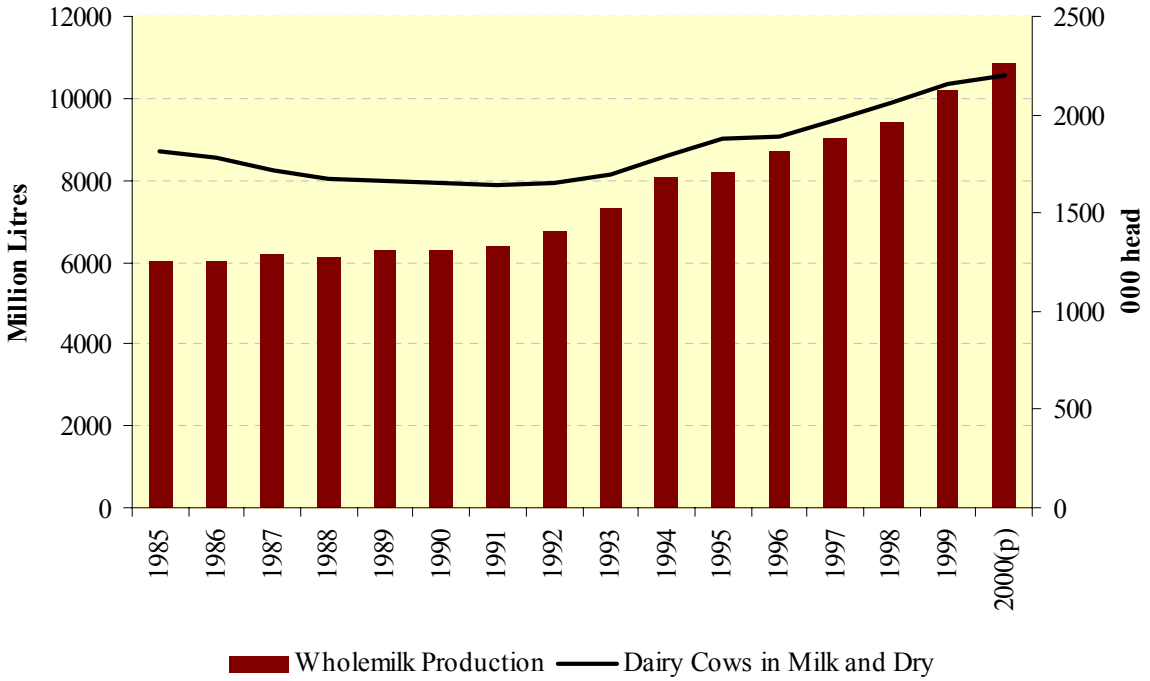
The ABARE Report assumes over the medium term, that the size of the Australian dairy herd will increase by one percent to just over 2 million head in 2003-04 (Hafi and Rodriguez, 2000, pg. 23). Although conservative, this growth assumption is considered reasonable given the current adjustment pressures in the industry, principally driven by deregulation. However, according to statistics provided by the Australian Dairy Corporation, growth in dairy cow numbers has risen from 1.654 million head in 1990 to an estimated 2.2 million head in 2000 (Exhibit 6) or an average of 3.0 percent growth per annum. These data indicate that the number of dairy cows is currently estimated to be in excess of the 2 million head projected by the report in 2004.

Unlike the beef, pig and chicken industries who have established specialised grain dependent feeding sectors, the dairy industry is predominantly a grass based production system and its dependence on feed grain is less certain and more difficult to measure. The national approach adopted to estimating growth in animal numbers as a basis for estimating changes in feed grain consumption is commendable, and works reasonably well for the beef, pig and chicken industries, and may also be relevant to the dairy industry in the long term as livestock productivity and profitability imperatives drive the industry towards more intensive livestock systems. As this transition occurs, the dairy industry is likely to increase the level of grain use over time. The approach adopted by ABARE is less able to capture changes in dairy industry feed grain usage in the short to medium term because it would appear that this

assumption does not consider the capacity for an industry to increase rates of feed grain use over time if usage rates move differentially to growth trends in the national herd.

The use of feed grain in the dairy industry is increasing according to the report "Technology and Farm Management Practices in the Dairy Industry" (produced for the Dairy Research and Development Corporation (DRDC) by ABARE), which found that grain use per farm doubled in the six years to 1997-98. With qualification, while this result hides a big range, most dairy farmers are much more dependent on purchased feedstuffs than they were a decade ago (O'Connor, 2000). The main reason driving this trend is that the cost of wheat – the main feed grain has become much cheaper in relative terms, including relative to pasture – the feed source that feed grain has mostly replaced (O'Connor, 2000) (refer Appendix 6 for further details).

Exhibit 6 Whole Milk Production and Dairy Cows in Milk and Dry



Source: Australian Dairy Corporation

4.2.3 Pig industry growth assumptions

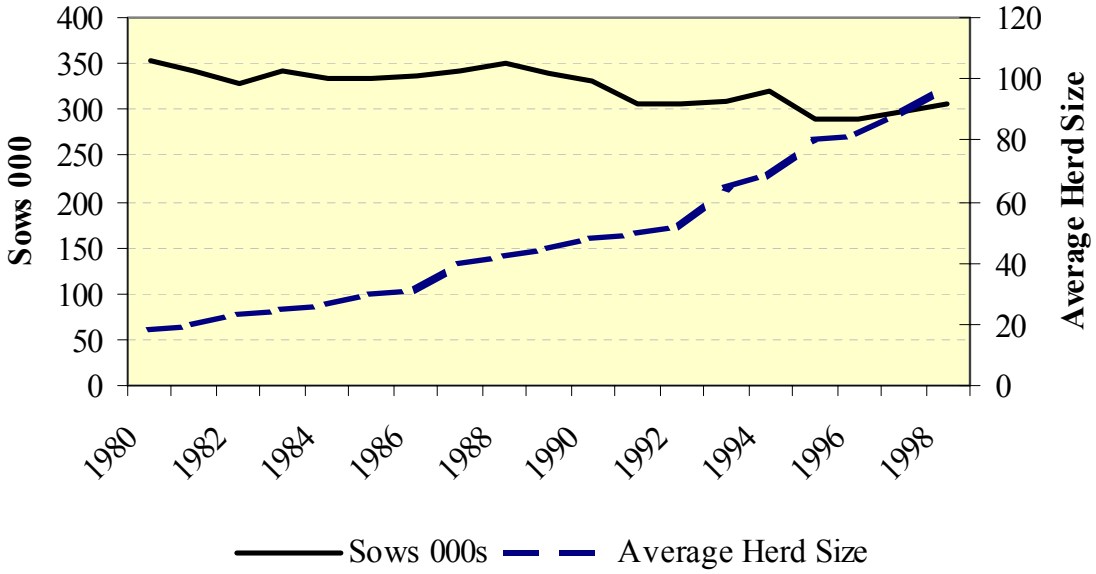
After a period of growth, total pig numbers had followed a slight declining trend from 1994/95 – 1998 (Hafi and Rodriguez, 2000, pg. 11). The average herd size per farm has increased as the industry continues the trend toward larger technically sophisticated pig farms, this is not enough to compensate fully for the impact on total pig numbers because of the fall in the number of producers (Hafi and Rodriguez, 2000, pg. 11). Pig numbers are assumed to increase, but industry growth assumptions are not clearly quantified by the report. It is also not evident if this assumption has changed across the BAU and HFD scenarios.

Since 1995/96 sow numbers have grown from 290,000 in 1995 to 307,000 in 1998 equating to a total increase of 5.86 percent in this period in an environment of significant structural adjustment (Exhibit 7). From an industry perspective, the number of producers who may exit the industry will only have negative impacts on industry growth if the number of breeding sows in the industry fall or are taken out of production as a result. One plausible explanation why this may occur could be that less efficient producers who exit the industry would most likely sell their breeding stock to existing producers seeking to expand.

The pig industry has experienced a long-term downward trend in its breeding herd. However, the long-term decline in the breeding herd has been predominantly driven by a historical reliance on a mature domestic market. In recent years, increasing import competition and generally higher costs of production compared with major global competitors has forced the industry to reposition its strategic focus to include an export orientation. Positive trends

in export growth, expansion of export processing capacity, and general industry consolidation have contributed to increasing average herd size which is driving the emergence of more competitive production structures. Export growth and increased economies of scale evident in the industry would indicate that the medium prospects are positive, resulting in an expansion in production and increased demand for feed grain.

Exhibit 7 Number of Sows and Average Herd Size



Source: Pig Stats, 1998

4.2.4 Poultry industry growth assumptions

Chicken production is forecast to grow at 4 percent per annum for the BAU and HFS Hafi and Rodriguez, 2000, pg. 23). It is not apparent that the HFD projection for poultry is any different from 4 percent. Exhibit 8 examines total poultry numbers including other poultry where available. Total poultry livestock numbers have grown by 33 percent between 1994 and 1999, representing a 5 percent average increase per annum. The model assumption for chicken is consistent with this finding.

Exhibit 8 Australian Poultry Numbers

31 March	Chickens(a) Hens and pullets for egg production '000	Meat Strain Chickens (broilers) b '000	Total Chickens '000	Other poultry(c)		Other Poultry '000	Total All Poultry '000
				Ducks 000	Turkeys 000		
1994	13,163	55,513	68,676	447	839	374	**70,336**
1995(d)	11,148	54,445	65,593	(e)	(e)	2,088	**67,682**
1996	13,413	62,331	75,744	411	1,222	1,040	**78,417**
1997	14,059	67,373	81,432	390	1,211	909	**83,942**
1998	14,036	75,504	89,540	456	1,268	673	**91,937**
1999	13,609	77,863	91,472	370	1,288	448	**93,578**

(a) Includes breeding stock, (b) Excludes meat strain chickens in Tasmania, (c) Excludes turkeys in South Australia, (d) Excludes other poultry in South Australia, (e) Not collected.
Source: Livestock Products, Australia (7215.0); Agricultural Commodities, Australia, 1998-99 (7121.0).

4.2.5 Oats usage in beef feedlot rations

The use of oats in feedlot rations is not commonly practiced in the feedlot industry, however the model has assumed higher than average proportions of oats in the model feedlot ration mix relative to standard industry practice. In determining the validity of this assumption, advice has been sought from key feedlot industry nutritionists[4]. Advice indicates that oats is not used extensively by the feedlot industry. The larger more significant industry players generally base feedlot rations on varying proportions of barley, wheat and sorghum (depending on availability) in preference to oats on the basis that these preferred grains have higher energy levels. Oats is occasionally used on an opportunistic basis, predominantly as a roughage source to balance with suitable higher protein feed grain inputs such as wheat. If oats is used at all in feedlot rations, it is generally better suited to feedlot starter rations. If oats is used in general rations (because price makes it profitable to do so) it is generally substituted with ingredients such as cottonseed meal comprising no more than 5 to 10 percent of the total ration. It is clear from industry surveys and expert advice that the use of oats by the feedlot industry is rare and it would not be appropriate or realistic to include a large proportion of oats in a representative feedlot ration formulation as required by the model.

The inclusion of large proportions of oats in the model feedlot ration, may have skewed projected feed grain demand away from the more common feedlot grain inputs. The Australian Lot Feeder's Association commodity usage survey further indicated that oats was not commonly used as the main ingredient in feedlot rations (ALFA, 1999).

While there appears to be considerable variation in the proportions of key grains used in feedlot rations across the industry, barley, sorghum and wheat are more commonly used grain inputs. The model appears to have substituted the use of wheat, barley and sorghum for oats due the cost differentials and the upper and lower constraints on ingredient usage assumed by the model. The estimated feed grain surpluses projected by the model are likely to be overstated for wheat, barley and sorghum. The narrowing of the upper and lower constraints on the model usage of oats in line with industry practice would guide the model to select the lowest cost ration based on a more realistic selection of feed inputs. Such an approach is likely to more accurately reflect the projected availabilities of the major feed grains used by the feedlot industry over the projection period.

4.2.6 Wheat and barley production assumptions

The Report assumes the production of feed wheat is forecast to rise by 5 percent in the BAU scenario and 36 percent in the HFS scenario between 1999 and 2004 and barley is assumed to increase by 20 percent over the same period (Hafi and Rodriguez, 2000, pg. 29). The ABARE 2001 Outlook for wheat and barley confirmed that production is expected to fall by 2.27 percent (Exhibit 9) and rise by 7.8 percent (Exhibit 10) respectively between 1999 and 2004 which suggests that the assumption settings for these grains may be revised down with the knowledge of this information.

Exhibit 9 ABARE Outlook 2001 Production Outlook for Wheat

	1999 – 2000	2000 - 2001	2001 - 2002	2002 – 2003	2003 - 2004	1999-2004 Growth
Wheat (kt)	25,012	21,168	23,306	23,773	24,458	**-2.27%**

Source: ABARE Outlook 2001

High yielding feed wheat (HYFW)

The Report estimates that the production of high yielding feed wheat will increase by 1000 percent from current estimates of 100,000 tonnes to 1,000,000 tonnes by 2004 (Hafi and Rodriguez, 2000, pg. 6). The generally conservative outlook presented for domestic livestock industry growth over the same period, the negative forecast for Australian wheat production, and the acknowledged absence of existing solid feed grain export markets for Australian feed wheat and barley may suggest that a moderating adjustment to this assumption is appropriate.

High yielding feed wheat varieties originated from European wheat varieties and have been generally planted in areas east of traditional wheat growing areas in higher rainfall zones, particularly in the south regions of NSW and

[4] In evaluating ingredient composition in beef feedlot rations, discussions were held with Dr John Doyle and Dr Matthew George who both have extensive expertise in feedlot industry nutrition and both provide nutritional services to key players in the Australian feedlot industry.

Victoria[5]. HYFW varieties are generally planted in February and harvested at the same time the next year, with higher yields than traditional wheat varieties. Historical farm level economic analysis suggests that it is possible under certain circumstances to achieve higher levels of profitability growing HYFW varieties in some non traditional growing regions. In recent years the potential of these varieties has been claimed to be overstated, principally due to the lag time associated with the emergence of a specialised feed grain industry, and the logistical problems associated with transporting wheat from non traditional growing regions to regions where grain logistics infrastructure is located. Some HYFW varieties have been found to be susceptible to stem rust which has also reduced potential adoption rates. Forecasts of future HYFW production do not exist, however with the advantage of hindsight it may be plausible that HYFW may comprise 5 percent (about 1,000,000 tonnes) of total wheat production in 10 years instead of 5 years as assumed by the Report. It may therefore be seen as reasonable that the current HFS forecast for wheat be reduced from 36 percent to 18 percent.

4.2.7 Other coarse grain production growth assumptions

The Report suggests that despite an assumed decrease in areas sown to coarse grains, total coarse grains (i.e. barley, oats, triticale, sorghum, and maize) production is assumed to increase due to increasing yields in the BAU scenario (Hafi and Rodriguez, 2000, pg. 23). The Outlook 2001 forecast for coarse grain production estimates that total area planted is expected to fall (predominantly driven by a decline in barley plantings) suggesting total production of coarse grain will remain stable between 1999 and 2004. The forecast indicates increasing production of barley (7.8%), oats (20.3%), triticale (11.7%) and maize (10.4%) and declining sorghum production (-32.5%) is likely over the same period.

Exhibit 10 Outlook 2001 Production Outlook for Coarse Grains (kt)

	1999 – 2000	2000 – 2001	2001 - 2002	2002 - 2003	2003 – 2004	1999-2004 Growth
Barley	5,043	5,596	5,893	5,330	5,434	**7.8%**
Oats	1,092	1,292	1,296	1,291	1,314	**20.3%**
Triticale	521	601	549	569	582	**11.7%**
Sorghum	2163	1423	1503	1482	1460	**-32.5%**
Maize	365	381	388	396	403	**10.4%**
Total	**9184**	**9293**	**9629**	**9068**	**9193**	**0%**

Source: ABARE Outlook 2001

4.2.8 Constraints to interregional feed grain transfers

The Report assumption that regions with feed surpluses are expected to divert feed from export markets to meet increased feed deficits in the neighbouring regions, while theoretically plausible and sensible, is less likely to occur in practice. The commitment of single desk monopolies to long term export contracts has resulted in inflated domestic prices for feed grain, as the single desk players are reluctant to release grain to domestic market users unless they can realise significant market premiums (Keaveny, pers. comm., 2001). From a modeling perspective the assumption of perfect markets and knowledge is also sensible, however in reality market knowledge and information is less than perfect which may prevent the diversion of feed surpluses to deficit regions when required.

4.3 Review of Model Projections

4.3.1 Overall feed demand projections

Compared with a strong growth in production, domestic feed usage is projected to increase by 3 percent to 7.8 million tonnes over the medium term due to "somewhat mixed future prospects for the livestock industries (Hafi and Rodriguez, 2000, pg. 6). As we now have updated information, the Report findings are likely to under estimate forecast feed grain demand due to documented changes in industry sentiment and the market environment since the

[5] Dr John Brennan, NSW Agriculture, provided advice on the potential of HYFW varieties.

publication of the Report. It is important that the drivers of growth or contraction of the intensive livestock industries be identified clearly in the determination of industry growth assumptions. The reported assumptions would assume more status if the justification for the intensive livestock industry growth assumptions had been documented in more detail, particularly for the beef and pig industries where better data are available.

4.3.2 Interregional transfers of grain and grain transport

The Report estimates nearly half the total feed usage was supplied by inter regional trade as feed deficits in some regions are met by shipments from regions in surplus, while imports supplied nearly 3 percent (Hafi and Rodriguez, 2000, pg. 6). Intensive livestock industries were also found to be the largest users of feed, where poultry accounted for 29 percent, feedlots 23 percent, pig industry 22 percent and dairy 21 percent. The generally poor information available on interregional feed grain flows does not allow for the validation of the interregional feed grain flow projections against actual feed usage in the reference year or subsequent years.

The Report recognises the importance of interregional transfer of feed grains such as WA wheat and lupins to Eastern Australia at times of reduced feed availability. With the advantage of hindsight and access to updated information, the finding that transportation of feed grain from Western Australia - Central Sandplains Region (WACS) to Central Queensland (QLDC) for the HFD and HFS scenarios appears to be less likely (although this may be possible in theory) based on opinion sought from key industry players and survey responses (refer Exhibit 3). For the HFD scenario, the assumed growth in feedlot numbers is cited as the major reason for the feed deficits in livestock producing regions of New South Wales and Queensland. It is not evident from the report which grains were transferred from WACS to QLDC or to any other region. Without further information on regional grain balances, the types of grain transferred between regions and the assumed per unit transport costs between regions, it is difficult to validate interregional transfers produced by the model at this point.

4.3.3 Feed grain export projections

The Report indicates that total feed exports are expected to increase by 41 percent to 7.2 million tonnes from the 1999 levels, 17 percent higher than the export volumes projected by 2004 in the BAU scenario. It is not possible to validate the feed grain projections as industry statistics are not sufficiently detailed to determine food/feed grain market separations. However, Exhibit 11 provides some insight into the projected exports of wheat and coarse grains, which indicate neutral and falling exports over the projection period respectively. The point to this comment is that in the absence of accurate industry statistics, it is unlikely that the Australian grains industry will experience rapid growth in feed grain exports in an environment of generally declining grain export disposals.

Exhibit 11 ABARE Outlook 2001 Export Outlook for Wheat and Coarse Grains

	1999 – 2000	2000 – 2001	2001 - 2002	2002 – 2003	2003 – 2004	1999-2004 Growth
Wheat: Domestic Use*	7,738	4,283	5,710	6,509	7,290	-5.8%
Wheat: Exports (kt)	17,274	16,885	17,596	17,264	17,168	0.61%
Coarse Grain: Domestic Use	4102	4322	4520	4832	4972	21.2%
Coarse Grain: Exports	4,488	4,209	4,488	4,193	4,102	-8.6%

Source: ABARE Outlook 2001
**Domestic use = Wheat production less wheat exports.*

4.3.4 Feed grain usage versus availability

The Report findings indicate that the concerns of feed scarcity faced by some livestock industries in Australia are expected to be eased to some extent, and the need to import feed is less likely to arise in the medium term. Due to the changed industry situation since the publication of the Report, many of the assumptions underpinning the expansion and contraction of livestock industries in the HFD and BAU scenarios over the time horizon may require some revision. In addition, the substitution of more common feedlot ration grains inputs (ie. wheat, barley and

sorghum) for cheaper less suitable grains (eg. oats) is likely to have overstated the volume of the more common feed grains available for export.

5 Recommendations

The section details the recommendations the key issues arising from this Review. Recommendations are intended to assist the project Steering Committee in delivering additional credible data to allow more informed policy decisions on feed grain supply and demand issues. The recommendations fall into three sections, namely recommendations on the revision of assumptions, revisions to methodologies and a brief final comment on the strategic direction that intensive livestock industries and the feed grains industry should take in the future to manage feed grain policy issues.

5.1 Revisions to Model Assumptions

5.1.1 Revisions to feedlot industry growth forecasts

Assumed growth in feedlot numbers are considered conservative (2.5 percent growth in feedlot numbers from 1999 – 2004) for the HFD scenario and understated for the BAU and HFS scenarios (7 percent decline in feedlot numbers from 1999 – 2004). Industry surveys indicate that feedlot growth is likely to increase between 1999 and 2004 by over 30 percent.

5.1.2 Revisions to pig industry growth forecasts

Pig numbers are assumed to increase, but industry growth assumptions are not clearly quantified by the report. It is also not evident that this assumption changes across the scenarios. It is recommended that pig industry assumptions be revised based on more concrete data and observations within the industry, via a key stakeholder survey. Survey responses from industry indicate that the pig industry would grow by 4 percent and 3 percent in the BAU and HFD scenarios respectively.

5.1.3 Minimise the use of oats in feedlot ration

It is recommended that oats be omitted or its use limited to a maximum usage of 5 percent of the total ration volume in line with industry expert opinion and industry survey outcomes methodology.

5.1.4 Feed wheat production

The production of feed wheat is forecast to rise by 5 percent in the BAU scenario and 36 percent in the HFS scenario between 1999 and 2004 and barley is assumed to increase by 20 percent over the same period. It is also assumed that high yielding feed wheat (HYFW) will increase by 1000 percent from current estimates of 100,000 tonnes to 1,000,000 tonnes by 2004. These assumptions appear to be optimistic given the generally conservative outlook presented for the domestic livestock industries over the same period, and the acknowledged absence of existing solid feed grain export markets for Australian feed wheat and barley. The adoption of HYFW is also expected to take longer than initially anticipated due to the delayed emergence of a significant specialist feed grain production sector, the lack of logistics infrastructure in non traditional wheat growing areas, and some problems with stem rust in some HYFW varieties. It is recommended that the forecast assumption for feed wheat in the HFS scenario be revised down by half from 36% to 18% based on discussions with industry. In the absence of better information, it is recommended that the assumption for feed wheat in the BAU and HFD be linked to trends in national wheat production which suggest that a modest decline of 2.3 percent is forecast between 1999 and 2004.

5.1.5 Submission of assumption changes to ABARE

All key differences in model assumptions are identified in Exhibit 12. It is recommended that assumption changes be submitted to ABARE for further consideration with a view to incorporating the revised assumptions into the model output with the intention of providing both industries with an improved appreciation of the sensitivity and dynamics of the feed grain supply and demand relationships.

Exhibit 12 Recommended revisions to model assumptions

	ABARE			Recommendation		
Assumptions	**BAU**	**HFS**	**HFD**	**BAU**	**HFS**	**HFD**
Feed Grain Supply ***						
Feed Wheat Production	5%	36%	5%	**-2.3%**	**18%**	**-2.3%**
Feed Barley Production	20%	20%	20%	**8%**	**8%**	**8%**
Animal Numbers ***						
Animal Numbers – Beef	-7%	-7%	2.5%	**32%**	**32%**	**31%**
Animal Numbers – Poultry	4%	4%	4%	**N/A**	**N/A**	**N/A**
Animal Numbers – Dairy	1%	1%	1%	**N/A**	**N/A**	**N/A**
Animal Numbers – Pigs	N/A	N/A	N/A	**4%**	**4%**	**3%**
Ration Composition						
Feedlot Ration – Percentage Oats Usage in mix	32% - 40%	39.2%*	35.9%**	**0% - 5%**	**0% - 5%**	**0% - 5%**

N/A = Not available
BAU = Business as usual, HFS – High Feed Supply, HFD = High Feed Demand
**Percent of oats in feedlot ration HFD 2004*
*** Percent of oats in ration Drought 2001*
**** Expressed as percentage change in industry growth between 1999 – 2004.*

5.2 Revisions to Methodology

The Critique found that the HFD scenario projection consisted of an increase in feedlot industry growth only. The industry livestock growth assumptions for dairy, pigs and poultry do not appear to have changed relative to the BAU and HFD scenarios. It is recommended that a HFD scenario projection is run separately for each intensive livestock industry to determine relative feed grain supply and demand impact. A consolidated projection should be run assuming a simultaneous change in industry growth assumptions for each user industry, to provide a maximum indication of feed grain demand possible.

The transportation of feed grain from Western Australia - Central Sandplains Region (WACS) to Central Queensland (QLDC) for the HFD and HFS scenarios is questionable. For the HFD scenario, the assumed growth in feedlot numbers is cited as the major reason for the feed deficits in livestock producing regions of New South Wales and Queensland (Page 31). It is not evident from the report which grains were transferred from WACS to QLDC. It is recommended that the detailed interregional feed grain flow data and the per unit transport costs be made available for further scrutiny and comment.

5.3 Final Comment

It is recommended the intensive livestock industries and the grains industry cooperatively work together to establish forward supply and demand projections that both sectors of the value chain can use for strategic and policy decision making.

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Appendix 1 People Contacted as a Part of the Project

Contact	Feedlot	Species	State
Mr Rob Backus	Goonoo Feedlot	Beef	QLD
Mr Roger Elliot	Bottletree Feedlot	Beef	QLD
Mr John Keaveny	AMH Beef City/Caroona (NSW)	Beef	QLD/NSW
Mr Methuen Morgan	Lillyvale	Beef	QLD
Mr Michael Green	Kainama	Beef	QLD
Mr Grant Carey	Sandalwood	Beef	QLD
Mr Greg Gibbons	Aronui	Beef	QLD
Mr Robin Hart	Kerwee	Beef	QLD
Mr David Brown	West Talgai	Beef	QLD
Mr Andrew Rushford	Miamba	Beef	QLD
Mr Shane Woltmann	Kewpie	Pigs	QLD
Ms Kerry Crawley	Darling Downs Bacon	Pigs	QLD
Mr Ron Munroe	Miandetta	Pigs	QLD
Mr Mike Prendergast	Qld Dairyman's Association	Dairy	QLD
Mr Simon Hall	Pine Grove (DA Hall & Co)	Beef/Pigs/Poultry	QLD
Mr Malcolm Foster	Rangers Valley Feedlot	Beef	NSW
Mr Rob Donovan	Myola Feedlot	Beef	NSW
Mr Steve Reynolds	Whyalla Feedlot	Beef	NSW
Mr Len Perry	Killara Feedlot	Beef	NSW
Mr Scott Braund	Jindalee Feedlot	Beef	NSW
Mr Peter Paradice	Rockdale Feedlot	Beef	NSW
Mr Rod Andrea	Bunge Industries	Pigs	NSW
Mr Geoff Clatworthy	Inghams	Poultry	NSW
Mr Greg Hargreaves	Baiada	Poultry	NSW
Mr Dave Mullins	Steggles	Poultry	QLD
Mr Vincent Heeran	Charlton Feedlot	Beef	VIC
Ms Jeana Lincoln	ICM Peechelba	Beef	VIC
Mr Brian Irwin	Irwin Stockfeeds	Feed Manu	VIC
Ms Leanne	Olsson Industries Pty Ltd	Beef	VIC
Mr Rob Wilson	Westons	Pigs	WA
Mr Dave Pashion	Furneys Stockfeeds (Archerfield)	Feed Manu	QLD
Mr Bob James	Mill Master feeds (Ourimbah)	Feed Manu	NSW
Ms Vivien Kite	Australian Stock feed Manufacturers Association	Feed Manu	NSW
Mr Bill Poynton	Ridley Corporation Limited	Feed Manu	VIC
Mr Rob Sewell	Australian Lotfeeders Association	Beef	NSW
Ms Kathleen Plowman	Australian Pork Limited	Pigs	NSW
Dr Garry Griffith	NSW Agriculture		NSW
Dr John Brennan	NSW Agriculture		NSW
Mr Godfrey Aranda	Australian Pork Corporation	Pigs	NSW
Mr John O'Connor	Dairy Research and Development Corporation	Dairy	VIC
Mr James Palfreeman	Rangers Valley Feedlot	Beef	NSW
Mr Jim Cudmore	Kerwee Feedlot	Beef	QLD
Mr John Allen	Pork Research and Development Corporation	Pigs	ACT
Dr John Doyle	Feedlot Nutritionist	Beef	QLD
Dr Matthew George	Feedlot Nutritionist	Beef	QLD
Mr Paul Donnelly	Dairy Research and Development Corporation	Dairy	VIC

Appendix 2 Terms of Reference

FEED DEMAND AND SUPPLY IN AUSTRALIA

TERMS OF REFERENCE

THE CONSULTANCY SERVICES

BACKGROUND

In May 2000, ABARE, on behalf of GRDC and GCA released a report titled "Projection of regional feed demand and supply in Australia". The report is being used by the grains industry to support its policies in the grain security area and may potentially be used by Government in the determination of its policy in this area as well.

An inaccurate representation of the feed grain supply and demand situation has serious implications for the intensive livestock industries; and may be prejudicial to their ability to ensure they have access to an assured supply of grain at internationally competitive price, into the future. There may also be major implications for further expansion of the intensive livestock industries on a regional basis.

The intensive livestock industries have requested that the findings of this study be further investigated, as there are indications that there are errors in both the scenario analyses on which the study is based and the methodologies employed.

For these reasons, it is important that the findings contained in this report are reviewed and any inaccuracies rectified.

OBJECTIVES

The objective of this project is to:

1. Provide a constructive critique of the ABARE report titled "Projection of regional feed demand and supply in Australia"; with particular reference to its ability to address the requirement of the intensive livestock industries to have access to a secure source of grain at internationally competitive prices at the point of usage.
2. Provide an evaluation of the ABARE regional feed market model, on which the report is based, particularly its ability to handle the effect of supply price elasticity on demand.
3. Establish the accuracy of the findings of the report, and provide alternative corrected findings where required; and,
4. Provide recommendations on actions required to address any identified deficiencies in:

a. the underlying assumptions on which the ABARE model operates
b. the methodologies employed in the modelling process;
c. the scenario analyses employed; and,
d. the results presented in the report.

REQUIREMENTS UNDER THE CONSULTANCY

Scope and Methodology

This study will provide the intensive livestock industries with an indication of the accuracy of the report's findings and identify means by which any identified inaccuracies can be addressed, enabling industry to correctly assess the implications of regional grain supply and demand on the security of feedstuff availability in the future.

The issues that the consultant will address will include, but not be limited to the following points:

Any deficiency of the report to address the issue of regional availability of grains to the intensive livestock industries at an internationally competitive price at the point of usage.
Evaluation of the ABARE regional feed market model, with particular reference to the limitations of the criteria and inputs on which the model is based.
Recommended actions to address any shortfalls in the report and/or the model.

In addition to the critique of the ABARE report and underpinning model, an alternative assessment of the regional supply and demand for feed grains, based on the outputs of other models that the consultant has access to (if these exist), would be advantageous as a basis for comparison.

Project Management

This project is a component of the MLA Feedlot Program, which has an 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.

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 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.

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.

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 the end of December 2000. An elapse time of 2 months to complete the project is envisaged with the Final Report being delivered to MLA by 28 February 2001.

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 full review 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 as Annex A.

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.

Appendix 3 Summary of ABARE's Key Model Assumptions and Projections

	BAU	HFS	HFD
Estimated Feed Supply and disposal			
Feed Production p.26	10%	18%	10%
Feed Usage p.26	3%	3%	6%
Feed Export availabilities p.26	21%	41%	18%
Feed Volume of inter-regional trade p.26	3.6%	-9.6%	7%
Estimated Feed Wheat Supply and disposal			
Feed Wheat Production p.29	5%	36%	5%
Feed Wheat Usage p.29	2%	53%	6%
Feed Wheat Export Availability p.29	9%	19%	4%
Volume of Inter-Regional Trade p.29	7%	16%	25%
Estimated Feed Barley Supply and disposal			
Feed Barley Production p47-50	20%	20%	20%
Feed Barley Usage p.47-50	15%	4%	16%
Feed barely export availability p.47-50	24%	34%	23%
Feed Demand-Beef Feedlot			
Animal Numbers p.7	-7%	-7%	2.5%
Feed Usage p.32	-7%	-7%	2.5%
Feed Demand-Pigs			
Animal Numbers p.23	"Domestic pig meat production is assumed to increase over the medium term due to an expected increase in the slaughter weight of pigs...Pig industry restructuring is assumed to continue with a further fall in the number of pig producers and an increase in the average size of pig operations. Pig Numbers are assumed to increase"		
Feed Usage-Slaughter Pigs p.32	8.71%	7.37%	8.55%
Feed Usage-Sows p.32	-2.34%	-3.13%	-2.34%
Feed Demand – Chickens			
Animals Numbers p.23	4%	4%	4%
Feed Usage-Broilers p.32	15.85%	15.40%	16.02%
Feed Usage-Layers p.32	-2.07%	-3.11%	-0.78%
Feed Demand – Dairy			
Animal Numbers p.23	1%	1%	1%
Feed Usage p.32	0.82%	0.57%	1.33%
Feed Demand – Sheep			
Animal Numbers p.6	"sheep numbers decline because of expected lower returns for wool and higher returns for crops"		
Feed Usage p.32	0%	0%	0%

Source: ABARE

Assumptions
Projections

Appendix 4 Analysis of Survey Responses

Ranking of feed attributes: Cattle and Pigs

Ranking of Feed Grain Attributes for Beef and Pig Industries

	Beef	Pigs	Total
Metabolisable energy	1	2	**1**
Feed digestibility	2	1	**2**
Protein content	3	4	**3**
Fibre quality	4	5	**4**
Oil content	5	6	**5**
Amino acid profile	6	3	**6**
Sample Size	**19**	**4**	**23**

Source: MLA Feed Grains Survey, 2001

Feed Grain Purchase Options

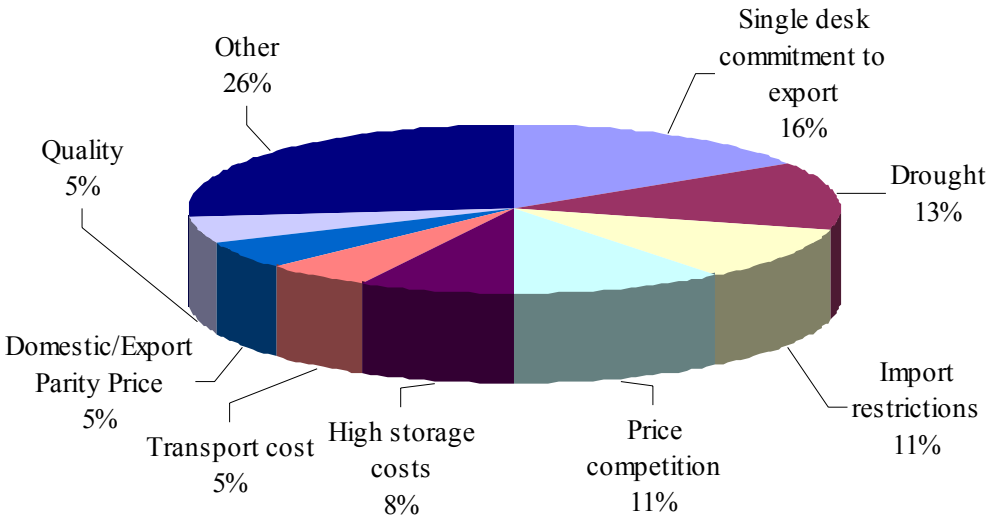
Ranking of Feed Grain Purchase Options

Grain Purchase Method	Ranking
Private Negotiation	**1**
Grain merchants	**2**
Grain trading houses	**3**
Spot buy	**4**
Grain Futures	**5**
Sample Size	**25**

Source: MLA Feed Grains Survey, 2001

Constraints to feed grain supply

Constraints to Feed Grain Supply Issues



Source: MLA Feed Grains Survey, 2001

Appendix 5 Survey Template

MLA Feed Grains Review
Industry Feed Grains Survey

Question 1 Business details

Name:_____

Address:_____

_____

Contact Ph:_____

Please nominate your main business activity and industry serviced by placing a tick in the appropriate box?

Business Activity		Industry	
Livestock Producer/Grower:	☐	Chicken	☐
Feedlot:	☐	Beef Cattle	☐
Feedmill:	☐	Pigs	☐
Feed Wholesaler/Retailer:	☐	Dairy	☐
Other:_____	☐	Aquaculture	☐
		Other:_____	☐

Question 2 Business scale

Please enter the actual level of feed used (tonnes) in ± 1999 and forecast change (expressed as a percentage) in usage by the year 2004? If you operate a livestock enterprise, please also enter actual livestock throughput and forecast change in livestock throughput in 2004?

Parameter	Financial Year ended June 30	
	Actual	Forecast
	1999	2004
Feed usage	(tonnes)	± (% change)
Wheat		
Barley		
Sorghum		
Oats		
Triticale		
Maize		
Lupins		
Peas		
Faba beans		
Millmix		
Rice pollard		
Canola meal		
Soymeal		
Sunflower meal		
Cottonseed		
Cottonseed meal		
Other		
	(head)	± (% change)
Livestock Turnoff (head)		

Question 3 Ranking of feed grain attributes

Please rank the following grain attributes in order of importance (1 = Low, 2 = Medium, 3 = High) to your business.

	Ranking	Other Comments
Protein content		
Amino acid profile		
Feed digestibility		
Fibre quality		
Metabolisable energy		
Oil content		
Other:_____		

Question 4 Method of feed grain purchase

Please rank (1 = Low, 2 = Medium, 3 = High) the following grain purchasing strategies based on the most frequently used.

Grain Purchasing Method	Ranking
Spot buy	
Grain futures	
Private Negotiation	
Grain merchants	
Grain trading houses	
Other:_____	

Other Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Question 5 Constraints to feed grain supply

Please list and describe the most significant constraints to securing access to a source of grain at internationally competitive prices at the point of usage for intensive livestock industries?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Question 6 Grain usage estimates

The ABARE Report "Projection of regional feed demand and supply in Australia" presented projections across 4 scenarios "High Feed Supply (HFS)", "Business as Usual (BAU)", "High Feed Demand (HFD)" and "Drought (D)". Please nominate the most likely changes in feed usage (expressed as a percentage change between 1999 to 2004) across the BAU, HFD and D scenarios for the feed inputs listed?

	BAU	HFD	Drought
	1999 – 2004	1999 – 2004	1999 – 2004
Feed usage			
Wheat			
Barley			
Sorghum			
Oats			
Triticale			
Maize			
Lupins			
Peas			
Faba beans			
Millmix			
Rice pollard			
Canola meal			
Soymeal			
Sunflower meal			
Cottonseed			
Cottonseed meal			
Other			
Livestock Numbers			
Feedlot			
Chicken			
Pigs			
Dairy			
BAU = Business as Usual			
HFD = High Feed Demand			

Question 7 High yielding feed wheat

Have you used High yielding feed wheat (HYFW)? Please describe and demonstrated differences compared with conventional wheat varieties?

Question 8 Grain substitutability

Do you regularly substitute grains into rations with similar nutritional characteristics in order to optimise ration costs? If so, please identify the feed grain substitutes most commonly used for each livestock type your business services?

Question 9 Grain transport

Estimate the minimum, average and maximum distances from your place of business, to key grain production source regions assuming a "business as usual" scenario. Average distances are likely to differ depending on the type of feed input required, price and season. You can either enter a general answer (1) where estimates can be provided across all feed grains used, or a more specific answer (2), where transport distances can be provided for each feed input listed.

	Transport Distance		
	Minimum	Average	Maximum
1. General			
2. Feed Grain			
Wheat			
Barley			
Sorghum			
Oats			
Triticale			
Maize			
Lupins			
Other			

Other comments

Please list any further comments you wish to disclose?

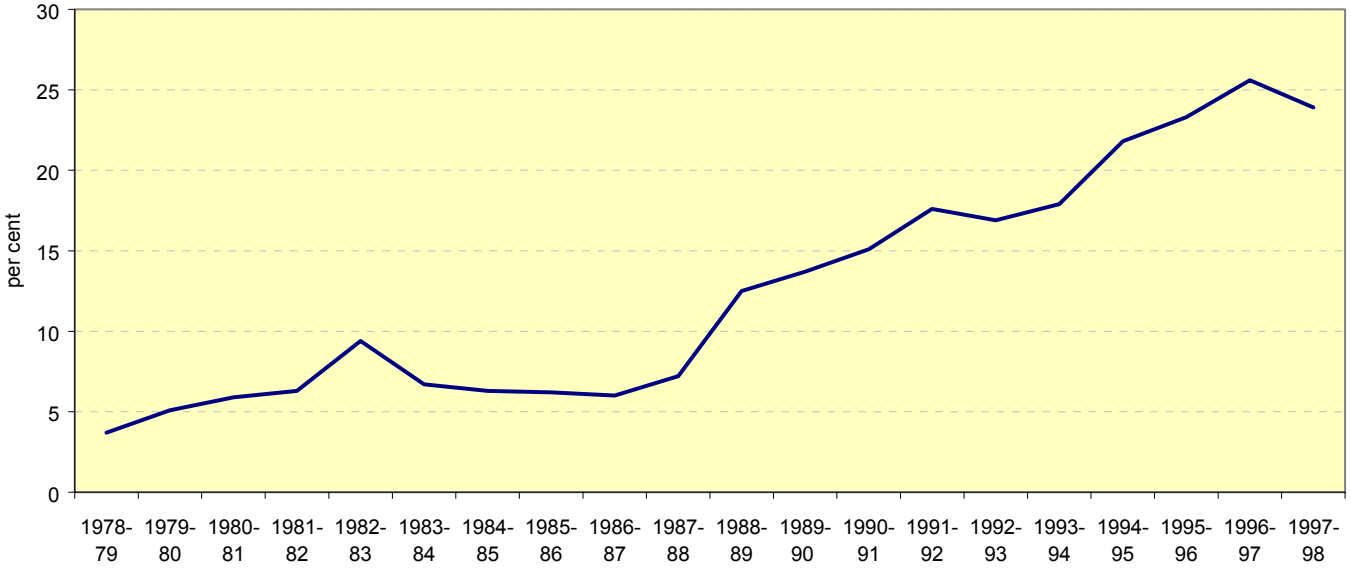
END OF SURVEY

The valuable information you have provided will assist intensive livestock industries better understand feed grain sourcing, usage patterns and decision making processes.

PLEASE SEND BY FAX TO
MACARTHUR AGRIBUSINESS
FAX: (07) 3832 7298

Appendix 6 Feed grain relationships in the Dairy Industry

Proportion of costs accounted for by fodder purchases



Prices for Feed Wheat, Dairy Land and Superphosphate