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AGRICULTURE AND THE WESTERN  
AUSTRALIAN ECONOMY:  
VALUE ADDED CONTRIBUTION OF  
AGRICULTURAL COMMODITIES



**Nazrul Islam**  
Office of Policy and Planning





# **AGRICULTURE AND THE WESTERN AUSTRALIAN ECONOMY: VALUE ADDED CONTRIBUTION OF AGRICULTURAL COMMODITIES**

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ISBN 073070033X

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December 1997

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## ACKNOWLEDGEMENTS

This study is the output of the project 'Value Chain Modelling', supported by Agriculture Western Australia's Office of Policy and Planning. The principal acknowledgment is to Ken Moore, Executive Director, Office of Policy and Planning, for his initiative, encouragement and support in completing the study.

Sincere gratitude and thanks to Ian Longson, Executive Director, Program Coordination; and to Industry Program Managers, Steve Trevenen, Rob Delane, Renata Paliskis-Bessell, Terry Hill, Geoff de Chaneet and Rob Kelly for their enthusiastic support by mobilising manpower and resources for the successful conduct of industry value added workshops. Special thanks to the workshop participants who provided useful information during the development phase of their respective industry models.

Assistance from Bradley Plunkett and Oliver Maponga significantly helped in rapid development of the industry models. Graham Annan has helped a lot by providing industry statistics. Their sincere contributions are thankfully acknowledged.

Grateful acknowledgments are also due to George Olney, Ed O'Loughlin, Peter Coyle, Andrew Bathgate, and Doug Durack for their critical comments on earlier drafts.

Many more individuals both from within and outside the agency, provided assistance during different phases of the project. All of their contributions are gratefully acknowledged.





## EXECUTIVE SUMMARY

### Background

The identification and assessment of the value adding potential of commodities and industries is an important factor in strategic planning and resource allocation. While national and state statistics on 'value added' components are available at aggregated levels, there have been no statistics available at the disaggregated commodity level.

In 1996, a project was undertaken to develop 'value chain' models to estimate the value added component of major agricultural commodities in Western Australia. Using data on production, processing and marketing for 1994/95, the value added component and value adding potential of major Western Australian agricultural industries were estimated.

The value chain model helps to quantify the relative contribution of major agricultural industries to State and regional economies. The models can also help to identify constraints to, and potential for, increased value adding from the research and development activities of Agriculture Western Australia.

This report presents an overview of the value adding components of Western Australian 'agri-industry' for 1994/95 and analyses the potential for further value adding.

By way of definition, the term 'agri-industry' refers to both farm and non-farm sectors (such as manufacturing, wholesale, retail, export and so on which are linked to the farm sector in terms of the flow of goods and services). The term 'value added' refers to the difference between the gross value of production and the value of materials and services used in production. There is a difference between what is referred to as the 'farm value added' (FVA) component and the gross value of agricultural production (GVAP). The former indicates the farming sector's contribution to the State or national income; the latter is the gross income of the farming sector.

### Recommendations

The GVAP of an industry does not necessarily reflect its importance to the economy compared with other agricultural and non-agricultural industries. The importance and potential of industries can be assessed in many different ways. For example, if the importance of an industry is assessed from:

- the relative size of gross farm income, GVAP is the measure;
- the farm sector's contribution to the State, FVA is the measure;
- the contribution to the State of agricultural-based non-farm sectors, the post-farm value added measure should be used;
- the contribution to the State of all sectors, the total value added measure should be used; and
- the total value at the point of final sale (i.e. domestic sale and exports), the gross value of final products can be used.

It is recommended that a combination of these measures be used to assess the relative importance of an industry. However, given the State Government's emphasis on promoting post-farm value adding, it is useful to measure the relative importance of an industry in terms of its post-farm value added component per unit of its farm value added component. This measure indicates the degree to which non-farm sectors of different industries contribute to the State income per dollar of the farm sector's contribution. The measure provides a common denominator against which to compare industries and helps to identify industries with greater potential for value adding.

The value adding potential of an industry depends on production and processing, output prices, input costs and domestic and export market conditions. It is difficult to make conclusions about the value adding potential of an industry unless a detailed analysis of these factors is undertaken.

It is recommended that Agriculture Western Australia's individual industry programs undertake such detailed studies by updating and utilising the individual commodity value chain models.

## Process

Industry value chain models were developed for 18 major commodities under Agriculture Western Australia's program areas of Cereals, Pulses and Oilseeds, Meat and Other Animal Products, Horticulture, Dairy and Apiculture and Wool (models could not be developed for commodities under the agency's New Industries program because of the inadequacy of data).

The analysis was carried out in three steps:

- Using 1994/95 data from different sources (including Australian Bureau of Statistics - ABS) links in the flow of goods and services were established and the value added component for industries estimated.
- Using these links and the five-year strategic plans developed by Agriculture Western Australia's industry programs, key assumptions were made on the expected value added growth in year 2000.
- Using some statistics on the present levels of industry production, processing and marketing, future potential for value adding was explored.

The results encompass more than 90 per cent of Western Australia's agri-industry, working with major commodities with a GVAP of \$3.5 billion (compared with the total GVAP for Western Australia in 1994/95 of \$3.9 billion).

## Major findings

From the commodities modelled, the total value added component was estimated at \$3.8 billion. Of this, the farm value added component was \$1.8 billion and the post farm value added component was \$2.0 billion. In other words, the farm sector added \$1.8 billion to the economy and the agriculture dependent non-farm sectors added another \$2.0 billion.

The validity of the results was verified by comparing the estimated farm value added component of \$1.8 billion to the ABS published value added figure of \$2.2 billion in the same year for the combined Western Australian agriculture, forestry and fishing industries. The difference can be attributed to the forestry and fishing industry components and the model estimates appear to be consistent.

A comparison of industries in terms of their total value added component and their GVAP leads to a significant shift in industry ranking:

- **In terms of GVAP**, cereals is the most important industry with a GVAP of \$1.6 billion or about 40 per cent of total GVAP, followed by wool (21 per cent) and meat (17 per cent).
- **In terms of the total value added component**, the meat industry is the most important with a total value added component estimated at \$1.5 billion or 40 per cent of the State's total value added component. The distribution of the post-farm value added component and total agri-industry value added component indicates that the meat-based non-farming sectors add more income to the Western Australian economy than any other agriculture based non-farming sectors. The cereals industry was ranked second at 29 per cent (although only about four per cent of cereal grains are processed, the size of the industry ensures its post-farm value added contribution remained bigger when export and marketing margins are taken into account); with wool (12 per cent) third.
- **In terms of the post-farm value added component per dollar of the farm value added component**, the highest contributors were the horticulture based non-farm sectors. In other words, while the farming sector of the horticulture industry adds \$1.00, the non-farming sector (based on horticultural commodities) adds another \$3.36 to the Western Australian economy. In contrast, the cereals-dependent non-farm sector adds only \$0.32 to the economy. From this point of view, the meat industry became the second most important industry with dairy third.

The overall results show that for every \$1.00 added by the farming sector another \$1.08 is added by the agricultural dependent non-farm sectors to the economy.

## 1999/2000 projections

The value added component can be expected to increase by about \$1.0 billion or about 21 per cent over the five-year strategic plan period of Agriculture Western Australia's industry programs - an annual increase of about four per cent. This increase is attributable to the research and development activities of the agency.

Other projections include:

- The total post-farm value added component is expected to increase by about 22 per cent, marginally higher than the total farm value added component (20 per cent).
- Inter-industry comparisons indicate the pulses and oilseeds industry total value added component is expected to increase by 57 per cent; horticulture is expected to increase by 46 per cent; and dairy 32 per cent.
- Comparison between farm and post-farm value added components indicates that a proportionately higher post-farm figure (50 per cent) is expected to accrue from the horticulture industry.
- For the meat industry, although the share of the post-farm value added component (\$1.3 billion) to the total value added component (\$1.8 billion) remains very high, the percentage change in the post farm value added component appears remarkably lower (16 per cent) than the farm value added component (28 per cent).
- For the wool industry, proportionate changes in the total, farm and post-farm value added components are expected to remain the same (14 per cent).

Comparison of the total value added component for 1994/95 and 2000, reveals that the relative position of industries in terms of their value added share remains more or less the same. However, the share of the total value added component has increased significantly for horticulture (from nine per cent to 18 per cent) and pulses and oilseeds (from four per cent to 11 per cent).

In terms of the post-farm value added component per dollar of the farm value added component, the relative rankings of industries remain the same. The degree of the post-farm value added component in general is expected to decline for all industries with the exception of horticulture. In absolute terms, both the farm and non-farm value added components have increased, but in relative terms the share of the post-farm value added component compared to the farm value added component have not increased.

The implication of these results is that current strategies aimed at achieving relatively more post-farm value adding from a dollar worth of farm value adding may have to be reviewed.

## Value adding potential

The value adding potential of industries has been assessed by applying the study results to an analysis of statistics on the proportion of production, processing and exports of major commodities. The analytical outcomes of this assessment are indicative only.

### Cereals

A very small proportion (only about two per cent) of product from the State's cereal industry is processed and exported. The present ratio of the level of farm to post-farm value added components is 1:0.32.



Given the size of the industry and the fact that only a small proportion of product is processed for export, the findings confirm that there is a tremendous opportunity for post-farm value adding. The industry can add an extra \$1.0 billion to the economy even without any change in existing processing technology and marketing systems.

### **Pulses and oilseeds**

The pulses and oilseeds industry appears to have significant potential for post farm value adding by increased processing and exports. According to strategic plan assumptions, a 57 per cent increase in the industry's value added capacity is expected to be generated from an increase in farm production alone. If a greater proportion of the farm produce is processed and exported the industry is likely to add significant amount of income to the State economy. A conservative estimate suggests that the pulses and oilseeds industry can add an extra \$33 million to the State economy if all the present farm production (except that part of the crop used on-farm) was all processed prior to trading using present technologies and systems.

### **Meat and other animal products**

The animal meat dependent non-farm sectors are the greatest value adding contributors to the State economy because most products are processed and traded domestically. The potential value adding capacity of this industry is likely to come from increased processed meat exports, particularly in the pig and chicken meat sectors.

### **Horticulture**

Although the ratio of farm to post-farm value added components of the horticultural industries was found to be 1:3.7, a very small proportion of the industry's commodities are processed, with the exception of potatoes and wine grapes. The reason for this higher post-farm value added component is mostly due to the contribution of these two industries. Wine grapes are processed and wine is exported at a higher export margins, and also sold at higher mark-up prices in the domestic market. In general terms, the value added potential for horticultural industries lies in an expansion of the area farmed, leading to an increase in the volume of production and increased exports.

### **Dairy and apiculture**

All milk (including white market milk) produced in Western Australia is processed and only nine per cent is currently exported already processed. For each litre of milk, the non-farm sector adds twice as much as the farm sector. Because the dairy industry's market (white) milk component operates in a regulated domestic market, further value adding opportunities are likely to depend on the degree of milk market deregulation and increases in the production and export of processed milk.

### **Wool**

The present value added ratio between the farm and non-farm sectors in the wool industry is only 1:0.4 (the second lowest of all industry sectors). In the foreseeable future the State's wool industry will continue to depend on the export of 75 per cent greasy and 25 per cent scoured wool. The current poor world market for wool, the

results of the value adding assessment and the industry's planned strategic outcomes confirm two alternatives to increase the wool industry's contribution to the Western Australian economy - the development of lower-cost farm production technology and continued improvement in wool quality to encourage higher prices for the product.

## I INTRODUCTION

Western Australian producers need to respond to the challenge of meeting the demands for higher quality products at competitive prices and increased competition in volatile markets. To become more competitive internationally, Western Australian agricultural commodities need to develop their value added potential either by quality improvement in primary farm production or by processing and manufacturing before they are exported. Value adding can also replace imports and benefit the WA economy in many ways. A 1992 study revealed that of those Australian farm industries which export, more than 60% of output volume is exported in the identical physical form in which it left the farm gate (McKerrow, 1992). It is therefore important for WA agri-industry to identify commodities and industries that have most potential for value adding.

While national and State statistics on industry value added components are available at aggregated levels, statistics for disaggregated commodity levels are not available. In 1996, a project was undertaken to develop 'value chain' models for major agricultural commodities in Western Australia. The purpose of the project was to estimate value added components of major agricultural commodities, identify commodities and industries with potential for value adding and to determine their relative importance to the State economy. With the 1994/95 data on production, processing and marketing, the value added components for most of major agricultural industries in the State were estimated.

### 1.1 Basic definitions

In this study the term 'agri-industry' refers to both farm and non-farm sectors, such as manufacturing, wholesale, retail export and so on which are linked to the farm sector in terms of the flow of goods and services. The term 'value added' refers to the difference between the gross value of production and the value of materials and services used in production (ABS, 1994). Therefore, both the farm and non-farm sectors have value added components. There is a difference between what is referred to as the 'farm value added' (FAV) component and the gross value of agricultural production (GVAP). The GVAP is the gross value of production at the farm gate and FVA is GVAP *less* value of materials and services used in farm production. The *sum* of all the non-farm sectors' value added components is termed as 'post-farm' value added (a more elaborate definition is given in Appendix 1.1).

Industry value chain models have been developed on the basis of the industry programs within Agriculture Western Australia. These programs are: Cereals; Pulses and Oilseeds; Meat and Other Animal Products; Horticulture; Dairy and Apiculture; and Wool. Models could not be developed for commodities under the agency's New Industry program because of the lack of data.

In this report, the estimated value added components of the major agricultural commodities and their overall benefits to the State's economy are presented. Industries with potential for increasing their value added component are also identified, based on the five year strategic plans for the agency's industry programs.

The report is organised into five chapters. In Chapter 2, the concepts and usage of a value chain model is briefly introduced. The basic construction of the model, data sources and methods are also described in this chapter. Overall value added results are discussed in Chapter 3 and in Chapter 4 planned industry strategies are simulated and industries with potential growth in value adding are identified. The report's recommendations are in Chapter 5.

## II THE VALUE CHAIN MODEL

### 2.1 Concepts and usage

The industry value chain model<sup>1</sup> is based on the principles of regional economic modelling (Islam 1995a). It gives a detailed physical and financial description of each industry's production, processing and marketing sectors (including exports and imports of goods and services). This provides detailed understanding of:

- how one part of the industry interrelates with all other parts of the industry;
- the levels of costs and incomes throughout the industry; and
- the contribution of each part of the industry to total industry output.

It is developed in computer spreadsheets and structured to illustrate the product and financial flows which occur throughout the industry. It provides an overview of the industry and the linkages between the industry and other parts of the economy.

The value chain model also specifies product-related information for each sector of the industry including farms, wholesalers, retailers and exporters. The type of product-related information includes:

- the stage of product conversion or transformation;
- the nature and quantity of products (i.e. raw materials) brought forward from previous stages of processing;
- materials and services brought into the chain from outside the industry; and
- the nature and quantity of products which progress to the next stage of processing, or to consumers.

Each physical input or output of an industry is linked directly to price. In this way the model also specifies financial information for each sector in the industry, including:

- the value of products brought forward from previous processing stages;
- the cost of materials and services purchased from outside the chain;
- income accrued at each stage from sales of products;
- transport, storage and handling costs incurred in moving products between processing stages; and
- the difference between total income earned and the total cost of inputs purchased, which in economic terms is value added (Appendix 1.1).

By describing these linkages the model shows the contribution of production, processing and marketing activities to the State, regional or industry economies.

---

<sup>1</sup> The value chain concept used in this study was developed on the concept used by the Meat Research Corporation (MRC, 1993). Conceptually this model is also similar to the concept developed by Porter (1985). Porter's model is relevant to an individual firm or company whereas this model is applicable to an industry or region.

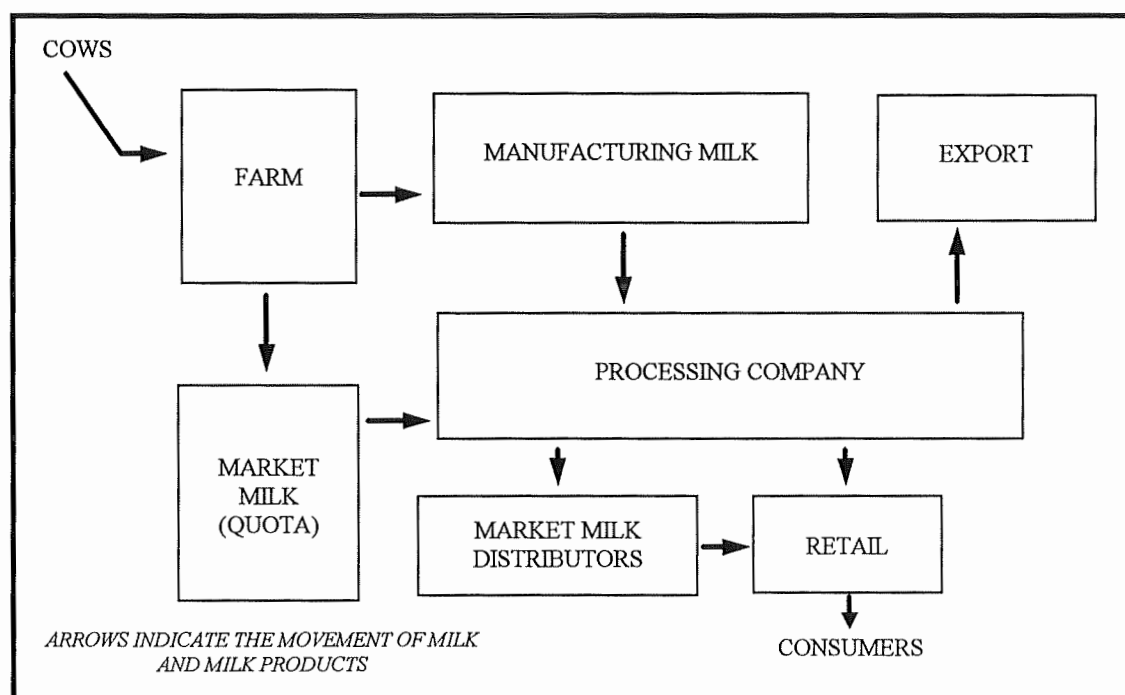


In short, the primary purpose of value chain modelling is to estimate value added components and quantify the relative contribution of an industry to the economy. Models help to identify constraints to, and potential for value adding, from research and development.

## 2.2 Structure of the model

An industry model is constructed by delineating the boundary of the industry first and then by identifying the chain of value adding stages of the industry. The value chain describes the linkages by which farm produce is used as intermediate inputs to produce different products for consumption and export. The structure is broadly divided into two components, farm and non-farm. The non-farm component is divided into several sectors depending on the number of product transformation stages, analytical requirements and availability of data. Figure 2.1 is an example of the flow diagram of the WA dairy industry value chain model. Each box in the diagram is considered as a value adding sector of the dairy industry. Flow diagrams for each of the industry models are given in Appendices A to F.

**FIGURE 2.1**  
**THE WESTERN AUSTRALIAN DAIRY INDUSTRY VALUE CHAIN**

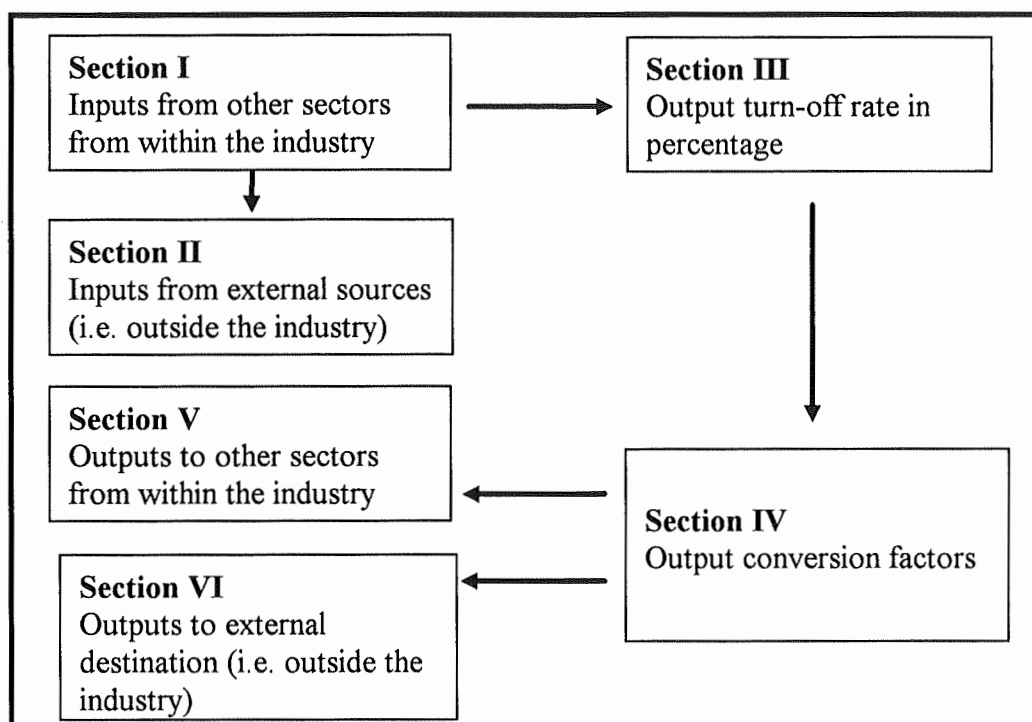


An industry's value added component is calculated by creating an accounting table for each of the identified sectors in a computer spreadsheet. In Figure 2.2, an overview of a spreadsheet structure of such an accounting table is presented. Each of these accounting tables is composed of six sections.

With the exception of the farm sector, Section I of the table includes the types and quantity of intermediate products bought from previous stages of production sectors from within the industry. For the farm sector, Section I includes type and quantity of farm production data.

Section II (inputs from external sources) includes the quantity and price of inputs used from outside the industry to produce or process the quantity of primary or intermediate products in Section I. These include wages, salaries, services, taxes, rents, and interest.

**FIGURE 2.2**  
**THE STRUCTURE OF A VALUE ADDED SPREADSHEET**



Section I is linked with Section II by the flow of quantity of primary product produced or the intermediate products purchased in Section I.

Section III includes the turn-off percentage and the proportion of the primary or the intermediate products listed in Section I, which is converted/processed into different types of intermediate and final products.

Section IV includes output conversion factors, which gives technical information about the rate of requirement of inputs listed in Section I to produce products listed in Sections V and VI (for example, how much raw milk is needed to produce one kilogram of butter and other milk products).

Section V (output to other sectors) includes types, quantities, prices and values of intermediate products produced in this sector. For example, the quantity, price and value of cheese, butter, flavoured milk and so on produced by the processing sector and will move to the packaging sector, are listed in Section V.

Section VI includes quantities, prices and values of products, which are transformed from the primary/intermediate products listed in Section I, and go out of the industry as final products. For example, if some quantities of cheese, butter etc. produced in the milk processing sector, and directly sold to consumers are listed in this section. Other products which will not be processed or transformed further are also listed here.

A proportion of the outputs produced in Section V of a sector flow to Section I of subsequent sectors of the industry as input. Therefore, Section V of the previous sector establishes link with the Section I of subsequent sectors.

### 2.3 Data sources and methods

The industry value added component is estimated by relying on information gathered from various sources (see Appendix 1.2), mainly the Australian Bureau of Statistics. Other sources included discussions with agency officers and economists, and workshops with people who have experience in particular industries. A list of workshops and their participants is presented in Appendix 1.3.

In calculating the value added component, the starting sector is usually the farm or growing sector. The output of the farming sector is either a final product that flows directly to the consumer, or an intermediate product which goes to other sectors as an input for further value adding or out of the industry. As mentioned in Section 2.2 the essential factors in the estimations are prices and quantities of inputs and outputs. For a growing sector, data on the price and quantity of products sold are mostly available from ABS publications. The prices at which growers sell their products become the costs to the sectors which buy them for processing. As these prices and cost estimates are generally available, they are often used in subsequent sectors as the basis for estimating other cost items, profits and value added components.

The detailed cost data required to estimate value adding in each part of the value chain, particularly for non-farm sectors, was not always readily available. In such cases, costs and returns were estimated based on extrapolations from other similar industries, or taking expert opinion from the participants of the respective industry workshops. Where data on costs and prices of different input and output items were not available the following steps and assumptions were made across all sectors to estimate profit and cost.

1. As a measure of profit 7.8% is deducted from the price that the sector sells its goods onto another sector. The rate of 7.8% is chosen so that after deducting company tax of 36% from it, a return of 5% accrues on a sector's annual expenditure. A return of 5% upon annual expenditure is chosen because it is assumed that the sector concerned is reasonably competitive and so may be thought of as making the same long run return as government bonds.
2. The profit per unit of product is deducted from the sector's final selling price, to give the total cost per unit. From total cost the sum of the price(s) of the input(s) from other sectors are deducted. The remaining portion of total cost is distributed between costs arising from inputs from external sources.
  - The cost of interest is assumed to be 7.5% of total costs.
  - The cost of rent is assumed to be 2% of total costs.
  - The cost of labour is assumed to be 50% of the costs arising from inputs from external sources.
3. Other costs are treated as a residual and are distributed as further cost structure information becomes available.

### III MODEL RESULTS

#### 3.1 Industry value added

The value chain model database was developed on the basis of six industry programs within Agriculture Western Australia. In each industry there is more than one commodity. Compositions of industry specific models are given briefly in Appendices A to F. The program specific commodity results are also briefly presented in these appendices.

The gross value of agricultural products (GVAP) and the value added results for all industry programs are presented in Table 3.1. The total GVAP for WA was \$3.9 billion and the GVAP for the major commodities taken for value chain modelling was \$3.5 billion (ABS 1996). From 67 to 100 per cent of the GVAP values have been covered by the selected commodities used to estimate industry value added components. The overall coverage was more than 90 per cent. Therefore, the value added estimates represent about 90 per cent of the GVAP of Western Australian farm produce in that year.

**TABLE 3.1**  
**WESTERN AUSTRALIAN AGRI-INDUSTRY VALUES**

Industry programs	1994/95						
	GVAP (\$'000)	GVAP of modelled commodities	C as % of B	Post farm value added (\$'000)	Farm value added (\$'000)	Total value added (\$'000)	Post farm value added per dollar of farm value added (\$)
A	B	C	D	E	F	G	H
1. Cereals	1,550,078	1,544,900	99.7	267,704	824,407	1,092,112	0.32
2. Pulses and Oilseeds	228,845	216,600	94.7	65,730	78,907	144,636	0.83
3. Meat	672,240	654,322	97.3	1,111,369	421,619	1,532,988	2.64
4. Horticulture	208,343	140,473	67.4	252,174	74,913	327,088	3.37
5. Dairy	126,200	126,200	100.0	152,763	72,627	225,390	2.10
6. Wool	811,200	811,200	100.0	137,609	329,738	482,775	0.40
7. Others (not modelled)	264,463	-	-	-	-	-	-
<b>WA Total</b>	<b>3,861,369</b>	<b>3,547,322</b>	<b>90.5</b>	<b>1,987,347</b>	<b>1,817,640</b>	<b>3,804,987</b>	<b>1.09</b>

The results in Table 3.1 give an understanding of how the price paid by the consumer is shared between the farming and non-farming sectors.

The results show that the total WA farm value added component was \$1.8 billion. According to ABS (1996) the value added component for 1994/95 was \$2.2 billion for the combined Western Australian agriculture, forestry and fishing industries. Because difference can be attributed to the forestry and fishing industries, the model's estimates appear to be consistent.

On the other hand, the total WA post-farm value added component was estimated at \$2.0 billion. The sum of the farm (\$1.8b) and post-farm (\$2.0b) value added components gave rise to a total of \$3.8 billion value adding for the WA agri-industry. The result could be interpreted as that WA the farm sector have added \$1.8 billion and agriculture dependent non-farm sectors in WA have added another \$2.0 billion. Therefore, the agri-industry as a whole has added \$3.8 billion to the economy.

### 3.2 Comparison of industry performance

GVAP of an agriculture industry is often used to determine its importance compared to other agriculture industries. However, to determine the relative importance of an agricultural industry compared to all other sectors of the economy, GVAP is not the best measure. Instead, the industry value added component is a better reflection of an industry's contribution to the economy. The value added component for a WA industry is equivalent to the Gross State Product (GSP) of that industry. Figure 3.1 demonstrates the relative importance of an industry changes when its value is measured in GVAP, post-farm, farm and in total value added terms.

In terms of GVAP in Chart 3.1(a), the cereals industry appeared to be the most important. Its GVAP was estimated to be \$1.5 billion which is about 40 per cent of the total GVAP. The second most important industry was wool (21%), with meat third (17%).

However, in terms of the total value added component in Chart 3.1(d), the meat industry is the most important. Its total value added component was estimated at \$1.5 billion which is 38% of the total value added component. The cereals industry is the second (26%) and wool the third (11%) most important industries.

It is important to note that Chart 3.1(a) and 3.1(d) are not comparable because their industry boundaries and measures are different. In Chart 3.1(a) industry importance is measured in terms of gross farm income whereas in Chart 3.1(d) the importance is measured in terms of farm and agriculture based non-farm sectors' combined contribution to the State income.

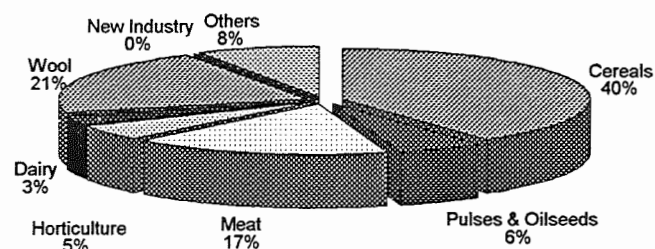
However, Charts 3.1(a) and 3.1(c) are comparable because the boundary for industry is the same (i.e. the farm sector) except that their measures are different. In Chart 3.1(c), the farm sector's contribution to the State income is measured. In this measure the importance between meat (21%) and wool (17%) is inter-changed. This shift in importance from the viewpoint of wool producing farms, is perhaps either due to relatively higher cost of purchased inputs, or lower wool price, or both. For the cereals industry the importance remained the same as in Chart 3.1(a).



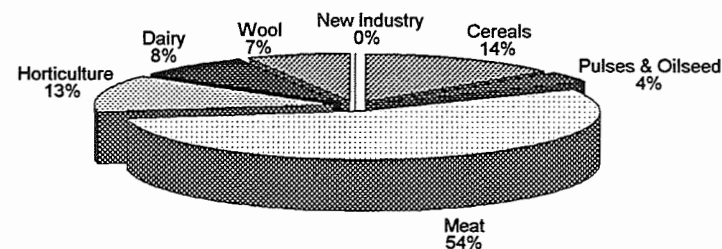
FIGURE 3.1

WESTERN AUSTRALIAN AGRI-INDUSTRY VALUES, 1994/95

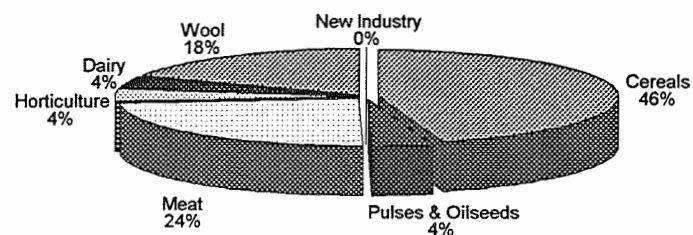
3.1(a) Gross Value of Agricultural Productions (GVAP) (\$3861m)



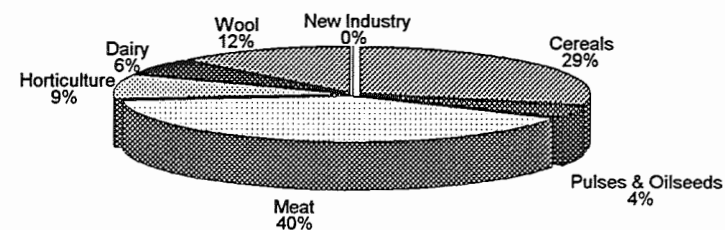
3.1(b) Post-farm value added (\$1987m)



3.1(c) Farm value added (\$1817m)



3.1(d) Total value added (\$3805m)



The distribution of the post-farm value added component in Chart 3.1(b) and total agri-industry value added component in Chart 3.1(d) indicates that meat based non-farming sectors add more income to WA economy than any other agriculture based non-farming sectors. Cereals based post-farm sectors stand second. Although only a very small proportion of the cereal grains are processed, the industry's post-farm value added contribution remained bigger when export and marketing margins were taken into consideration. This is due to the size of the industry.

In Chart 3.1(b), horticultural based non-farm sectors was the third biggest contributor to the WA economy (13%).

Further analysis of industry importance in terms of 'post-farm value added' per dollar of 'farm value added' indicates that horticultural based non-farm sectors contribute the most (Table 3.1). In other words, while the farming sector of the horticulture industry adds \$1.00 the non-farming sector which are based on horticultural commodities, adds another \$3.7 to the WA economy (whereas the cereals dependent non-farm sector adds only \$0.32 to the economy). From this point of view, meat is the second and dairy the third most important industry.

The overall result indicates that for \$1.00 added to the economy by the farming sector another \$1.09 is added by the agricultural dependent non-farm sectors. It is important to note that this extra dollar added by other sectors of the economy should not be interpreted as a multiplier.

The analysis of industry importance is summarised in Table 3.2. As revealed in the table, the results could be interpreted in many ways depending on which point of view one measures the importance of an industry.

**TABLE 3.2**  
**PERFORMANCE RANKINGS OF WA AGRI-INDUSTRIES**

Ranks	Measures of Industry Ranking				
	GVAP (Chart 3.1(a))	Farm value added (Chart 3.1(c))	Post-farm value added (Chart 3.1(b))	Total value added (Chart 3.1(d))	Post-farm value added per \$ of farm value added (Column H, Table 3.1)
First	Cereals	Cereals	Meat	Meat	Horticulture
Second	Wool	Meat	Cereals	Cereals	Meat
Third	Meat	Wool	Horticulture	Wool	Dairy
Fourth	P&O	P&O	Dairy	Horticulture	P&O
Fifth	Horticulture	Horticulture	Wool	Dairy	Wool
Sixth	Dairy	Dairy	P&O	P&O	Cereals

For example, if the importance of an industry is assessed from its relative size of gross farm income, then the GVAP is a better measure. If it is from the view point of the farm sector's contribution to the State income, then the FVA is the right measure. But if it is to assess agriculture based non-farm sectors' contribution to the State economy, then the post-farm value added measure should be taken into account. However, to assess the importance of agri-industry as a whole (i.e. both the farm and post-farm sectors combined) to the State economy, then the total value added estimate should be considered. Furthermore, if the importance of agricultural industries is assessed on the basis of gross value of final goods then the value of agricultural commodities at the point of final sale is a better measure<sup>2</sup>.

However, as the current emphasis of the agency is to promote more post-farm value adding endeavour, it is useful to measure the relative importance of an industry in terms of its post-farm value added component per unit of the farm value added component. This measure indicates the degree to which non-farm sectors of different industries can contribute to the State economy. This measure also helps to identify industries with potential for value adding.

Nevertheless, it is recommended that instead of using a single measure a combination of measures should be used to assess the relative importance of an industry. In this analysis, all the measures combined, indicates that the WA meat industry is the major contributor to the State economy.

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<sup>2</sup> The value of agricultural commodities at the point of final sale is not compared and analysed in this report. The total final sale value was estimated at \$6.2 billion in 1994/95 (Islam, 1997).



## IV VALUE ADDED GROWTH POTENTIAL

The growth potential of value adding is estimated based mainly on the industry programs' five year strategic plans (see Appendix 1.2 for references) and on farm production trends. Key strategies that are considered to be contributing to each industry are also taken into account to simulate each of the industry models.

### 4.1 Assumed changes based on industry strategic plans

It is assumed that over the five year plan period, major program strategies will achieve the following changes in WA agri-industries.

#### **Cereals:**

- annual production increase of wheat by 3%;
- increase in wheat exports to the expanding quality discriminating markets by 20% for 5% price premium;
- annual production increase of barley by 1.7%;
- increase in malt processing by 30%;
- 3% increase in price premium for malt export demand;
- 10% increase in the export of high quality oats to US markets;
- 25% increase in milling oats to Asian markets; and
- 3% increase in price premium.

#### **Pulses and Oilseeds:**

- 25% increase in production due to increase in export demand for lupins; and
- 150% increase in production due to increase in export demand for canola.

#### **Meat:**

- 50% increase in beef exports;
- 70% increase in live cattle exports;
- 50% increase in sheep meat exports;
- 25% increase in live sheep exports;
- 2% increase in pig production;
- 100% increase in pork exports;
- 50% increase in live pig exports;
- 10% increase in chicken meat production;
- 10% increase in domestic consumption of chicken meat;
- 10% increase in the exports of chicken meat;
- 10% increase in the eggs production;
- 10% increase in domestic consumption of eggs; and
- 10% increase in exports of eggs.



**Horticulture:**

- 5% increase in apple production;
- Increase in apple exports to 12000 tonnes;
- 50% increase in apple juice processing;
- 20% replacement of bananas imports from other States in Australia by increase in local production;
- 5% increase in the production of carrots;
- 50% increase in retail and export demand due to improvement in the quality of carrots;
- 5% increase in the production of cauliflower;
- 50% increase in retail and export demand due to improvement in the quality of cauliflower;
- 25% increase in production efficiency by reducing costs of potatoes;
- 5% increase in the production of ware-potatoes;
- 10% increase in the growing area of processing potatoes;
- 95% increase in wine-grapes production; and
- 50% increase in wine exports.

**Dairy:**

- 10% increase in exports of butter, cheese and skim milk powder (SMP);
- 10% in the production of fresh milk; and
- 40% increase in the production of manufacturing milk.

**Wool:**

- 10% increase in wool production;
- 2% increase in the overall price due to improvement in the quality of wool;
- 50% increase in the export of greasy wool to India;
- 20% increase in the export of greasy wool to China; and
- 10% increase in the export of scoured wool to Italy.

## **4.2 Strategic outcomes in value added growth**

The results of the expected value added component of industries within Agriculture Western Australia's industry programs in the year 2000 are presented in Table 4.1. The total agri-industry value added component due to all programs is expected to increase by about \$1.0 billion - an increase of about 21% over a five year period or an annual increase of about 4%.

The total post-farm value added component is expected to increase marginally higher (22%) than the total farm value added (20%).

Inter-industry comparisons reveal that the pulses and oilseeds industry's total value added component is expected to increase by 57%. For horticulture, it will increase by 46% and for the dairy industry by 32%.

**TABLE 4.1**  
**STRATEGIC OUTCOMES IN THE WA AGRI-INDUSTRY VALUE ADDED**  
**GROWTH 1994/95 TO 1999/2000 (\$'000)**

Industry programs	1999/2000				% Change from 1994/95			Post-farm value added/ dollar of farm value added
	Farm value added	Post-farm value added	Total value added	Change in total value added	Farm value added	Post- farm value added	Total value added	
Cereals	1,016,996	307,764	1,324,760	159,961	13%	15%	14%	0.30
Pulses and Oilseeds	125,127	113,298	238,425	86,271	59%	55%	57%	0.91
Meat	554,031	1,249,895	1,803,926	290,018	28%	16%	19%	2.26
Horticulture	98,876	364,585	463,461	146,073	32%	50%	46%	3.69
Dairy	97,568	198,847	296,415	71,025	34%	30%	32%	2.04
Wool	376,389	156,388	532,777	65,431	14%	14%	14%	0.42
All Programs	2,268,987	2,390,777	4,659,764	818,779	20%	22%	21%	1.05

Comparison between farm and post-farm value added components indicates that a proportionately higher post-farm value added component is expected to accrue from the horticulture industry. Although the share of post-farm value adding to the total value adding for the meat industry remains very high (i.e. \$1.3 billion post-farm value adding to \$1.8 billion total value adding), the percentage change in the post farm value added component appeared to be much lower (16%) than the farm value added (28%).

For the wool program proportionate changes in the total, farm and post-farm value adding are expected to remain the same (14%).

The relative share of WA agri-industry value adding to the year 2000 is presented in Figure 4.1. A comparison of Charts 4.1(a), 4.1(b) and 4.1(c) in Figure 4.1 with the Charts 3.1(d), 3.1(c) and 3.1(b) in Figure 3.1 reveals that relative position of industries in terms of their value added share remains more or less the same. However, Chart 4.1(d) indicates that the share of expected increase in the total value added component has increased significantly for horticulture (from 9% to 18%) and pulses and oilseeds (from 4% to 11%) industries.

In terms of post-farm value adding to the per dollar of farm value adding, the results in Table 4.1 indicates that relative importance of industries remained the same as shown in Table 3.1. Except for horticulture, the degree of post-farm value adding in general, has declined for all the industries.

The implication of this result is perhaps the reason that, although Agriculture Western Australia aims to achieve relatively more post farm value adding from a dollar worth of farm value adding, the strategic changes assumed of industries in this study do not appear to be achieving it. In absolute terms, both the farm and non-farm value added components have increased but in relative terms the share of post-farm value adding compared to the farm value adding did not increase. This result suggests that the current strategies aimed at achieving relatively more post-farm value adding from a dollar worth of farm value adding may have to be reviewed.

### **4.3 Value adding potential industries**

The value adding potential of an industry depends on the local production and processing technologies and environment, output prices, input costs and domestic and export market conditions. Analysis of these factors in determining value adding potential of industries is beyond the scope of this report. The individual industry programs may undertake such detailed studies.

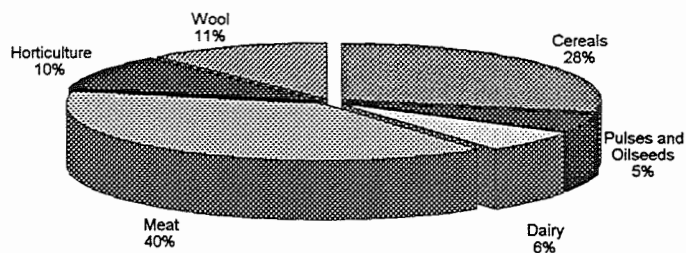
However, relying on the results discussed above and on the analysis of statistics, the value adding potential of an industry is assessed in Table 4.2.

In 1994/95, a very small proportion (only about 2%) of the total produce from the cereals industry was processed and exported. As estimated above, the ratio of the present level of farm to post-farm value adding is 1:0.32. Given that the cereals industry is the biggest in Western Australian agriculture and only a small proportion is processed for export this analysis confirms that there remains a tremendous opportunity for post farm value adding.

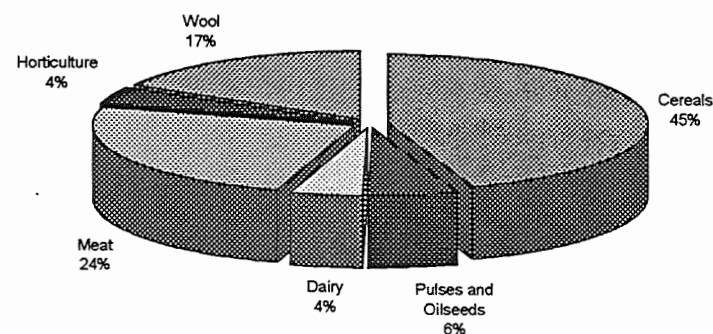
FIGURE 4.1

WESTERN AUSTRALIAN AGRI-INDUSTRY VALUES IN 2000

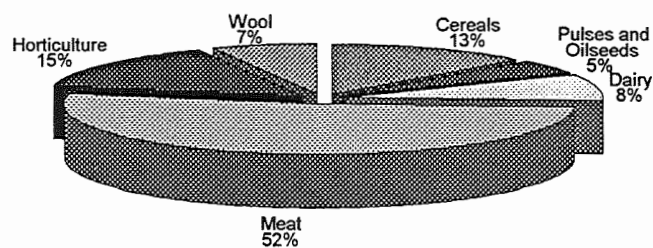
4.1(a) Expected Total value-added (\$4.7b)



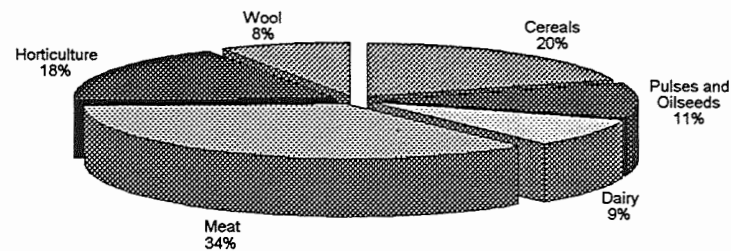
4.1(b) Expected Farm value-added (\$2.3b)



4.1(c) Expected Post-farm value-added (\$2.4b)



4.1(d) Expected Change in Total value-added (\$0.8b)



**TABLE 4.2**  
**WA AGRICULTURAL COMMODITY STATISTICS ON DOMESTIC USE AND EXPORTS (1994/95)**

Industry programs and commodities	Units	Farm Produce (FP)	Domestic use				Export (including Eastern States)				Total turn-off	Turn-off %
			Processed amount	% of FP	Unprocessed amount	% of FP	Processed amount	% of FP	Unprocessed amount	% of FP		
<b>Cereals</b>												
Wheat	ktonnes	5,438	103	2	100	2	51	1	5,154	95	5,407	99
Barley	ktonnes	915	25	3	180	20	75	8	635	69	915	100
Oats	ktonnes	417	4	1	351	84	32	8	30	7	417	100
<b>Pulses &amp; Oilseeds</b>												
Canola	ktonnes	115	6	5	0	0	7	6	97	88	110	95
Lupins	ktonnes	880	132	15	271	31	5	1	472	54	880	100
<b>Meat</b>												
Beef (cattle)	000' heads	1,895	528	57	6	1	274	30	119	13	928	49
Sheep	000' heads	29,392	2,463	26		0	3,865	41	3,103	33	9,431	32
Pigs	000' kg	35,700	35,102	98		0	498	1	100	0	35,700	100
Chicken	000' birds	35,000	35,000	100		0		0		0	35,000	100
Eggs	000' dozen	19,500		0	18,330	94	1,170	6		0	19,500	100
<b>Meat</b>												
Apple	Tonnes	29,900	4,485	15	19,525	65		0	5,890	20	29,900	100
Bananas	Tonnes	21,353	202	1	21,033	99		0	118	1	21,353	100
Carrots	Tonnes	44,700		0	9,834	22		0	34,866	78	44,700	100
Cauliflower	Tonnes	15,700	471	3	2,198	14		0	13,031	83	15,700	100
Potatoes	Tonnes	101,600	49,471	49	42,695	42		0	9,434	9	101,600	100
Wine (bottle)	Number	12,095	3,870	32		0	8,225	68		0	12,095	100
<b>Dairy</b>												
Milk	000' L	346,265	157,657	46	155,753*	45	32,855	9		0	346,265	100
<b>Wool</b>												
Wool	000' kg	180,783		0		0	45,196	25	135,588	75	180,783	100

\* The amount of white market milk is classified as 'unprocessed' in this table.

The cereals industry can add an extra \$1 billion to the economy if all the cereals are processed and traded even without any change in the existing processing technology and marketing systems (see the report on 'Cereals industry value added', Islam, 1996).

The pulses and oilseeds industry also appears to have significant potential for post farm value adding by increased processing and export. If a greater proportion of farm produce is processed and exported, the industry is likely to add significant amount of income to the State economy.

It was conservatively estimated an extra \$33 million could be added to the State economy if all the present level of farm production (except the quantity used on-farm) is processed and traded using present technology and systems (Islam, 1996a).

Meat is mostly processed and a greater proportion domestically traded. The results show that animal meat dependent non-farm sectors already contribute the highest level of value adding to the State economy. Potential value adding of this industry is likely to be generated from exports of pig and chicken meat.

It is interesting to note that, although the ratio of the farm to post-farm value adding for horticulture was found to be 1:3.4, a very small proportion of this industry's commodities, except for potatoes and wine grapes are processed. The reason for the higher post-farm value added component is mostly due to these two industries. Wine grapes are processed and wine is exported at relatively higher export margins, and also sold at higher mark-up prices in the domestic market. In general terms, value added potential for the horticultural industries appears to remain in the expansion of the area farmed and a subsequent increase in the volume of production and exports.

All the milk produced in WA is processed in one form or another. About 45% of milk production was processed as white market milk and 55% was processed as manufacturing milk. From this only 9% was exported. Most of the post-farm value adding was generated from the manufacturing milk component. The non-farm sector adds twice as much as the farm sector per litre of milk (Appendix E, Table E2). As the dairy industry's market milk component operates in a regulated domestic market conditions, further value adding opportunities are likely to depend on the degree of milk market deregulation and increases in the production and exports of white and processed milk.

For the wool industry, present ratio between the farm to non-farm value adding is only 1:0.4, which is the second lowest. It appears that in the foreseeable future the WA wool industry will continue to depend on the export of 75% greasy and 25% scoured wool. The present gloomy world market situation for wool, the value added results and the industry planned strategic outcomes suggest that this industry has two ways to add value to the WA economy - one is the development of low cost farm production technology; the other is the improvement in the quality of wool so that a higher export price is received.





## V CONCLUSIONS AND RECOMMENDATIONS

The value chain spreadsheet model is a simple, transparent and powerful analytical tool which can provide key information to support a number of management and strategic planning decisions, including budget allocation. An industry program can use this model to monitor and evaluate industry performance on a regular basis.

The analysis of value added results presented in this report has revealed that the importance and potential of an industry can be assessed in many ways depending on which value adding criteria is used and from which point of view it is measured.

If the importance of an industry is to be assessed from the relative size of gross farm income, GVAP is a better measure. If it is from the view point of the farm sector's contribution to the State income, FVA should be used. However, if it is of interest to measure the importance of an industry on the basis of contributions from its non-farm sectors, the post-farm value added component should be taken into account. To assess the importance of the industry as a whole the total value added should be used.

Given that the present emphasis of Agriculture Western Australia is to promote more post farm value adding endeavour, it is useful to measure the relative importance of an industry in terms of post farm value adding per unit of farm value adding. This measure indicates the degree to which non-farm sectors of different industries can contribute to the State while the farm sector of each of these industries adds one dollar. This provides a common denominator to compare industries. The measure also helps to identify industries with potential for value adding.

Nevertheless, it is recommended that instead of using a single measure, a combination of measures should be used to assess relative importance of an industry. In this analysis, when all the measures combined, the WA meat industry appeared to be the major contributor to the State economy.

As the value adding potential of an industry depends on local production and processing technologies and environment, output prices, input costs and domestic and export market conditions, it is difficult to make conclusive statements about the value added potential of an industry unless a detailed analysis of these factors is undertaken. Individual commodity models can help conduct such a detailed analysis. It is recommended that Agriculture Western Australia's individual industry programs undertake such detailed studies by updating and utilising the individual commodity value chain models.

Each commodity value chain model can be utilised in two ways. Firstly, because the value chain model provides an overview of all activities and products within the industry, it can be used as a physical and financial description of the industry. Each model is descriptive and can serve as a reference source. It highlights the basic structure and characteristics of the commodities under the industry programs of Agriculture Western Australia. Secondly, the

model can be used as a research and analytical tool and can complement other models for input-output and demand and supply analyses. It can analyse the impacts on industry changes due to events external to the industry, such as inputs and product prices, technologies, tariffs and exchange rates.

# **APPENDIX - 1**

## **DEFINITIONS, DATA SOURCES AND WORKSHOP PARTICIPANTS**

## Appendix 1.1

### DEFINITION OF VALUE ADDED

General perception about the term ‘value added’ is usually restricted to the processing of product enhancement, i.e. by improving style, shape, function, materials or methods of manufacturing. In agriculture, the general perception of value adding is processing or manufacturing the raw or unprocessed agricultural commodity, i.e. the form in which it leaves farm-gate (McKerrow, 1992). Sometimes, the definition is extended to include any activity which increases the value of the product, such as more elaborate packaging or changing the form of exports (for a detailed discussion on the definitions of value added see Islam, 1995; and ABS, 1994).

In value added accounting, an agricultural industry consists of not just the farm sector, but many other sectors that contribute to the value of the industry’s final products. The number of sectors may vary from industry to industry depending on the nature and steps of product transformation that takes place from the primary to the final products produced and also on the analytical requirements.

For agricultural industries the starting point is the farm sector which produces the primary products i.e. wheat, barley, sheep, cattle and other commodities, and the final sectors could be the retail and/or export sectors. In between, the sectors could be broadly classified into: (a) transport and handling (including storage); (b) wholesale marketing; (c) initial processing; (d) packaging and distribution; (e) further processing; (f) retail marketing; and (g) export marketing.

Once the value adding sector for an industry is determined, for each sector the equation of value added starts with profit:

- **Profit** *equals* value of sales *less* all expenses.
- **All expenses** *includes* value of purchased inputs, wages, salaries, supplements and operating surplus.
- **Value added** *equals* value of sales *less* value of purchased inputs; alternatively,
- **Value added** *includes* profit, wages, salaries, supplements and operating surplus.

Purchased inputs for the farm sector are intermediate goods like fuel, seed, fertiliser, and hiring of services such as accounting or custom spraying of crops by local agricultural agencies or cooperatives. However, for subsequent sectors, a purchased input could be a product from the previous sector. For example, milk produced at the farm level may become a purchased input or an intermediate goods for the butter processing company. Therefore value added is profit, plus the add-back of wages, salaries, supplements and operating surplus. Thus, value added is a broader concept of income/earnings than is conveyed by the concept of proprietor profit.

## Value added contribution of agricultural commodities

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Sales for the farm sector in a particular industry is equivalent to the gross value of agricultural products (GVAP) i.e. the quantity of farm produce multiplied by its farm-gate price. This measure of GVAP is equivalent to the measure 'local value of commodities produced' used by Australian Bureau of Statistics (ABS, 1994b).

The distinction between GVAP and Farm Value Added (FVA) is the value of farm sale *less* the value of purchased input.

In this report the term value added is defined as 'the difference between the total value of an industry's final outputs and the total value of purchased inputs used to produce those outputs'.

More explicitly, value added is equal to the gross value of output *less* the total value of purchased inputs except the value of wages, salaries, supplements paid and operating surplus received in production.

## Appendix 1.2

### DATA SOURCES AND REFERENCES

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### Appendix 1.3

#### LIST OF WORKSHOPS AND PARTICIPANTS

Industry programs	Dates and venues	Participants
Cereals	21 November 1996 N'gala Conference room, Agriculture Western Australia, South Perth	Ian Wilkinson David Feldman Ted Rowley Nazrul Islam
Pulses and Oilseeds	6 November 1996 Executive Conference Room E1, Agriculture Western Australia, South Perth	Rob Delane Nazrul Islam
Meat and Other Animal Products	29 October 1996 Executive Conference Room E1, Agriculture Western Australia, South Perth	Greg Sawyer Paul Frapple Renata Paliskis-Bessell Bob Nickels Jason Kelly Greg Brennan Roly Bishop Peter O'Malley Bruce Mullan Michael Paton Brad Plunkett Nazrul Islam
Horticulture	25 September 1996 Bunbury Office, Agriculture Western Australia	Julie Warren Brad Plunkett Terry Hill Peter Dawson Eleanor Melvin-Carter Jim Campbell-Clause Ian McFarlane Kate Ambrose Nazrul Islam
Dairy	24 September 1996 Bunbury Office, Agriculture Western Australia	George Olney Graham Annan Geoff de Chaneet Joe King Kate Ambrose Nazrul Islam
Wool	26 November 1996 Albany Office, Agriculture Western Australia	Bruce Layman David Feldman Ed O'Loughlin David Windsor Dan Carter Keith Croker Rob Kelly Kimbal Curtis Nazrul Islam



## **APPENDIX - A**

# **CEREALS INDUSTRY**

## The Cereals Industry Model

Three major commodities are modelled for the cereals industry. These are wheat, barley and oats. The gross value of agricultural production (GVAP) of these three crops comprises nearly 100% of the GVAP of cereal grains produced in WA (Table A1). For each of these three grains a value chain spreadsheet model is developed to estimate their value added. The results are presented in Table A2.

**TABLE A1**  
**COMPOSITION OF THE CEREALS INDUSTRY**

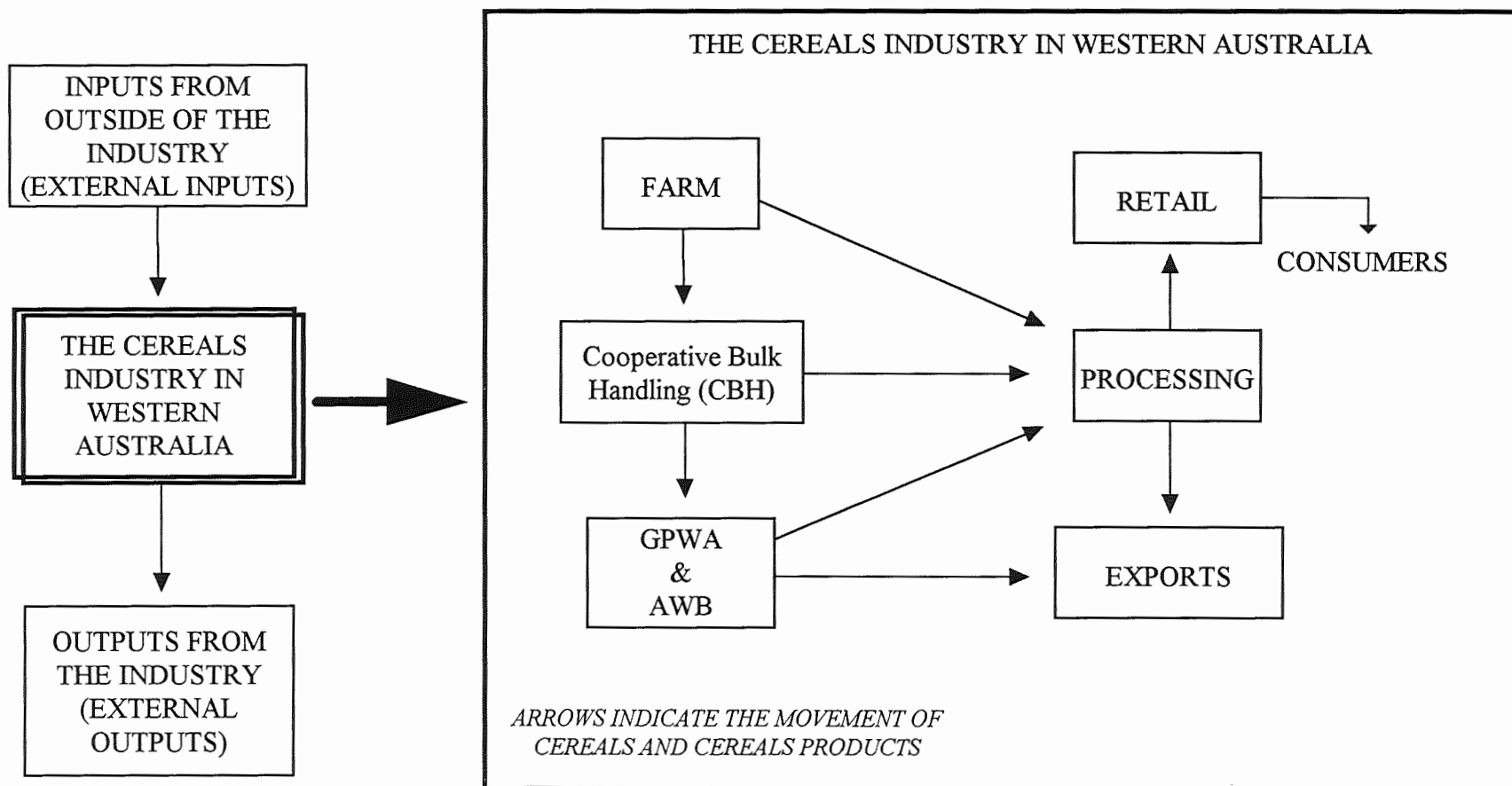
Industry programs	Commodities	GVAP (\$m)	% of total	Sectors	Data items
1. Cereals	Wheat	1307	84	Farms (4-regions)	• Quantity and price of farm outputs.
	Barley	179	12	CBH	
	Oats	59	4	GPWA & AWB	• Quantity and price of major inputs such as labour, rents, interests.
				Processing	
				Retail	• Product turn-off rates.
				Exports	• Product conversion factors.

To estimate the industry value added each of the cereal industries was divided into six sectors. These sectors are: farms, Cooperative Bulk Handling (CBH), Grain Pool of WA (GPWA) and Australian Wheat Board (AWB), processing, retail and exports. An overview of the value chain model of these industries is given in a flow diagram in Figures A1 and their share of values is compared in Figure A2. The value chain summary results are presented in Tables A3 to A5.

**TABLE A2**  
**WA CEREALS INDUSTRY VALUE ADDED**

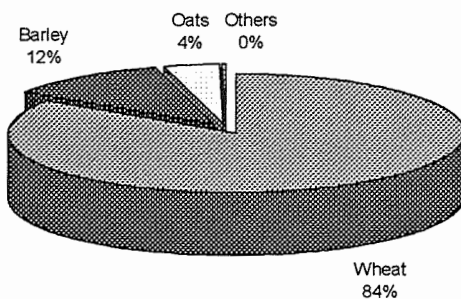
Cereals programs	1994/95					
	GVAP (\$'000)	Post farm value added (\$'000)	Farm value added (\$'000)	Total value added (\$'000)	Post farm value added per dollar of GVAP (\$)	Post farm value added per dollar of farm value added (\$)
Wheat	1,307,000	197,839	655,853	853,692	0.15	0.30
Barley	179,200	58,457	119,151	177,609	0.33	0.49
Oats	58,700	11,408	49,404	60,812	0.19	0.23
Program total	1,544,900	267,704	824,407	1,092,112	0.17	0.32

**FIGURE A1**  
**OVERVIEW OF THE *CEREALS* INDUSTRY VALUE CHAIN**

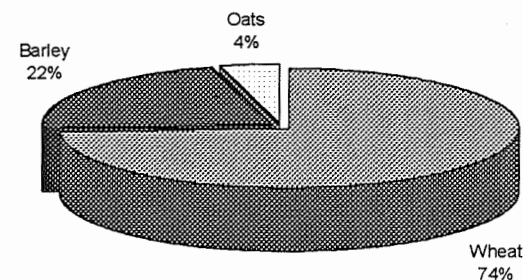


**FIGURE A2**  
**CEREALS INDUSTRY VALUES IN WESTERN AUSTRALIA**

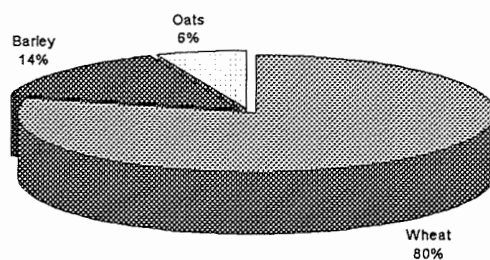
**GVAP (\$1550m)**



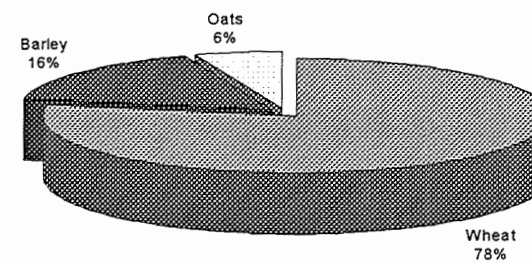
**Post-farm Value-added (268m)**



**Farm Value added (\$824m)**



**Total Value added (\$1092m)**



**TABLE A3**  
**WESTERN AUSTRALIAN *WHEAT* INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers	Cooperative Bulk Handling	Grain Pool WA and Australian Wheat Board	Processing	Retail	Exports	Total
Inputs from other sectors			1,044,096	1,110,992	32,065	25,668	1,152,783	3,365,604
Inputs from external source		532,669	90,597	42,607	1,531	53,093	41,230	761,727
<b>Total Inputs</b>		<b>532,669</b>	<b>1,134,693</b>	<b>1,153,599</b>	<b>33,597</b>	<b>78,761</b>	<b>1,194,013</b>	<b>4,127,331</b>
Outputs to other sectors		1,045,852	1,121,940	1,161,379	36,433	0	0	3,365,604
Outputs to external destination		18,410	17,791	0	0	98,567	1,205,858	1,340,626
<b>Total Output</b>		<b>1,064,263</b>	<b>1,139,731</b>	<b>1,161,379</b>	<b>36,433</b>	<b>98,567</b>	<b>1,205,858</b>	<b>4,706,231</b>
<b>Profits</b>		<b>531,594</b>	<b>5,038</b>	<b>7,780</b>	<b>2,836</b>	<b>19,806</b>	<b>11,845</b>	<b>578,900</b>
Wages and salaries		50,193	31,975	5,196	766	26,592	20,615	135,338
Rents and interests		74,066	21,317	28,578	145	5,041	10,307	139,454
<b>VALUE ADDED</b>		<b>655,853</b>	<b>58,330</b>	<b>41,554</b>	<b>3,747</b>	<b>51,439</b>	<b>42,768</b>	<b>853,692</b>



**TABLE A4**  
**WESTERN AUSTRALIAN *BARLEY* INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

	Sectors	Growers	Cooperative Bulk Handling	Grain Pool WA and Australian Wheat Board	Processing	Retail	Exports	Total
Inputs/Outputs								
Inputs from other sectors			152,274	162,567	23,611	23,985	158,484	520,922
Inputs from external source		88,481	11,086	3,152	4,652	34,983	5,582	147,936
<b>Total Inputs</b>		<b>88,481</b>	<b>163,361</b>	<b>165,719</b>	<b>28,263</b>	<b>58,968</b>	<b>164,067</b>	<b>668,858</b>
Outputs to other sectors		157,526	164,863	167,885	30,648	0	0	520,922
Outputs to external destination		25,391	0	0	0	63,961	171,000	260,353
<b>Total Output</b>		<b>182,918</b>	<b>164,863</b>	<b>167,885</b>	<b>30,648</b>	<b>63,961</b>	<b>171,000</b>	<b>781,275</b>
<b>Profits</b>		<b>94,437</b>	<b>1,502</b>	<b>2,165</b>	<b>2,385</b>	<b>4,993</b>	<b>6,934</b>	<b>112,417</b>
Wages and salaries		13,066	4,513	742	2,324	17,509	2,791	40,945
Rents and interests		11,648	5,400	2,039	441	3,322	1,396	24,247
<b>VALUE ADDED</b>		<b>119,151</b>	<b>11,415</b>	<b>4,946</b>	<b>5,151</b>	<b>25,824</b>	<b>11,121</b>	<b>177,609</b>

**TABLE A5**  
**WESTERN AUSTRALIAN OATS INDUSTRY VALUE CHAIN SUMMARY (IN '000 \$)**

Inputs/Outputs	Sectors	Growers	Cooperative Bulk Handling	Grain Pool WA and Australian Wheat Board	Processing	Retail	Exports	Total
Inputs from other sectors			6,284	5,514	5,158	890	11,446	29,292
Inputs from external source		32,986	676	154	1,553	1,557	499	37,425
<b>Total Inputs</b>		<b>32,986</b>	<b>6,960</b>	<b>5,669</b>	<b>6,711</b>	<b>2,447</b>	<b>11,944</b>	<b>66,717</b>
Outputs to other sectors		9,026	6,972	5,805	7,489	0	0	29,292
Outputs to external destination		64,956	0	0	0	2,847	19,062	86,865
<b>Total Output</b>		<b>73,982</b>	<b>6,972</b>	<b>5,805</b>	<b>7,489</b>	<b>2,847</b>	<b>19,062</b>	<b>116,157</b>
<b>Profits</b>		<b>40,997</b>	<b>12</b>	<b>136</b>	<b>778</b>	<b>400</b>	<b>7,117</b>	<b>49,440</b>
Wages and salaries		2,085	275	36	776	779	249	4,201
Rents and interests		6,322	329	200	147	148	125	7,270
<b>VALUE ADDED</b>		<b>49,404</b>	<b>616</b>	<b>272</b>	<b>1,701</b>	<b>1,328</b>	<b>7,491</b>	<b>60,812</b>



## **APPENDIX - B**

# **PULSES AND OILSEEDS INDUSTRY**

## The Pulses and Oilseeds Industry Model

Two commodities are modelled for the Pulses and Oilseeds industry program. These are lupins and canola. The GVAP of these two crops comprises more than 95% of the GVAP of pulses and oilseeds in WA (Table B1). For these two industries the value added estimates are given in Table B2.

**TABLE B1**  
**COMPOSITION OF THE PULSES AND OILSEEDS INDUSTRY**

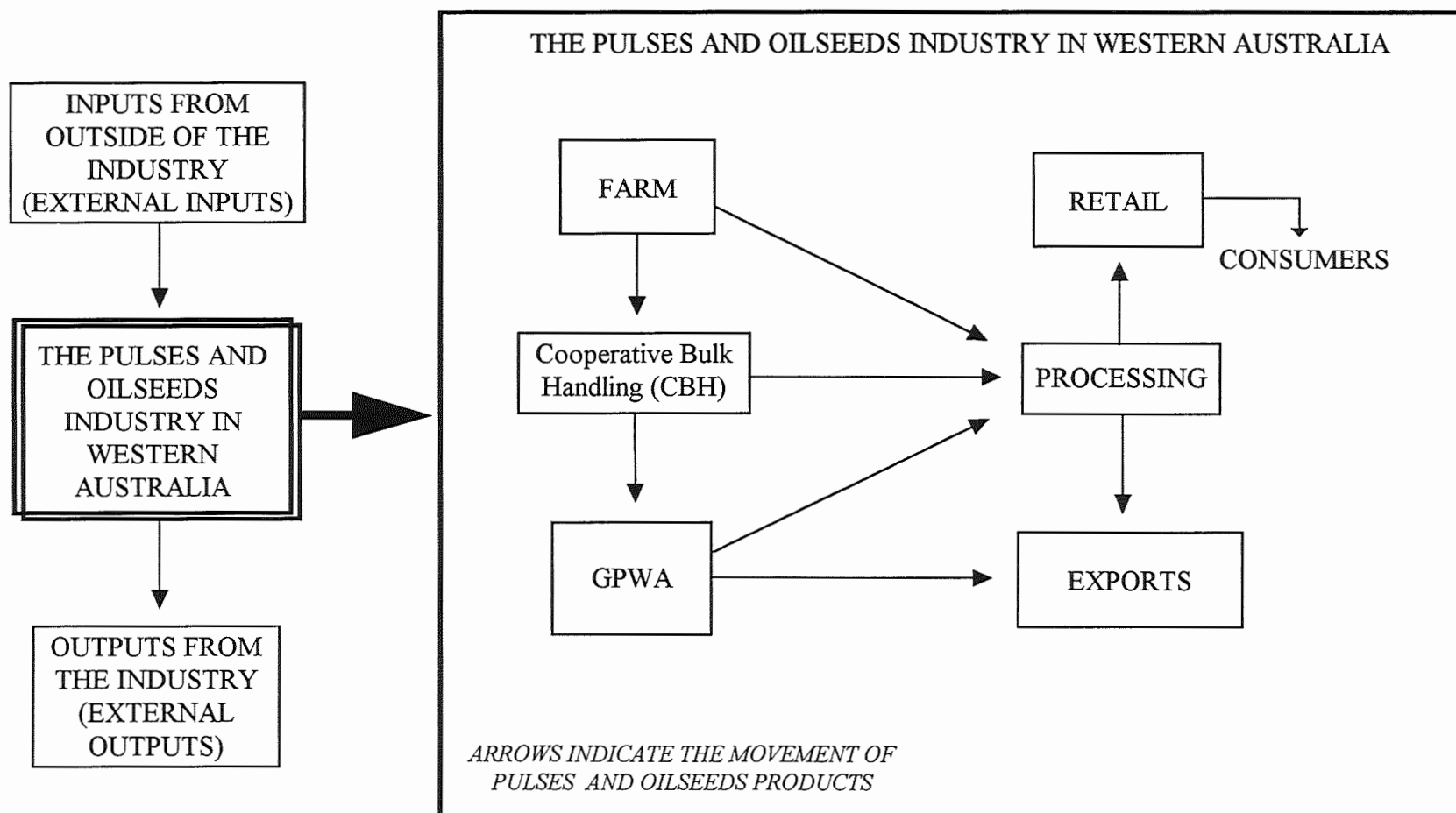
Industry programs	Commodities	GVAP (\$m)	% of total	Sectors	Data items
Pulses & Oilseeds	Lupins	177	78	Farms (4-regions)	• Quantity and price of farm outputs.
	Canola	39	17	CBH	
				GPWA & AWB	• Quantity and price of major inputs such as labour, rents, interests.
				Processing	
				Retail	• Product turn-off rates.
				Exports	• Product conversion factors.

Similar to the cereals industry the Pulses and Oilseeds industry is also divided into six sectors and the same approach was used to estimate the industry value added. An overview of the value chain of these crop industries is given in a flow diagrams in Figure B1. The value chain summary results are presented in Tables B3 and B4.

**TABLE B2**  
**WA PULSES AND OILSEEDS INDUSTRY VALUE ADDED**

Pulses & Oilseeds programs	1994/95					
	GVAP (\$'000)	Post farm value added (\$'000)	Farm value added (\$'000)	Total value added (\$'000)	Post farm value added per dollar of GVAP (\$)	Post farm value added per dollar of farm value added (\$)
Lupin	177,300	49,909	57,712	107,627	0.28	0.86
Canola	39,300	15,821	21,194	37,015	0.40	0.75
Program total	216,600	65,730	78,907	144,636	0.30	0.83

**FIGURE B1**  
**OVERVIEW OF THE *PULSES AND OILSEEDS* INDUSTRY VALUE CHAIN**



**TABLE B3**  
**WESTERN AUSTRALIAN LUPIN INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

	Sectors	Growers	Cooperative Bulk Handling	Grain Pool WA and Australian Wheat Board	Processing	Retail	Exports	Total
Inputs/Outputs								
Inputs from other sectors			85,481	94,130	23,904	39,538	93,851	336,905
Inputs from external source		116,781	7,770	4,020	14,048	21,220	625	164,464
<b>Total Inputs</b>		<b>116,781</b>	<b>93,251</b>	<b>98,150</b>	<b>37,953</b>	<b>60,758</b>	<b>94,476</b>	<b>501,368</b>
Outputs to other sectors		102,340	94,130	99,124	41,310	0	0	336,905
Outputs to external destination			0	0	0	65,896	102,368	168,264
<b>Total Output</b>		<b>147,890</b>	<b>94,130</b>	<b>99,124</b>	<b>41,310</b>	<b>65,896</b>	<b>102,368</b>	<b>550,719</b>
<b>Profits</b>		<b>31,110</b>	<b>880</b>	<b>974</b>	<b>3,357</b>	<b>5,139</b>	<b>7,891</b>	<b>49,351</b>
Wages and salaries		10,564	3,902	1,018	7,021	10,609	310	33,423
Rents and interests		16,039	3,360	2,035	1,334	2,016	62	24,847
<b>VALUE ADDED</b>		<b>57,712</b>	<b>8,141</b>	<b>4,027</b>	<b>11,712</b>	<b>17,764</b>	<b>8,264</b>	<b>107,621</b>

**TABLE B4**  
**WESTERN AUSTRALIAN CANOLA INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers	Cooperative Bulk Handling	Grain Pool WA and Australian Wheat Board	Processing	Retail	Exports	Total
Inputs from other sectors			39,236	40,522	6,950	4,384	36,399	127,492
Inputs from external source		22,149	1,739	2,411	186	3,743	4,555	34,782
<b>Total Inputs</b>		<b>22,149</b>	<b>40,975</b>	<b>42,933</b>	<b>7,136</b>	<b>8,127</b>	<b>40,954</b>	<b>162,274</b>
Outputs to other sectors		39,525	41,160	43,336	7,541	0	0	131,563
Outputs to external destination			0	0	0	11,407	45,093	56,500
<b>Total Output</b>		<b>39,525</b>	<b>41,160</b>	<b>43,336</b>	<b>7,541</b>	<b>11,407</b>	<b>45,093</b>	<b>188,063</b>
<b>Profits</b>		<b>17,376</b>	<b>185</b>	<b>403</b>	<b>405</b>	<b>3,280</b>	<b>4,139</b>	<b>25,788</b>
Wages and salaries		2,048	939	923	46	1,871	680	6,508
Rents and Interests		1,770	730	1,303	36	299	580	4,719
<b>VALUE ADDED</b>		<b>21,194</b>	<b>1,855</b>	<b>2,629</b>	<b>487</b>	<b>5,450</b>	<b>5,399</b>	<b>37,015</b>





## **APPENDIX - C**

### **MEAT INDUSTRY**

## The Meat and other Animal Products Industry Model

Five commodities are modelled for the Meat and other Animal Products industry program. These are beef (cattle), sheep meat, pigs, chicken and eggs. The GVAP of these five commodities comprises more than 97% of the GVAP of animals and poultry birds slaughtered and poultry eggs produced in WA (Table C1). The estimated value added results are presented in Table C2.

**TABLE C1**  
**COMPOSITION OF THE MEAT INDUSTRY**

Industry programs	Commodities	GVAP (\$m)	% of total	Sectors	Data items
Meat	Cattle	296	44	Farm	• Quantity and price of farm outputs.
	Sheep	173	26	Feedlot	
	Pigs	75	11	Abattoir	• Quantity and price of major inputs such as labour, rents, interests.
	Chicken	79	12	OMP	
	Eggs	32	5	Tannery	• Product turn-off rates.
				Wholesale	• Product conversion factors.
				Retail	
				Fast food	
				Exports	

To estimate the industry value added of each the meat and poultry industries were divided into a number of sectors. In general these sectors are: farm, feedlot, abattoir, other meat processing (OMP), tannery, wholesale, retail, fast food, and exports. For beef (cattle) and sheep meat industries, sectors were chosen following the Meat Research Corporation's report (MRC, 1993).

The farm sector was divided into four sub-sectors for beef industry. High rainfall zone, wheat-sheep zone, pastoral zone and Kimberley zone. For sheep and pig meat industries, Kimberley zone was not included because, farming of these industries are not done commercially (there is a minor pig meat industry in the Kimberley but no sheep).

The beef feedlot sector was divided into two sub-sectors. One is for 'domestic trade cattle' and the other for 'export cattle'. There is no feedlot sub-sector for sheep or other meat industry models.

The abattoir sector includes all cattle, sheep and pigs slaughtering, meat packing and by-product production. There are two sub-sectors in the beef cattle model, one for the beef export abattoirs, and the other for domestic beef/sheep abattoirs. The sheep model includes two abattoir types; one for domestic lamb and one for export operations. In the pig model there are also two abattoir sub-sectors, one for slaughtering and the other for boning. The model included these sub-sectors separately because of the differences in their cost structure.

The tannery sector is included in the beef and sheep models only. It includes production of semi-processed wet blue hides, finished bovine leathers, salted calf skins, tanned wool-on sheep and lamb skins, and other raw sheep skin products. Packing raw hides and skins for export is included in the tannery sector.

The wholesale sector includes distribution of carcasses from domestic abattoirs to butchers, supermarkets and the food service sectors.

The retail sector includes butcher shops and supermarkets for cattle, sheep, pigs, chicken and egg retailing.

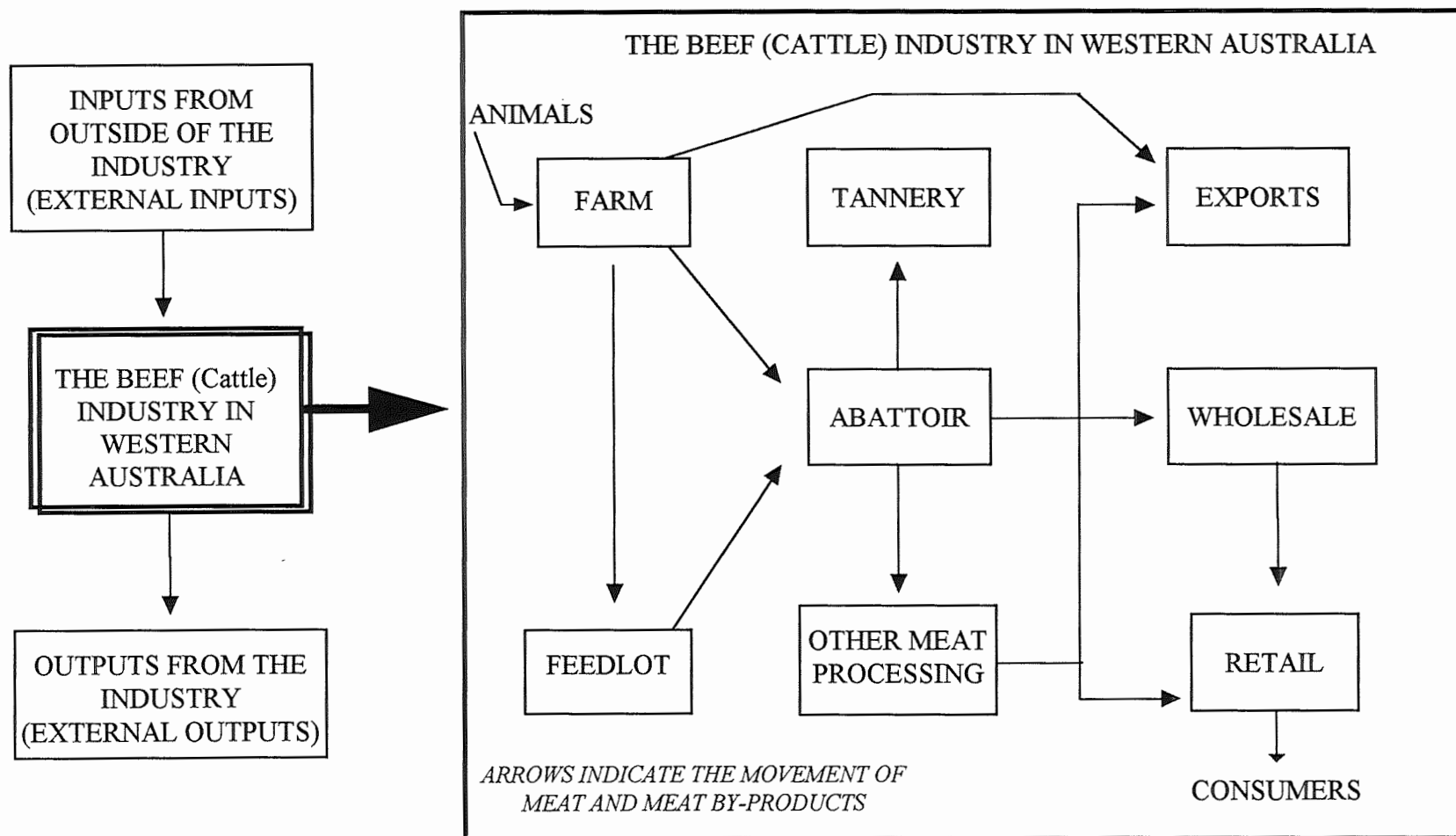
The export sector included live animal and meat as well as processed eggs.

The overview of the value chain of these industries is given in flow diagrams in Figures C1 to C5 and their share of values is compared in Figure C6. The value chain summary results are presented in Tables C3 to C7.

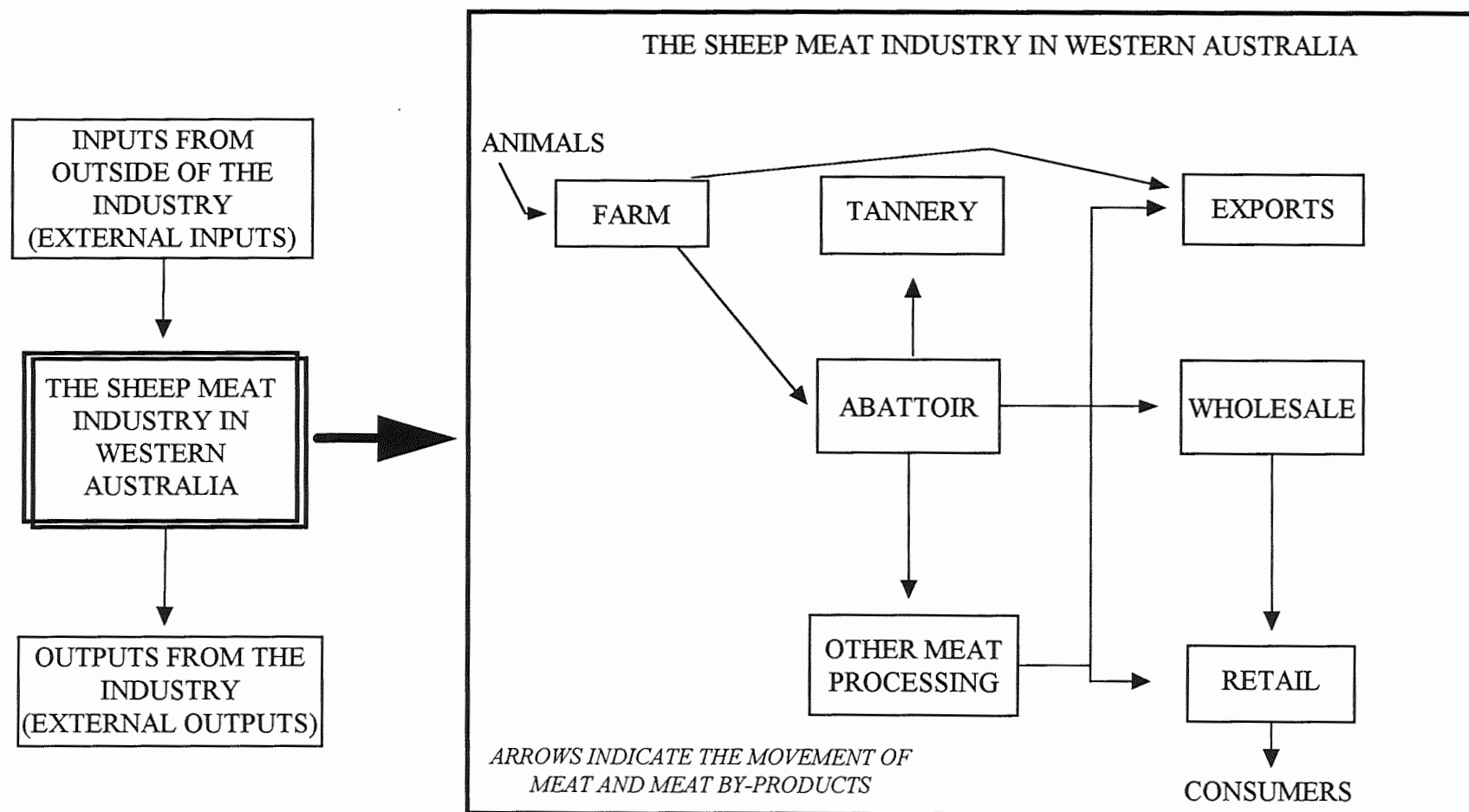
**TABLE C2**  
**WA MEAT-INDUSTRY VALUE ADDED**

Meat programs	1994/95					
	GVAP (\$'000)	Post farm value added (\$'000)	Farm value added (\$'000)	Total value added (\$'000)	Post farm value added per dollar of GVAP (\$)	Post farm value added per dollar of farm value added (\$)
Cattle	295,619	269,133	166,418	436,020	0.91	1.62
Sheep	173,131	351,882	187,673	539,555	2.03	1.87
Pigs	75,190	197,416	27,958	225,374	2.63	7.06
Chicken	78,782	275,999	18,900	294,899	3.50	14.60
Eggs	31,600	16,470	20,670	37,140	0.52	0.80
Program total	654,322	1,111,369	421,619	1,532,988	1.70	2.64

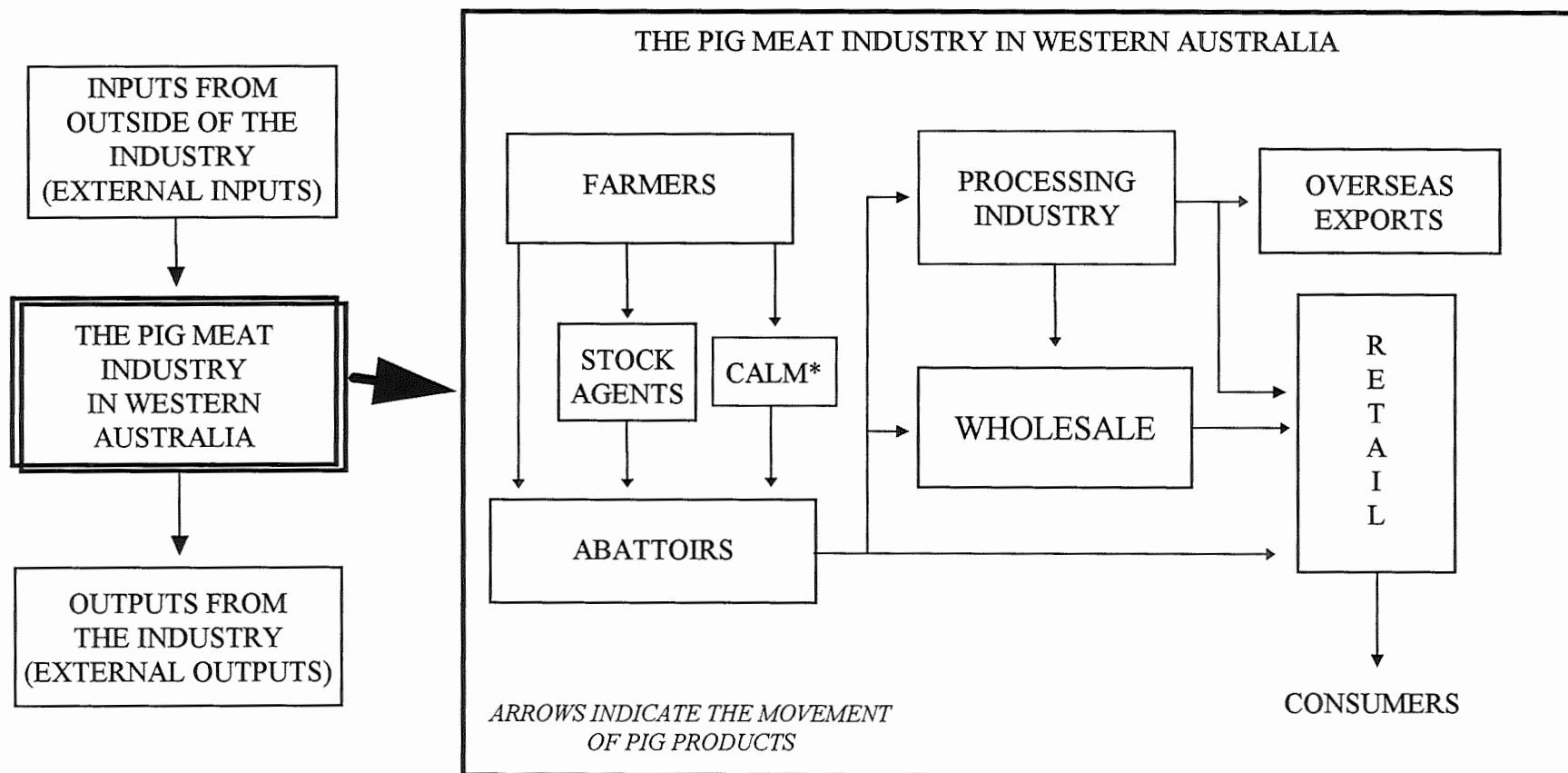
**FIGURE C1**  
**OVERVIEW OF THE *BEEF* INDUSTRY VALUE CHAIN**



**FIGURE C2**  
**OVERVIEW OF THE *SHEEP* MEAT VALUE CHAIN**

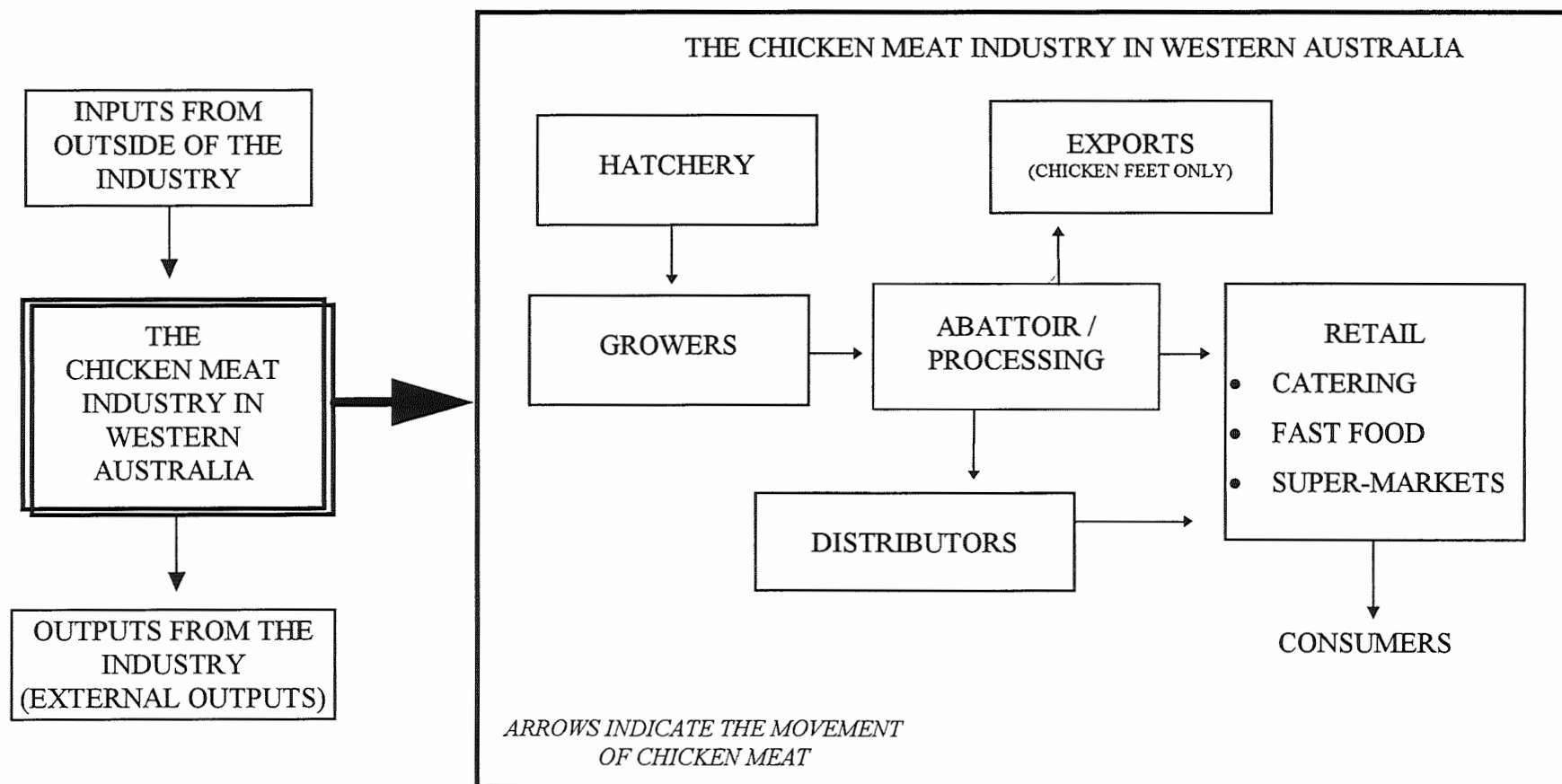


**FIGURE C3**  
**OVERVIEW OF THE PIG MEAT INDUSTRY VALUE CHAIN**



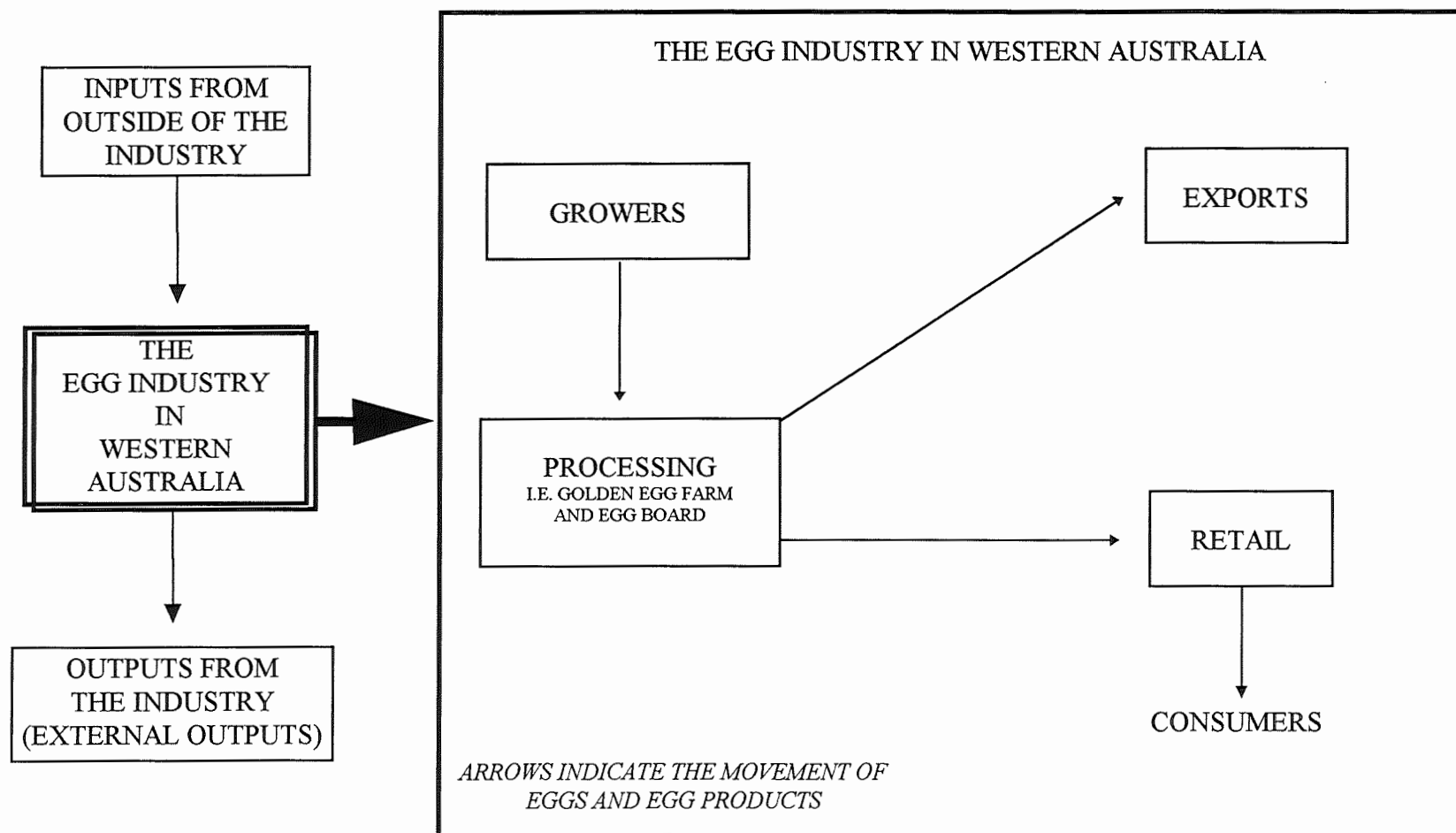
\* Computer Assisted Livestock Marketing

**FIGURE C4**  
**OVERVIEW OF THE *CHICKEN* MEAT INDUSTRY VALUE CHAIN**

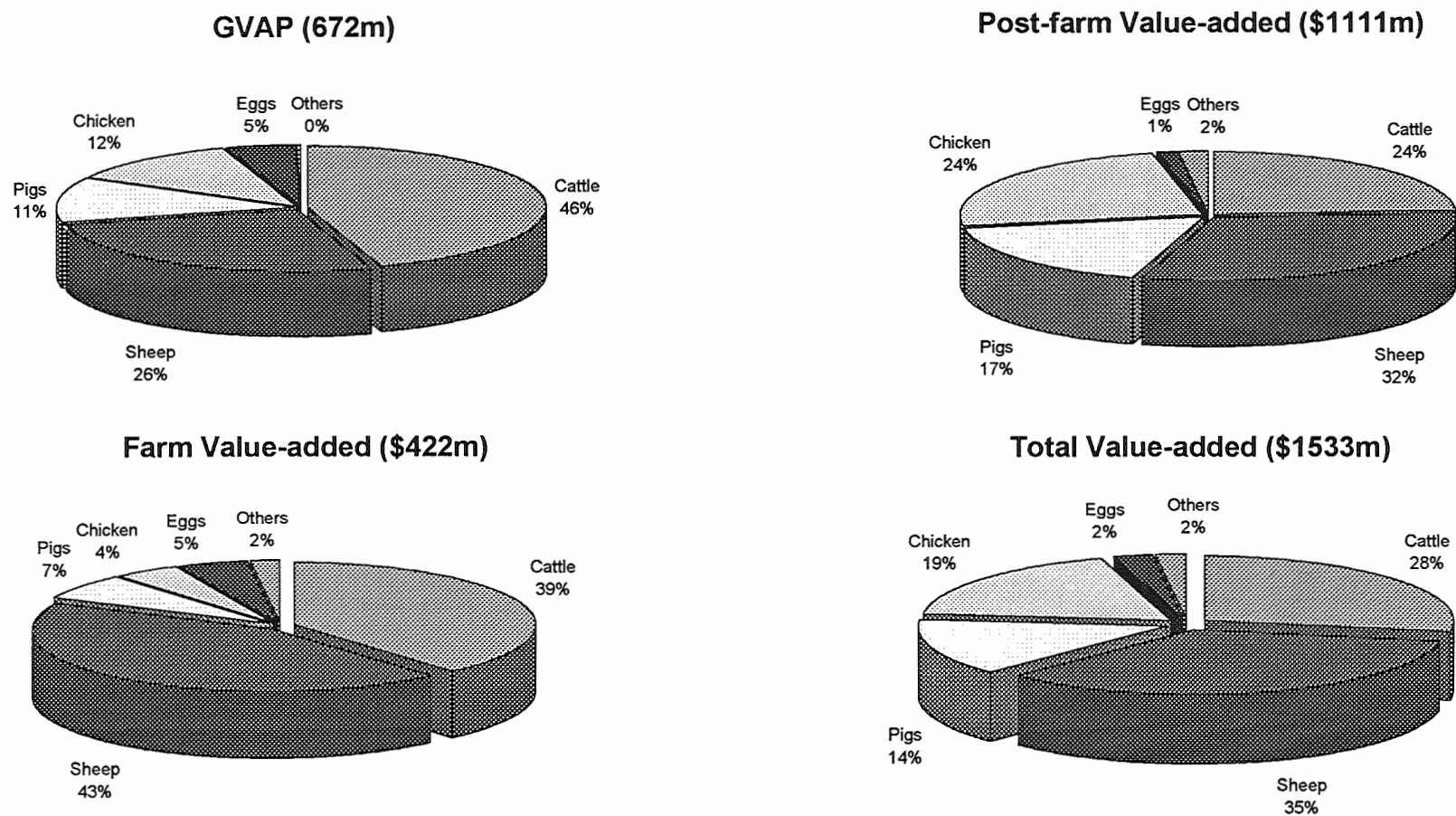




**FIGURE C5**  
**OVERVIEW OF THE EGG INDUSTRY VALUE CHAIN**



**FIGURE C6**  
**MEAT INDUSTRY VALUES IN WESTERN AUSTRALIA**



# Value added contribution of agricultural commodities

**TABLE C3**  
**WESTERN AUSTRALIAN BEEF INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers	Feedlot	Abattoir	Other meat processing	Tannery	Wholesale	Retail	Meat exports	Live animal exports	Total
Inputs from other sectors		0	136,844	367,312	8,690	37,695	29,821	201,154	219,011	59,510	1,060,037
Inputs from external source		255,356	50,748	82,470	4,724	9,210	3,612	215,049	61,005	49,074	731,249
<b>Total Inputs</b>		<b>255,356</b>	<b>187,592</b>	<b>449,782</b>	<b>13,415</b>	<b>46,905</b>	<b>33,433</b>	<b>416,203</b>	<b>280,017</b>	<b>108,584</b>	<b>1,791,286</b>
Outputs to other sectors		337,960	204,373	446,471	3,384	0	10,597	0	0	0	1,002,786
Outputs to external destination		5,154	2,699	5,611	19,874	52,498	29,757	441,230	297,739	119,020	973,581
<b>Total Output</b>		<b>343,114</b>	<b>207,072</b>	<b>452,082</b>	<b>23,258</b>	<b>52,498</b>	<b>40,354</b>	<b>441,230</b>	<b>297,739</b>	<b>119,020</b>	<b>1,976,366</b>
<b>Profits</b>		<b>87,758</b>	<b>19,480</b>	<b>2,300</b>	<b>9,844</b>	<b>5,593</b>	<b>6,921</b>	<b>25,026</b>	<b>17,723</b>	<b>10,436</b>	<b>185,080</b>
Wages and salaries		22,199	1,599	40,163	743	337	63	103,273	469	1,864	170,710
Rents and interests		35,383	0	0	0	0	0	44,847	0	0	80,230
<b>VALUE ADDED</b>		<b>145,339</b>	<b>21,079</b>	<b>42,463</b>	<b>10,587</b>	<b>5,930</b>	<b>6,985</b>	<b>173,147</b>	<b>18,192</b>	<b>12,299</b>	<b>436,020</b>

**TABLE C4**  
**WESTERN AUSTRALIAN *SHEEP* MEAT INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers	Abattoir	Other meat processing	Tannery	Wholesale	Retail	Meat exports	Live animal exports	Total
Inputs from other sectors		0	116,745	35,810	37,669	21,186	114,653	108,742	118,700	553,505
Inputs from external source		82,318	107,541	39,837	48,486	2,023	147,940	35,531	101,863	565,539
<b>Total Inputs</b>		<b>82,318</b>	<b>224,286</b>	<b>75,647</b>	<b>86,155</b>	<b>23,209</b>	<b>262,593</b>	<b>144,274</b>	<b>220,563</b>	<b>1,119,044</b>
Outputs to other sectors		234,121	263,961	6,495	0	22,646	0	0	0	527,223
Outputs to external destination		0	9,251	81,889	103,345	1,785	308,481	144,917	245,818	895,486
<b>Total Output</b>		<b>234,121</b>	<b>273,212</b>	<b>88,384</b>	<b>103,345</b>	<b>24,431</b>	<b>308,481</b>	<b>144,917</b>	<b>245,818</b>	<b>1,422,709</b>
<b>Profits</b>		<b>151,804</b>	<b>48,926</b>	<b>12,737</b>	<b>17,190</b>	<b>1,222</b>	<b>45,887</b>	<b>643</b>	<b>25,255</b>	<b>185,080</b>
Wages and salaries		19,140	74,828	7,829	20,191	568	64,957	1,605	0	189,117
Rents and interests		16,729	1,919	0	0	0	25,385	1,124	1,616	46,772
<b>VALUE ADDED</b>		<b>187,673</b>	<b>125,673</b>	<b>20,566</b>	<b>37,381</b>	<b>1,790</b>	<b>136,228</b>	<b>3,372</b>	<b>26,872</b>	<b>539,555</b>

**TABLE C5**  
**WESTERN AUSTRALIAN *PIG* MEAT INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs \ Sectors	Growers	Stock agents	Abattoir	Other meat processing	Wholesale	Retail	Food services	Exports	Total
Inputs from other sectors	0	10,707	195,587	43,984	43,368	99,919	60,200	2,830	456,595
Inputs from external source	92,534	1,388	21,716	5,233	7,327	47,855	7,189	1,111	184,353
<b>Total Inputs</b>	<b>92,534</b>	<b>12,095</b>	<b>217,303</b>	<b>49,217</b>	<b>50,695</b>	<b>147,774</b>	<b>67,389</b>	<b>3,941</b>	<b>640,948</b>
Outputs to other sectors	92,861	12,236	227,129	64,169	60,200	0	0	0	456,595
Outputs to external destination	0	0	0	0	0	224,461	86,228	4,136	314,825
<b>Total Output</b>	<b>92,861</b>	<b>12,236</b>	<b>227,129</b>	<b>64,169</b>	<b>60,200</b>	<b>224,461</b>	<b>86,228</b>	<b>4,136</b>	<b>771,420</b>
<b>Profits</b>	<b>327</b>	<b>141</b>	<b>9,826</b>	<b>14,952</b>	<b>9,504</b>	<b>76,687</b>	<b>18,839</b>	<b>196</b>	<b>130,472</b>
Wages and salaries	4,070	694	12,950	3,497	3,435	28,385	3,594	555	57,181
Rents and interests	23,562	139	2,075	491	76	10,590	683	106	37,722
<b>VALUE ADDED</b>	<b>27,958</b>	<b>974</b>	<b>24,850</b>	<b>18,940</b>	<b>13,015</b>	<b>115,662</b>	<b>23,116</b>	<b>857</b>	<b>225,374</b>

**TABLE C6**  
**WESTERN AUSTRALIAN CHICKEN MEAT INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Hatchery	Growers	Processing	Distributors	Supermarkets	Fast food	Catering	Exports	Total
Inputs from other sectors	-	-	17,500	80,500	46,305	94,462	92,610	20,580	49	352,006
Inputs from external source	14,000	14,000	58,800	24,500	937	7,056	70,560	15,680	37	191,570
<b>Total Inputs</b>	<b>14,000</b>	<b>14,000</b>	<b>76,300</b>	<b>105,000</b>	<b>47,242</b>	<b>101,518</b>	<b>163,170</b>	<b>36,260</b>	<b>86</b>	<b>543,576</b>
Outputs to other sectors	17,500	17,500	80,500	205,849	48,157	-	-	-	-	352,006
Outputs to external destination	-	-	350	-	-	155,453	176,400	39,200	98	371,501
<b>Total Output</b>	<b>17,500</b>	<b>17,500</b>	<b>80,850</b>	<b>205,849</b>	<b>48,157</b>	<b>155,453</b>	<b>176,400</b>	<b>39,200</b>	<b>98</b>	<b>723,507</b>
<b>Profits</b>	<b>3,500</b>	<b>3,500</b>	<b>4,550</b>	<b>100,849</b>	<b>915</b>	<b>53,934</b>	<b>13,230</b>	<b>2,940</b>	<b>12</b>	<b>179,931</b>
Wages and salaries	3,500	3,500	2800	14,000	165	4410	48510	10,780	7	84,173
Rents and Interests	1,050	1,050	3500	8,750	331	441	13671	3,038	15	30,795
<b>VALUE ADDED</b>	<b>8,050</b>	<b>8,050</b>	<b>10,850</b>	<b>123,599</b>	<b>1,411</b>	<b>58,785</b>	<b>75,411</b>	<b>16,758</b>	<b>34</b>	<b>294,899</b>

**TABLE C7**  
**WESTERN AUSTRALIAN EGG INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers	Fresh eggs	Pulp eggs	Retail	Total
Inputs from other sectors		0	28,412	1,814	36,660	66,885
Inputs from external source		23,985	7,699	4,867	5,316	41,867
<b>Total Inputs</b>		<b>23,985</b>	<b>36,110</b>	<b>6,681</b>	<b>41,976</b>	<b>108,752</b>
Outputs to other sectors		30,225	36,660	0	0	66,885
Outputs to external destination		0	0	7,254	45,825	53,079
<b>Total Output</b>		<b>30,225</b>	<b>36,660</b>	<b>7,254</b>	<b>45,825</b>	<b>119,964</b>
<b>Profits</b>		<b>6,240</b>	<b>550</b>	<b>573</b>	<b>3,849</b>	<b>11,213</b>
Wages and salaries		13,845	3,849	2,434	2,750	22,877
Rents and Interests		585	733	632	1,100	3,050
<b>VALUE ADDED</b>		<b>20,670</b>	<b>5,132</b>	<b>3,639</b>	<b>7,699</b>	<b>37,140</b>

## **APPENDIX - D**

# **HORTICULTURE INDUSTRY**



## The Horticulture Industry Model

Six commodities are modelled for the Horticulture program. These are apples, bananas, carrots, cauliflowers, potatoes and wine. The GVAP of these six commodities comprise more than 67% of the total GVAP of the horticultural and floricultural crops produced in WA (Table D1). The value added results for these commodities are given in Table D2.

Each primary commodity was divided into a number of sectors depending on their processing and marketing chains from growers to consumers. In general these sectors are: farm, packing house, processing and winery, wholesale, fresh market, retail, and exports.

**TABLE D1**  
**COMPOSITION OF THE HORTICULTURE INDUSTRY**

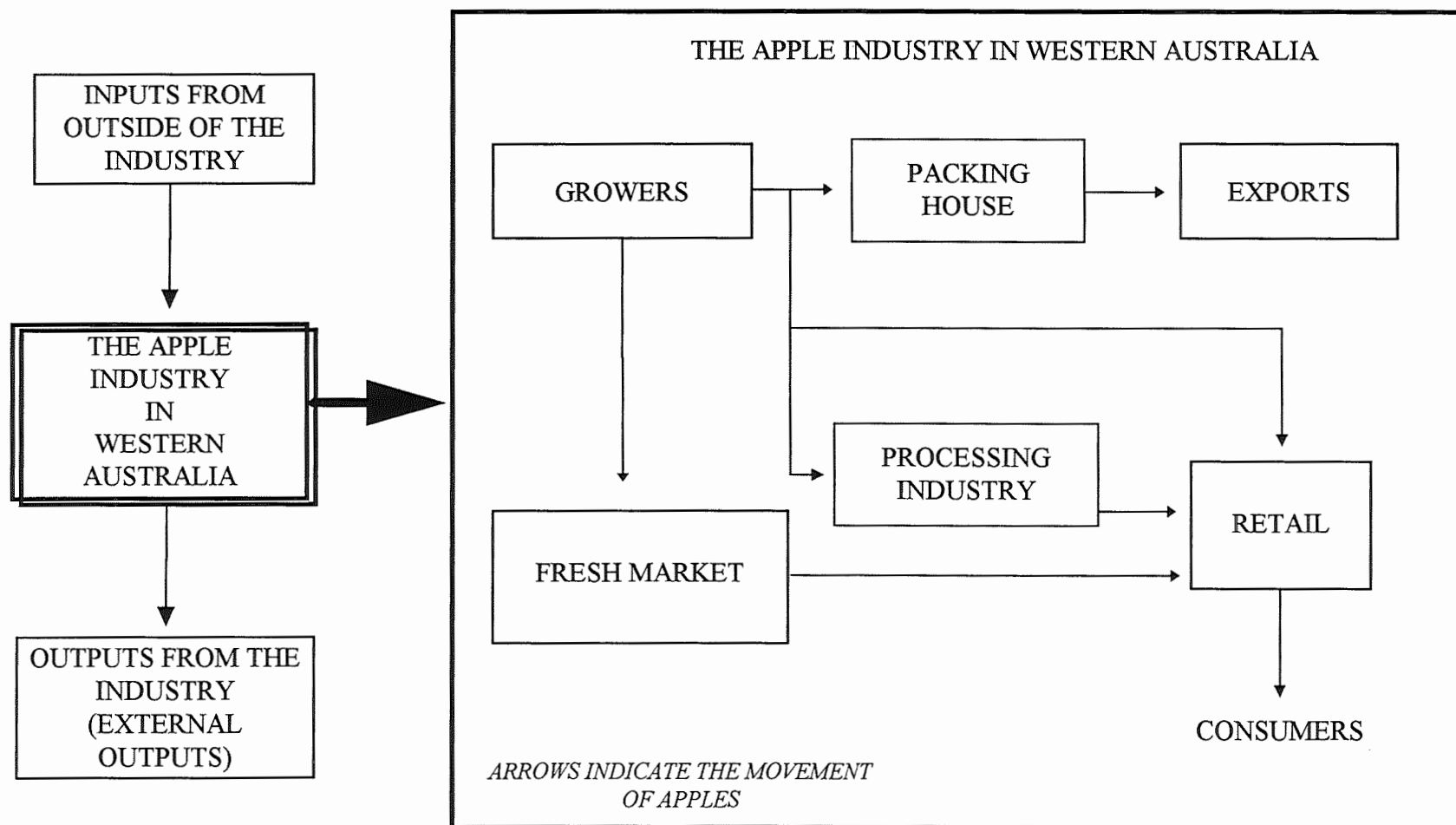
Industry programs	Commodities	GVAP (\$m)	% of total	Sectors	Data items
Horticulture	Apples	24	11	Farm	• Quantity and price of farm outputs.
	Bananas	17	8	Packing house	
	Carrots	31	15	Processing + winery	• Quantity and price of major inputs such as labour, rents, interests.
	Cauliflowers	20	9	Whole sale	
	Potatoes	37	18	Fresh market	• Product turn-off rates.
	Wine	12	6	Retail	
				Exports	• Product conversion factors.

The overview of the value chain of these industries are given in flow diagrams in Figures D1 to D6 and their share of values is compared in Figure D7. The value chain summary results are presented in Tables D3 to D8.

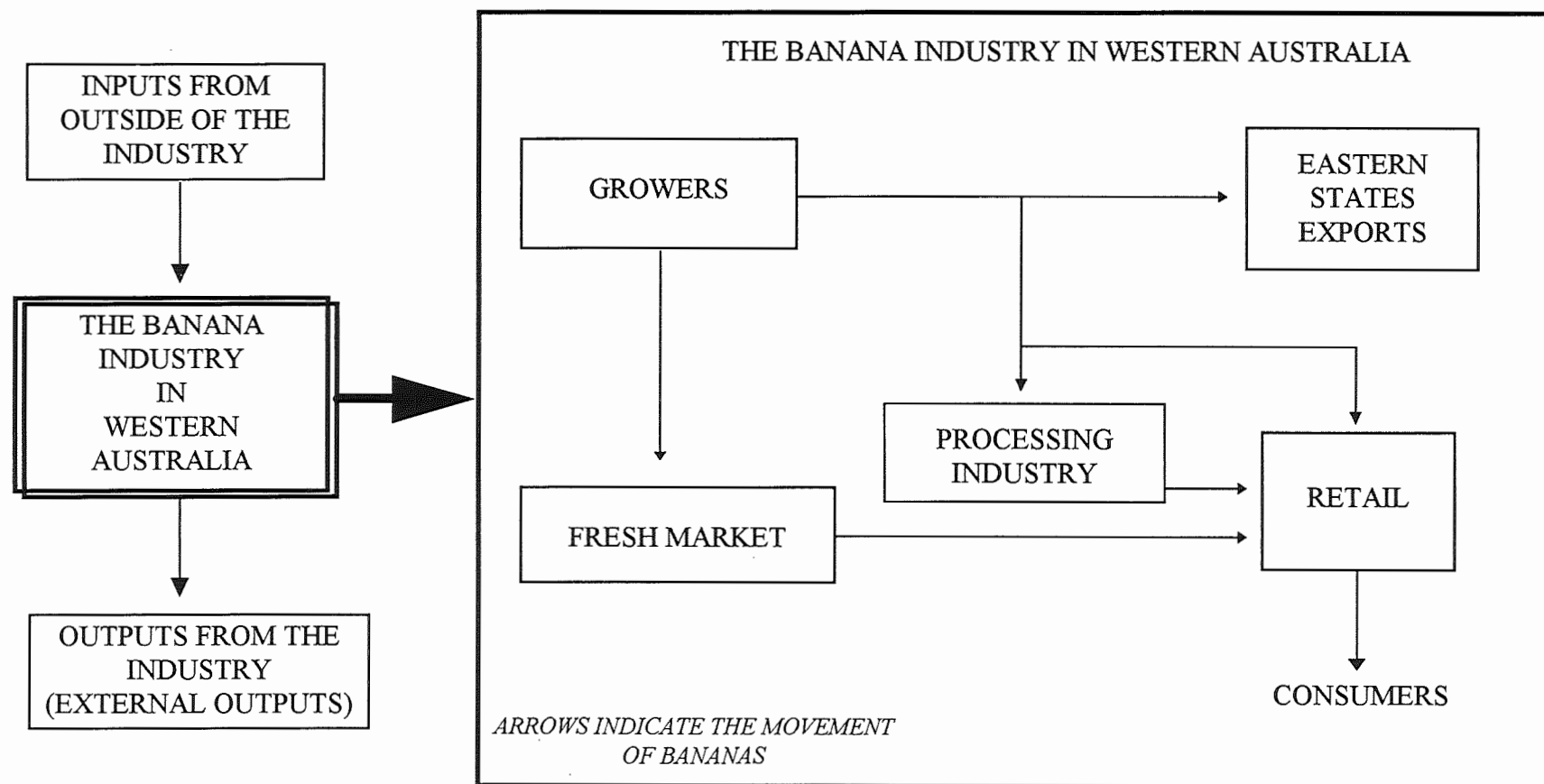
**TABLE D2**  
**WA HORTICULTURE-INDUSTRY VALUE ADDED**

Horticulture programs	1994/95					
	GVAP (\$'000)	Post farm value added (\$'000)	Farm value added (\$'000)	Total value added (\$'000)	Post farm value added per dollar of GVAP (\$)	Post farm value added per dollar of farm value added (\$)
Apples	23,700	19,190	11,671	30,861	0.81	1.64
Bananas	16,773	18,714	10,507	29,221	1.12	1.78
Carrots	31,100	9,169	10,535	19,704	0.29	0.87
Cauliflowers	19,500	5,862	11,277	17,139	0.30	0.52
Potatoes	37,300	107,262	21,854	129,117	2.88	4.91
Wine	12,100	91,977	9,069	101,046	7.60	10.14
Program total	140,473	252,174	74,914	327,088	1.80	3.37

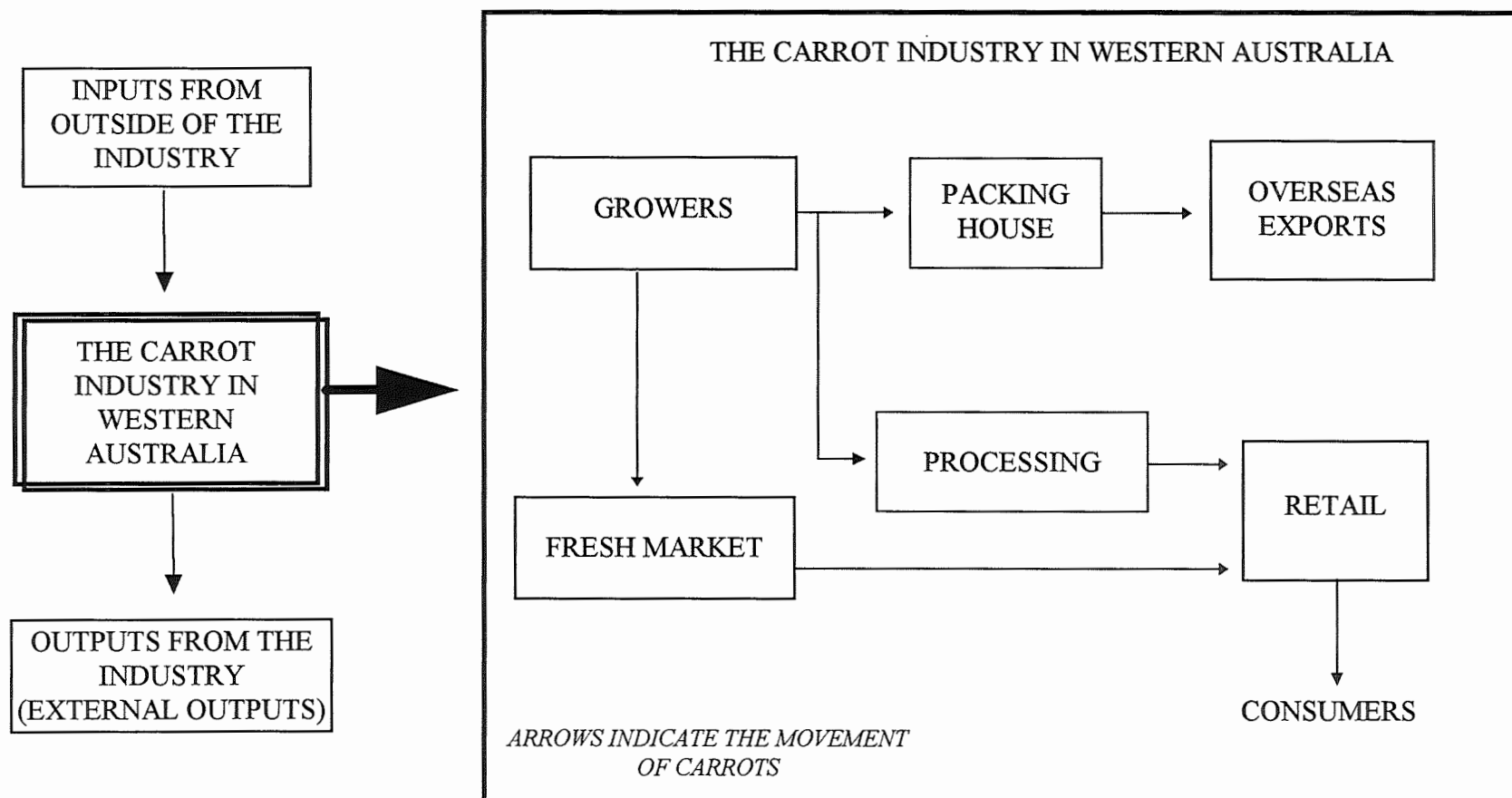
**FIGURE D1**  
**OVERVIEW OF THE *APPLE* INDUSTRY VALUE CHAIN**



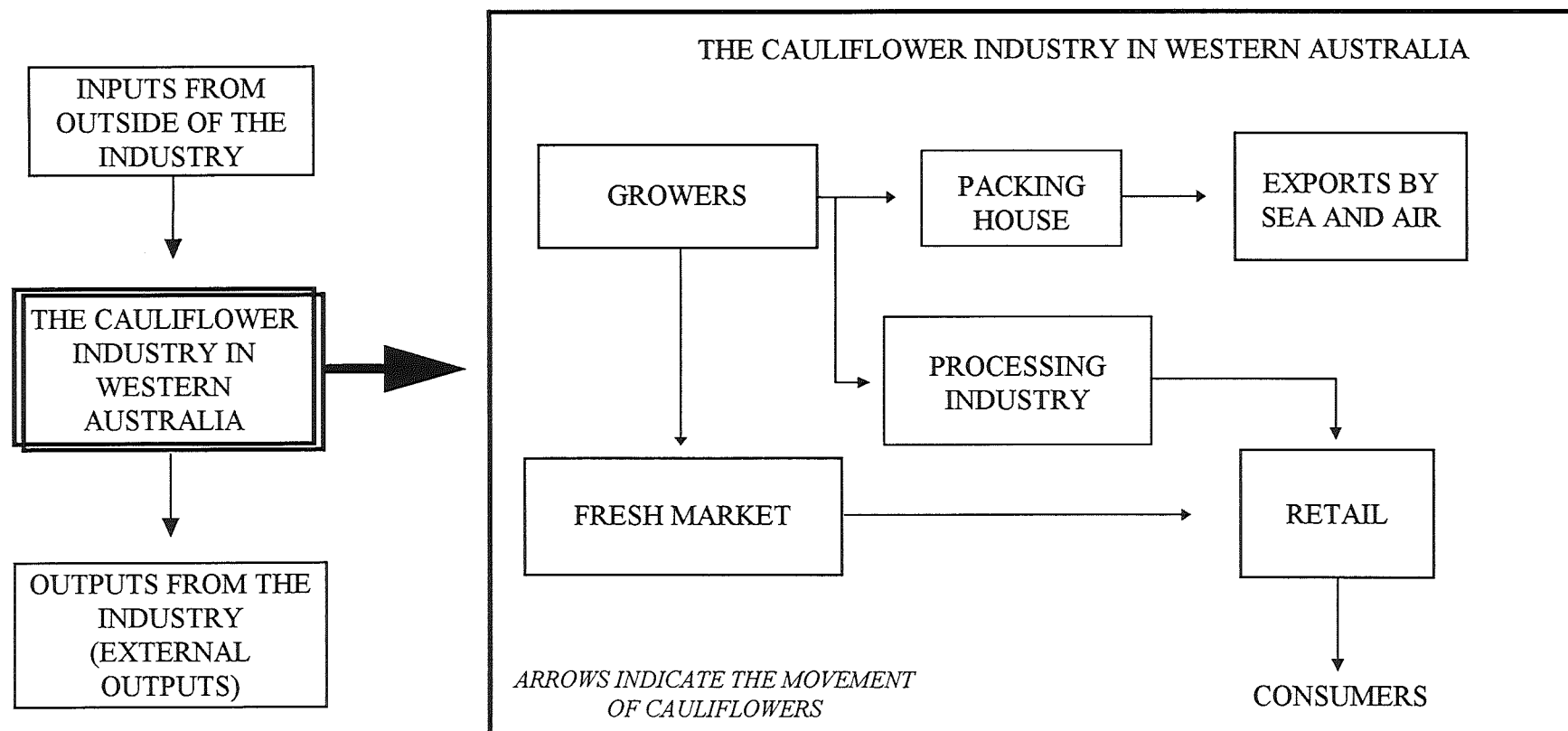
**FIGURE D2**  
**OVERVIEW OF THE BANANA INDUSTRY VALUE CHAIN**



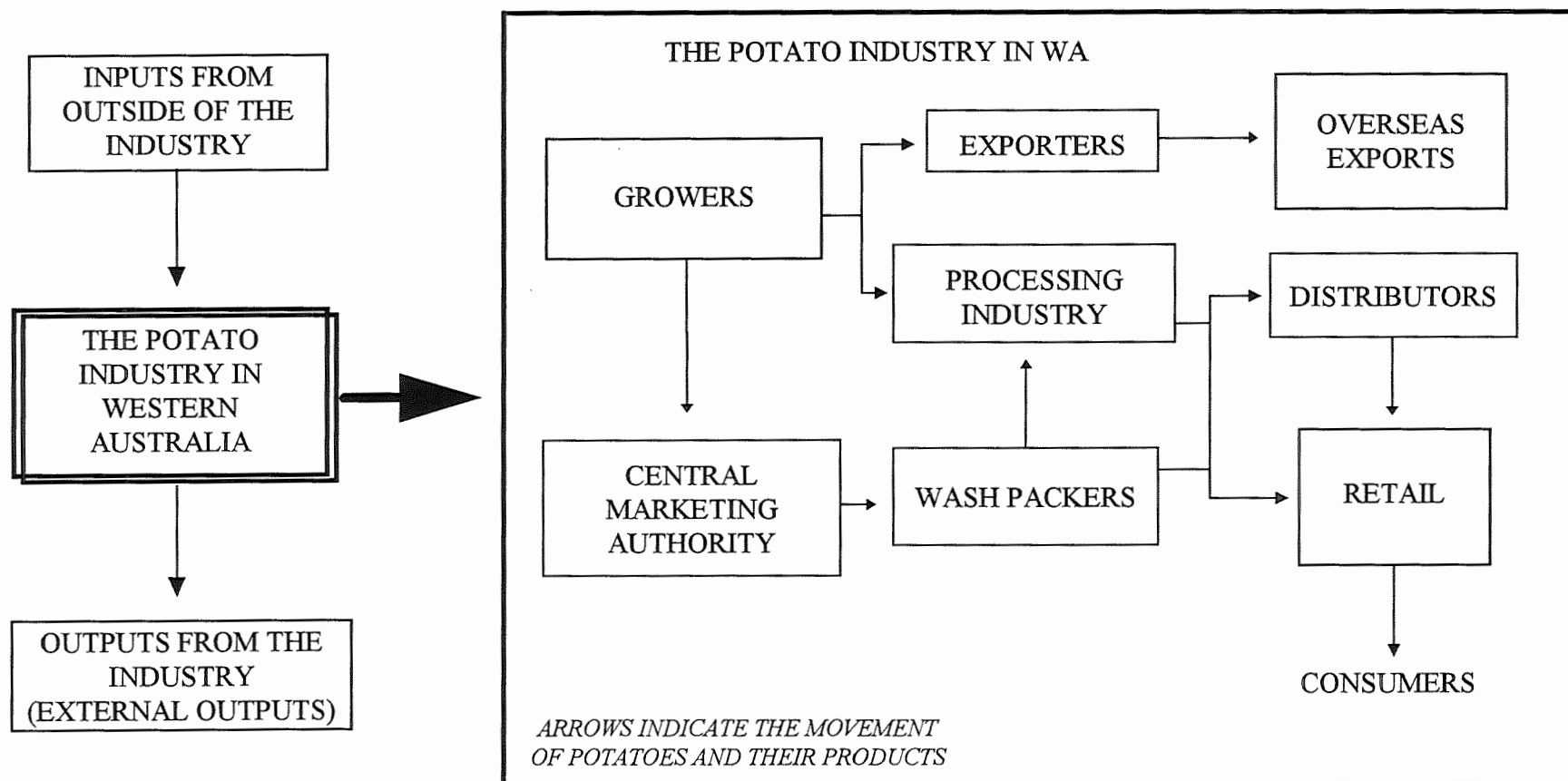
**FIGURE D3**  
**OVERVIEW OF THE CARROT INDUSTRY VALUE CHAIN**



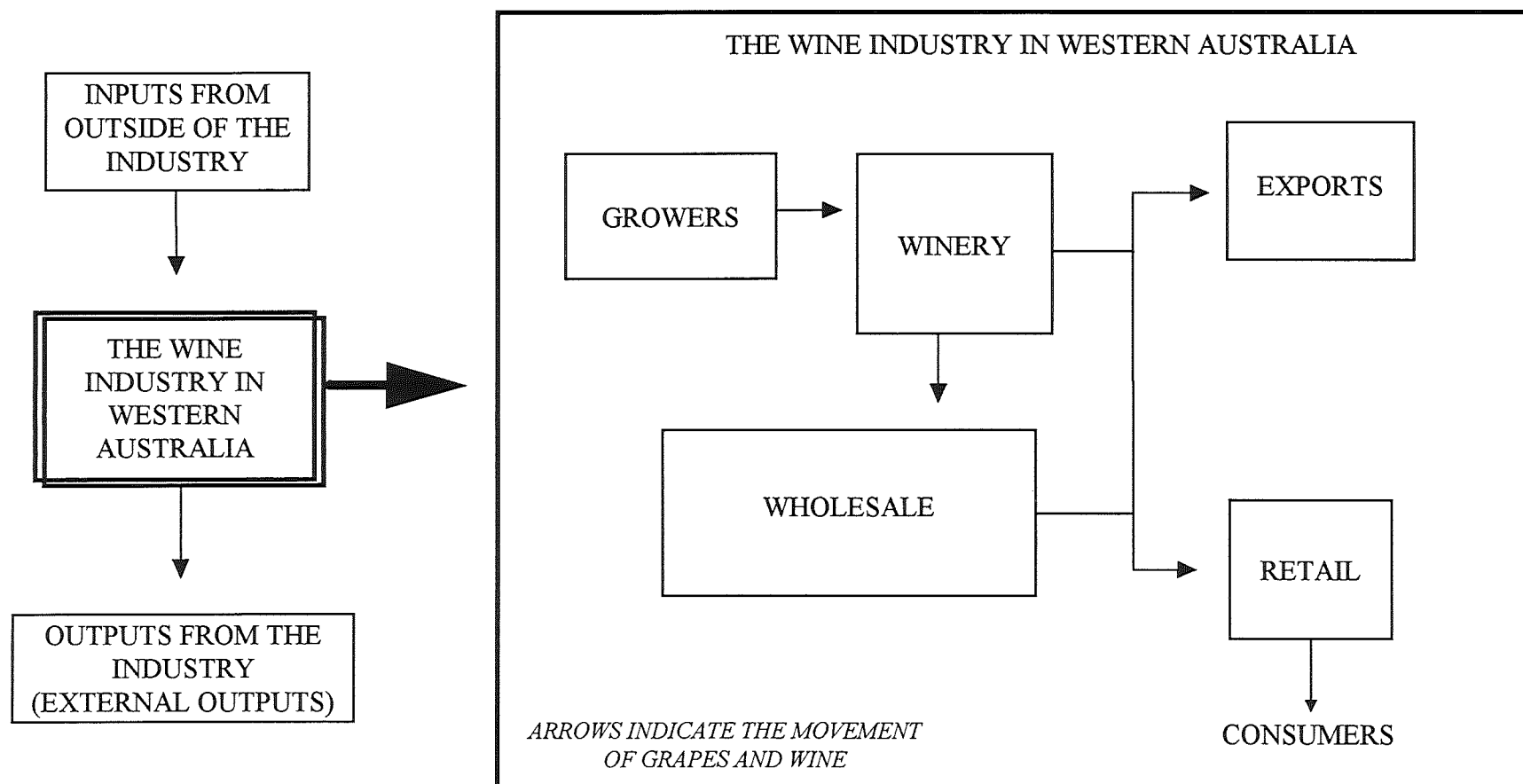
**FIGURE D4**  
**OVERVIEW OF THE CAULIFLOWER INDUSTRY VALUE CHAIN**



**FIGURE D5**  
**OVERVIEW OF THE *POTATO* INDUSTRY VALUE CHAIN**

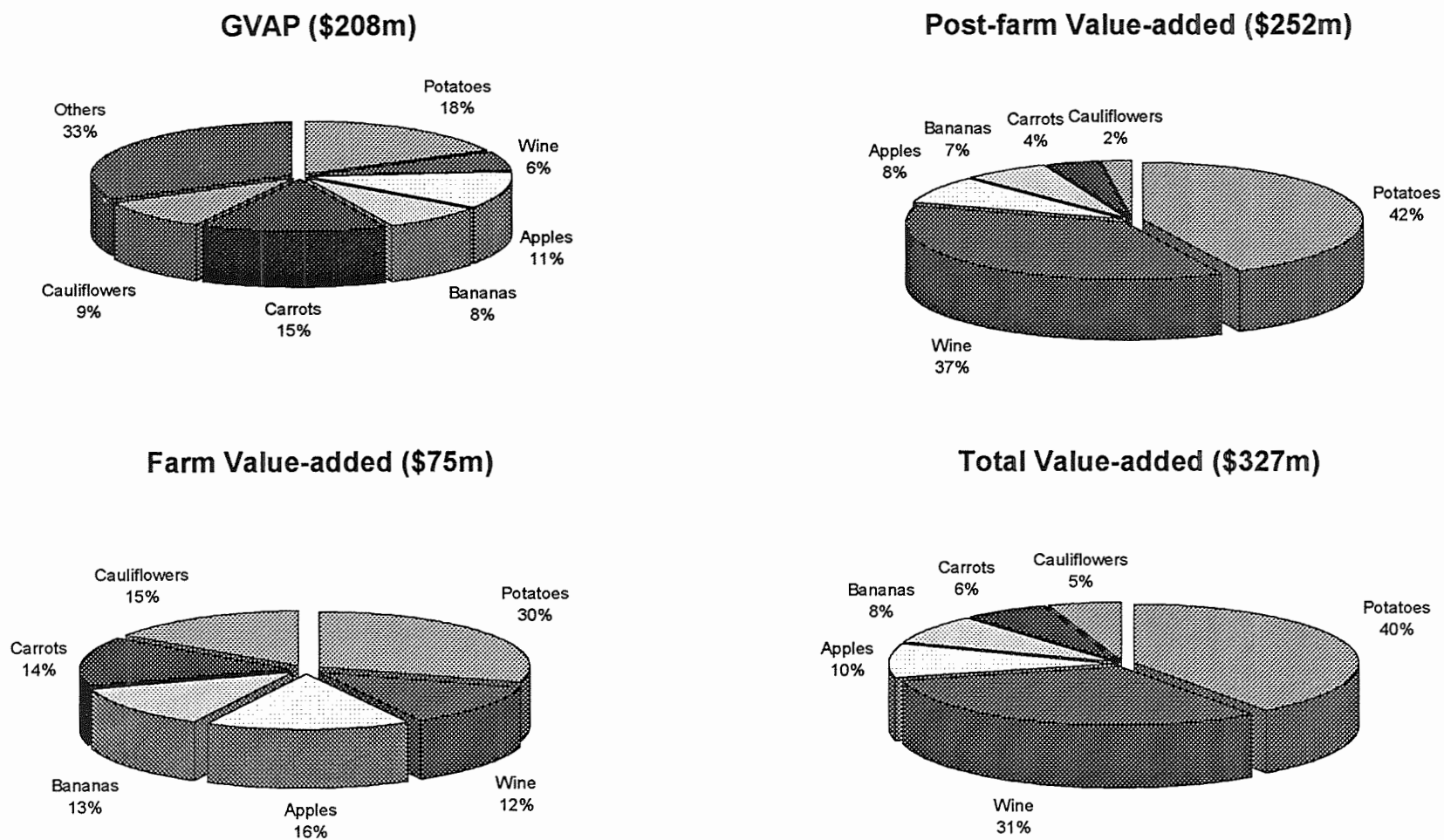


**FIGURE D6**  
**OVERVIEW OF THE *WINE* INDUSTRY VALUE CHAIN**





**FIGURE D7**  
**HORTICULTURE INDUSTRY VALUES IN WESTERN AUSTRALIA**



**TABLE D3**  
**WESTERN AUSTRALIAN *APPLE* INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs \ Sectors	Growers	Exports	Juicing	Fresh market	Retail	Eastern States exports	Total
Inputs from other sectors		4	897	20	24	2,101	3046
Inputs from external source	19,139	4,920	2,577	2,088	15,624	683	45,030
<b>Total Inputs</b>	<b>19,139</b>	<b>13,890</b>	<b>3,474</b>	<b>16,146</b>	<b>35,714</b>	<b>2,784</b>	<b>91,146</b>
Outputs to other sectors	26,026	0	3,767	16,323	0	0	46,116
Outputs to external destination	0	14,473	0	0	38,735	2,967	56,175
<b>Total Output</b>	<b>26,026</b>	<b>14,473</b>	<b>3,767</b>	<b>16,323</b>	<b>38,735</b>	<b>2,967</b>	<b>102,291</b>
<b>Profits</b>	<b>6,887</b>	<b>583</b>	<b>294</b>	<b>177</b>	<b>3,021</b>	<b>183</b>	<b>11,145</b>
Wages and salaries	4,019	292	1,288	1,044	7,812	91	14,545
Rents and interests	765	411	330	215	3,393	56	5,171
<b>VALUE ADDED</b>	<b>11,671</b>	<b>1,286</b>	<b>1,912</b>	<b>1,436</b>	<b>14,226</b>	<b>330</b>	<b>30,861</b>

**TABLE D4**  
**WESTERN AUSTRALIAN BANANA INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers (Kununurra)	Growers (Carnarvon)	Fresh market	Processing	Retail	Total
Inputs from other sectors				17,279	198	20,537	38,013
Inputs from external source		5,525	11,134	2,005	468	17,861	36,994
<b>Total Inputs</b>		<b>5,525</b>	<b>11,134</b>	<b>19,284</b>	<b>665</b>	<b>38,398</b>	<b>75,007</b>
Outputs to other sectors		6,119	11,710	19,753	790	0	38,372
Outputs to external destination		255	239	0	0	41,074	41,568
<b>Total Output</b>		<b>6,374</b>	<b>11,949</b>	<b>19,753</b>	<b>790</b>	<b>41,074</b>	<b>79,940</b>
<b>Profits</b>		<b>848</b>	<b>815</b>	<b>470</b>	<b>125</b>	<b>2,676</b>	<b>4,933</b>
Wages and salaries		2,410	4,795	1,002	234	10,103	18,544
Rents and interests		616	1,022	191	75	3,839	5,743
<b>VALUE ADDED</b>		<b>3,874</b>	<b>6,633</b>	<b>1,663</b>	<b>434</b>	<b>16,617</b>	<b>29,221</b>

**TABLE D5**  
**WESTERN AUSTRALIAN CARROT INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs \ Sectors	Growers	Fresh market	Retail	Exports	Total
Inputs from other sectors		3,609	4,229	11,854	19,692
Inputs from external source	7,823	571	3,569	15,659	27,622
<b>Total Inputs</b>	<b>7,823</b>	<b>4,180</b>	<b>7,798</b>	<b>27,514</b>	<b>47,314</b>
Outputs to other sectors	15,464	4,229	0	0	19,692
Outputs to external destination		0	8,457	28,241	36,699
<b>Total Output</b>	<b>15,464</b>	<b>4,229</b>	<b>8,457</b>	<b>28,241</b>	<b>56,391</b>
<b>Profits</b>	<b>7,641</b>	<b>48</b>	<b>660</b>	<b>728</b>	<b>9,077</b>
Wages and salaries	2,347	286	1,784	2,266	6,683
Rents and interests	548	54	741	2,602	3,945
<b>VALUE ADDED</b>	<b>10,535</b>	<b>388</b>	<b>3,185</b>	<b>5,596</b>	<b>19,704</b>

**TABLE D6**  
**WESTERN AUSTRALIAN CAULIFLOWER INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers	Fresh market	Processor	Retail	Export by air	Exports by sea	Total
Inputs from other sectors			1,387	377	2,962	922	8,643	14,290
Inputs from external source		3,204	208	866	1,771	1,266	5,877	13,193
<b>Total Inputs</b>		<b>3,204</b>	<b>1,595</b>	<b>1,243</b>	<b>4,733</b>	<b>2,188</b>	<b>14,520</b>	<b>27,484</b>
Outputs to other sectors		11,328	1,613	1,349	0	0	0	14,290
Outputs to external destination		0	0	0	5,396	2,355	16,049	23,801
<b>Total Output</b>		<b>11,328</b>	<b>1,613</b>	<b>1,349</b>	<b>5,396</b>	<b>2,355</b>	<b>16,049</b>	<b>38,091</b>
<b>Profits</b>		<b>8,124</b>	<b>18</b>	<b>105</b>	<b>663</b>	<b>167</b>	<b>1,530</b>	<b>10,607</b>
Wages and salaries		2,713	104	260	886	82	765	4,810
Rents and interests		440	20	118	473	122	550	1,722
<b>VALUE ADDED</b>		<b>11,277</b>	<b>142</b>	<b>483</b>	<b>2,021</b>	<b>370</b>	<b>2,845</b>	<b>17,139</b>

**TABLE D7**  
**WESTERN AUSTRALIAN *POTATO* INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers	Wholesale	Processing	Distribution	Retail	Fastfood	Exports	Total
Inputs from other sectors		0	43,758	10,951	3,325	102,527	15,857	3,321	179,737
Inputs from external source		20,231	20,483	62,007	101	35,140	13,807	4,709	156,478
<b>Total Inputs</b>		<b>20,231</b>	<b>64,240</b>	<b>72,957</b>	<b>3,426</b>	<b>137,667</b>	<b>29,664</b>	<b>8,029</b>	<b>336,215</b>
Outputs to other sectors		34,974	66,220	78,118	3,463	0	425	0	183,201
Outputs to external destination		0	0	0	0	147,807	31,798	9,198	188,803
<b>Total Output</b>		<b>34,974</b>	<b>66,220</b>	<b>78,118</b>	<b>3,463</b>	<b>147,807</b>	<b>32,223</b>	<b>9,198</b>	<b>372,003</b>
<b>Profits</b>		<b>14,743</b>	<b>1,980</b>	<b>5,160</b>	<b>38</b>	<b>10,140</b>	<b>2,559</b>	<b>1,169</b>	<b>35,789</b>
Wages and salaries		6,162	14,468	17,470	63	17,570	6,892	613	63,239
Rents and interests		949	4,303	6,842	38	14,716	2,799	442	30,089
<b>VALUE ADDED</b>		<b>21,854</b>	<b>20,751</b>	<b>29,473</b>	<b>139</b>	<b>42,426</b>	<b>12,250</b>	<b>2,224</b>	<b>129,117</b>

**TABLE D8**  
**WESTERN AUSTRALIAN *WINE* INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Grower	Winery	Wholesaler	Retail	Exports	Eastern States	Total
Inputs from other sectors		0	11,404	18,626	35,491	9,848	49,021	124,390
Inputs from external source		5,201	48,525	10,803	21,427	816	1,172	87,944
<b>Total Inputs</b>		<b>5,201</b>	<b>59,929</b>	<b>29,429</b>	<b>56,918</b>	<b>10,664</b>	<b>50,193</b>	<b>212,335</b>
Outputs to other sectors		11,404	82,464	30,523	0	0	0	124,390
Outputs to external destination		0	7,257	0	62,057	11,526	50,193	131,033
<b>Total Output</b>		<b>11,404</b>	<b>89,721</b>	<b>30,523</b>	<b>62,057</b>	<b>11,526</b>	<b>50,193</b>	<b>255,423</b>
<b>Profits</b>		<b>6,203</b>	<b>29,792</b>	<b>1,094</b>	<b>5,139</b>	<b>862</b>	<b>0</b>	<b>43,088</b>
Wages and salaries		1,561	30,237	2,448	2,570	138	552	37,506
Rents and interests		1,305	1,209	639	16,897	263	138	20,451
<b>VALUE ADDED</b>		<b>9,069</b>	<b>61,239</b>	<b>4,180</b>	<b>24,606</b>	<b>1,263</b>	<b>689</b>	<b>101,046</b>

## **APPENDIX - E**

# **DAIRY INDUSTRY**



## The Dairy Industry Model

Only milk is used for the dairy industry value chain model. Given the production and market structure of WA dairy industry (see DIA Annual Report (1995) for the detail about milk production and marketing systems in WA) milk was divided into two types of commodities, market (white) and manufacturing milk. The model covers 100% of the GVAP of milk produced in WA. About 61% of this value is shared by the market milk production (Table E1). The value added results are presented in Table E2.

**TABLE E1**  
**COMPOSITION OF THE DAIRY INDUSTRY**

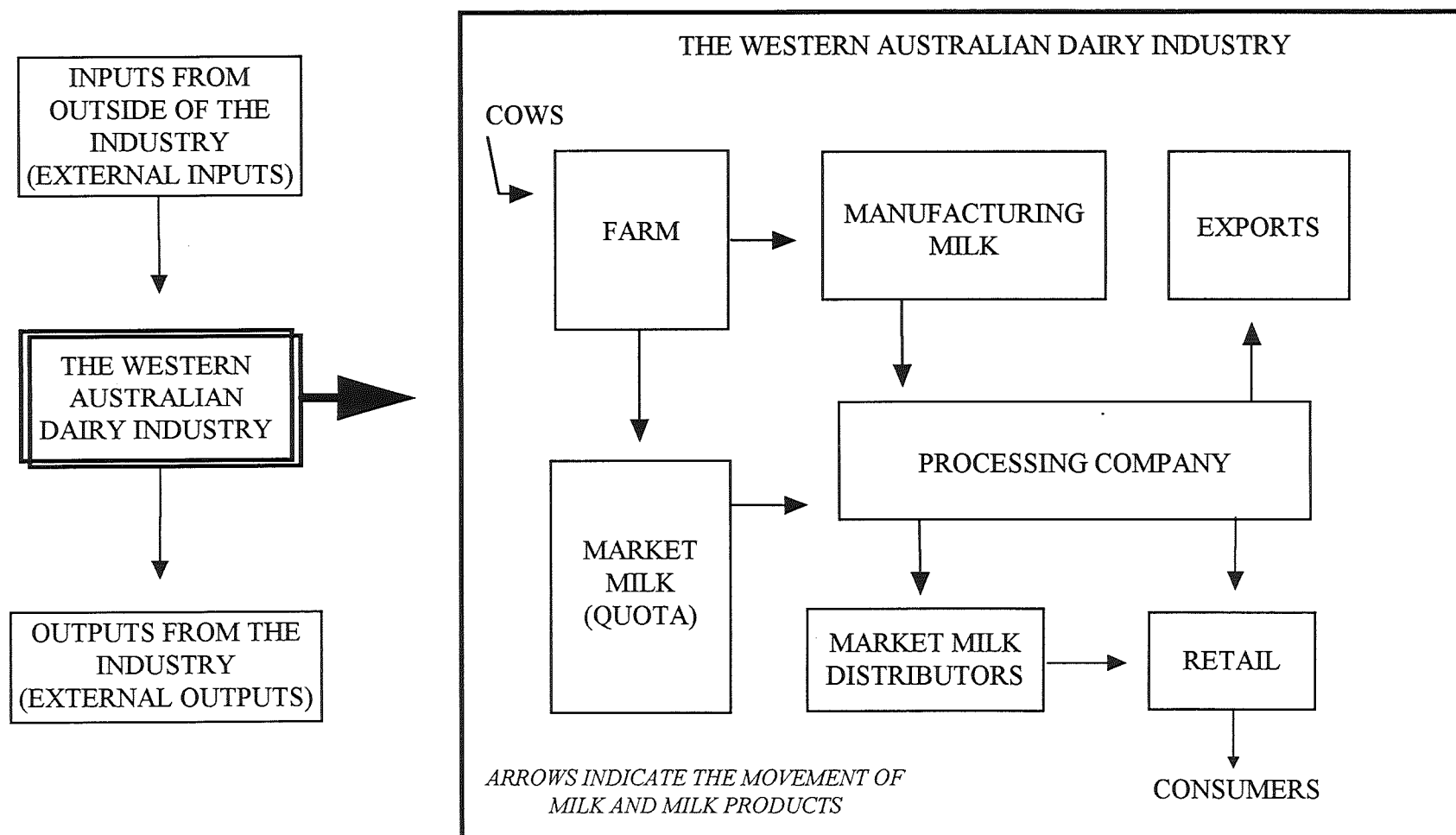
Industry programs	Commodities	GVAP (\$m)	% of total	Sectors	Data items
Dairy and Apiculture	Fresh milk	77	61	Farm	• Quantity and price of farm outputs.
	Manufacturing milk	49	39	Processing Distributor Retail Exports	• Quantity and price of major inputs such as labour, rents, interests. • Product turn-off rates. • Product conversion factors.

The industry value added was estimated by dividing the industry into farm, processing, distributor, retail, and exports sectors. The overview of the value chain of these industries are given in flow diagrams in Figure E1. The value chain summary results are given in Table E3.

**TABLE E2**  
**WA DAIRY INDUSTRY VALUE ADDED**

Dairy program	1994/95					
	GVAP (\$'000)	Post farm value added (\$'000)	Farm value added (\$'000)	Total value added (\$'000)	Post farm value added per dollar of GVAP (\$)	Post farm value added per dollar of farm value added (\$)
Fresh milk	77,421	73,719	64,968	138,687	0.95	1.13
Manufacturing milk	48,779	79,044	7,659	86,703	1.62	10.32
Program total	126,200	152,763	72,627	225,390	1.21	2.10

**FIGURE E1**  
**OVERVIEW OF THE *DAIRY* INDUSTRY VALUE CHAIN**



**TABLE E3**  
**WESTERN AUSTRALIAN DAIRY INDUSTRY VALUE CHAIN SUMMARY (\$'000)**

Inputs/Outputs	Sectors	Growers	Processing market milk	Processing manufacturing milk	Distribution market milk	Retail market milk	Retail manufacturing milk	Exports	Total
Inputs from other sectors		0	66,584	41,951	132,026	149,095	83,487	27,079	500,221
Inputs from external source		93,678	47,505	58,106	6,230	6,230	9,087	1,468	222,305
<b>Total Inputs</b>		<b>93,678</b>	<b>114,089</b>	<b>100,057</b>	<b>138,256</b>	<b>155,325</b>	<b>92,574</b>	<b>28,547</b>	<b>722,526</b>
Outputs to other sectors		108,535	132,026	110,565	149,095	0	0	0	500,221
Outputs to external destination		30,884	0	0	0	181,578	121,935	42,017	376,414
<b>Total Output</b>		<b>139,419</b>	<b>132,026</b>	<b>110,565</b>	<b>149,095</b>	<b>181,578</b>	<b>121,935</b>	<b>42,017</b>	<b>876,635</b>
<b>Profits</b>		<b>45,741</b>	<b>17,937</b>	<b>10,508</b>	<b>10,838</b>	<b>26,254</b>	<b>29,361</b>	<b>13,470</b>	<b>154,109</b>
Wages and salaries		16,260	15,575	19,051	1,558	1,558	2,272	245	56,518
Rents and interests		10,626	0	3,810	0	0	0	326	14,762
<b>VALUE ADDED</b>		<b>72,627</b>	<b>33,513</b>	<b>33,370</b>	<b>12,396</b>	<b>27,811</b>	<b>31,633</b>	<b>14,041</b>	<b>225,390</b>

## **APPENDIX - F**

# **WOOL INDUSTRY**

## The Wool Industry Model

Wool is the only primary product modelled for the wool industry program. The model covers 100% of the GVAP of wool produced in WA (Table F1). In terms of GVAP wool is the second largest primary industry. The value added results are given in Table F2.

**TABLE F1**  
**COMPOSITION OF THE WOOL INDUSTRY**

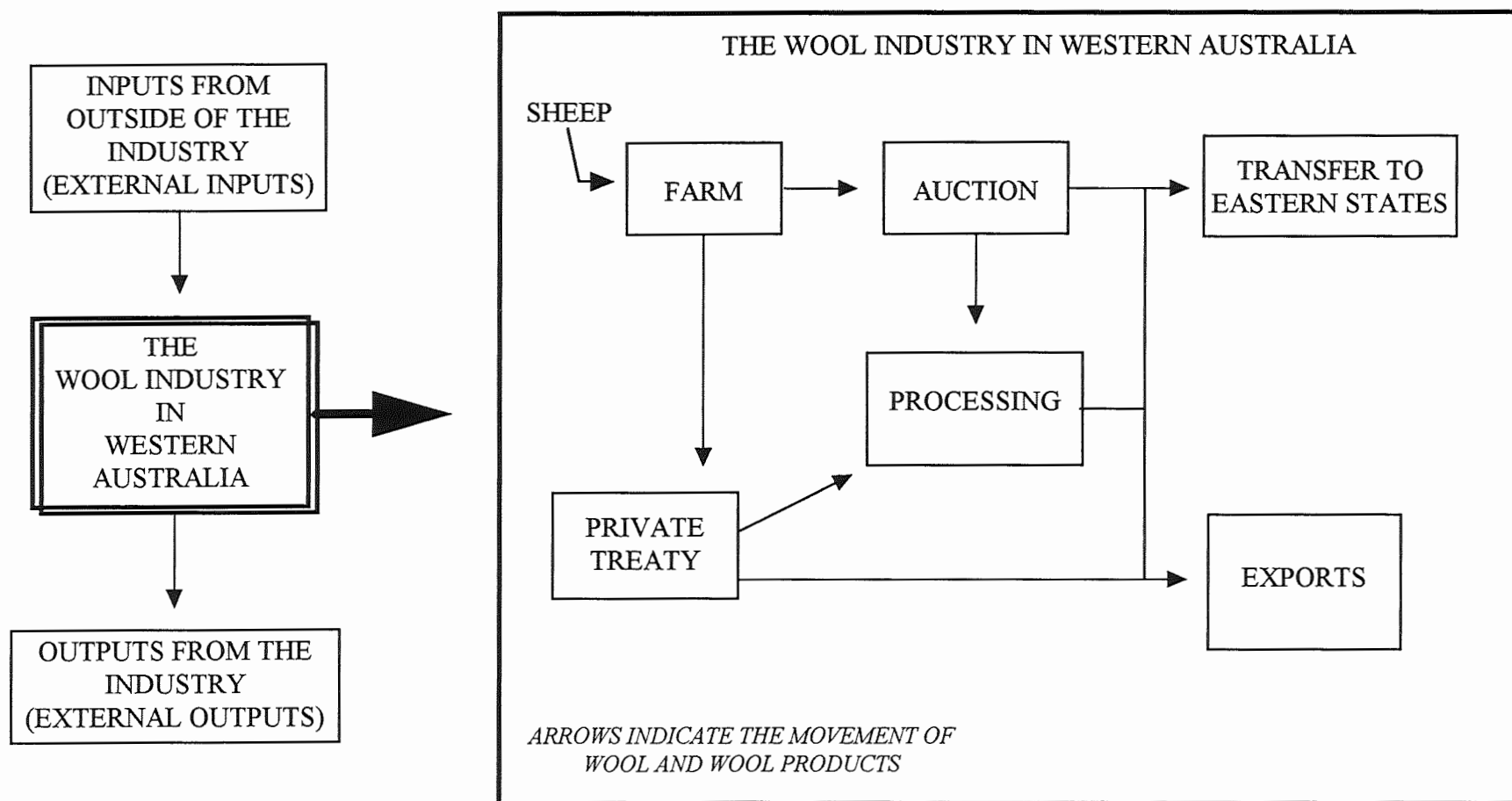
Industry programs	Commodities	GVAP (\$m)	% of total	Sectors	Data items
Wool	Wool	811	100	Farm Private treaty Auction Processing Exports	<ul style="list-style-type: none"> <li>Quantity and price of farm outputs.</li> <li>Quantity and price of major inputs such as labour, rents, interests.</li> <li>Product turn-off rates.</li> <li>Product conversion factors.</li> </ul>

The industry was divided into farm, private-treaty, auction, processing, and export sectors by considering the processing and marketing chains of wool from growers to exports. The overview of the value chain of this industries is given in a flow diagram in Figure F1 and the value chain summary results are given in Table F3.

**TABLE F2**  
**WA WOOL INDUSTRY VALUE ADDED**

Wool program	1994/95					
	GVAP (\$'000)	Post farm value added (\$'000)	Farm value added (\$'000)	Total value added (\$'000)	Post farm value added per dollar of GVAP (\$)	Post farm value added per dollar of farm value added (\$)
Wool	811,200	137,609	345,166	482,775	0.17	0.40
Program total	811,200	137,609	345,166	482,775	0.17	0.40

**FIGURE F1**  
**OVERVIEW OF THE *WOOL* VALUE CHAIN**



**TABLE F3**  
**WESTERN AUSTRALIAN WOOL INDUSTRY VALUE CHAIN SUMMARY (IN '000 \$)**

Inputs/Outputs	Sectors	Growers	Auction	Private treaty	Processing	Eastern States exports	Exports	Total
Inputs from other sectors		0	497,385	124,346	172,566	34,513	729,708	1,558,518
Inputs from external source		409,648	41,284	10,321	62,863	1,849	56,207	582,173
<b>Total Inputs</b>		<b>409,648</b>	<b>538,669</b>	<b>134,667</b>	<b>235,429</b>	<b>36,362</b>	<b>785,915</b>	<b>2,140,691</b>
Outputs to other sectors		621,731	552,211	138,053	246,523	0	338,690	1,897,207
Outputs to external destination		0	0	0	0	45,196	465,928	511,124
<b>Total Output</b>		<b>621,731</b>	<b>552,211</b>	<b>138,053</b>	<b>246,523</b>	<b>45,196</b>	<b>804,618</b>	<b>2,408,331</b>
<b>Profits</b>		<b>212,082</b>	<b>13,542</b>	<b>3,386</b>	<b>11,094</b>	<b>8,834</b>	<b>18,703</b>	<b>267,640</b>
Wages and salaries		70,020	6,574	1,643	31,637	904	28,104	138,882
Rents and interests		63,064	789	197	5,752	205	6,245	76,253
<b>VALUE ADDED</b>		<b>345,166</b>	<b>20,905</b>	<b>5,226</b>	<b>48,483</b>	<b>9,943</b>	<b>53,052</b>	<b>482,775</b>



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