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**Measuring the Value of the Food Industry – A Revenue
Approach as applied to South Australia**

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1. Introduction

Although a multitude of measures, from a range of sources, are available to capture aspects of the agri-food industries, no single series allows analysts to undertake detailed comparative assessments of performance along particular food chains from production to processing and on to consumption.

Over 1999 and 2000, a team of economists working out of Primary Industries and Resources South Australia, developed and refined a methodology to derive food revenues by tracking volume and value estimates of food along points of the value chain. This analysis provides accurate and up-to-date information to both measure the performance of South Australia's agri-food industries over time, as well as to assisting in the development of programs designed to assist in their expansion. The results of this work are presented in an easy to use and understand summary reference called the *ScoreCard*. This summary reference is updated on an annual financial year basis at both a State as well as regionally disaggregated basis.

This paper discusses the outcomes of this work, looks at the criteria, methodology and broader uses of the analysis. A brief discussion of the limitations of the available economic indicators covering the agri-food sectors is also presented. Two attachments defining the composition and sources of key aggregate indicators in the *ScoreCard* are also presented.

2. Background

In 1997 the South Australian Premier implemented a strategy to expand the revenue generated by the South Australian Food industry to \$15 billion by the year 2010. The expansion of the SA agri-food industry will be largely achieved through value-adding opportunities and enhanced exports and import replacement.

In order to meet the \$15 billion target set for the agri-food Industries by 2010, the program needs to understand the value of the industry, and how the value is changing over time.

As part of achieving this goal, the Food for the Future Program introduced a *ScoreCard* which contains a range of summary measures to evaluate the value of the contribution made by food and beverage to the economy, through the value chain from production to consumption.

In 1999-2000 the *ScoreCard* indicates that the gross value of the South Australian Food Industry is \$7.22 billion. This aggregate measure of gross food value is based on a revenue estimate of the final value of consumption added to exports. An additional measure called the net food revenue (currently \$6.25b), removes the value of imported food from the gross food value.

However, beyond these aggregate measures, the *ScoreCard* is an innovative tool, which unlike available 'output' or 'value added' measures, allows for detailed assessments and understandings of the flows within particular agri-food sectors.

The measures used within the *ScoreCard* are purposefully intended to be easy to understand, and therefore, accessible to a wide range of users. For example, the use of volume flows, prices and a combination of production, consumption and revenue measures, means that the analysis has particular reference to commercial users in understanding margins, identifying opportunities and developing markets.

3. Measuring the Agri-Food Sector - Criteria for Compiling the ScoreCard

The Food for the Future Program requires up-to-date, accurate and reliable information to assist in the development of programs and to assess the performance of South Australia's agri-food industries over time.

The information on the food industry, is deliberately intended for wide public use. A key client for this data is industry, and therefore, a priority for the *ScoreCard* is to enable users of this information to trace particular food products through value chains.

The criteria for the *ScoreCard* is to deliver a series of consistent and timely measures to:

- ◆ identify the value, size and structure of the agri-food industries;
- ◆ develop comparative measures of relative sector and industry performance;
- ◆ identify areas of opportunity;
- ◆ enable detailed comparisons of the value-chains within and between the agri-food industries by detailing prices at the production (farm-gate), processing (wholesale), and consumption stages (retail);
- ◆ allow for analyses of the volume distributions along the value-chain to identify trade and freight distributions intra/interstate and overseas.

Beyond these technical specifications, the *ScoreCard* is intended to be a reliable and useful product, where its composition and calculations can be both verified, and importantly, easily understood and communicated.

4. Assessing available information and models in meeting criteria

The *ScoreCard* team assessed a range of available models and data against the criteria identified (above) for measuring the agri-food industry by food product (sector) and industry. Although a range of information and models are available, no single data source or method is sufficient for our purposes¹.

Perhaps the greatest difficulty posed by the *ScoreCard* criteria is obtaining sufficient data at the level of detail specified. Another is the standard use and definition of industry groups. As indicated above, our specifications for the

¹ Models researched by the *ScoreCard* team include: “*A Portrait of the Canadian Agri-Food System*”, Economic and Policy Analysis Directorate, Agriculture and Agri-Food Canada, 2000; “*Queensland Value Chain Analysis Series – Vol 1-4*”, Mark O’ Sullivan, Qld, Dept. of Primary Industries, 1998/99; “*ABS Input-Output Tables*”; “*International Wheat Value Chain Analysis*”, Hudson Howells, Asia Pacific Consulting, May 2000; Monash CGE model

project required us to identify key agricultural products and their derivatives, and from this basis, group together like based sectors to form industries. Almost all of the available data covering revenue, employment, capital investment output and other measures is organised around standard industry (Australia and New Zealand Standard Industry Classification, ANZSIC) or commodity groupings. Therefore, the available output data lacked the functionality of being able to measure revenue at each of the stages of the value chain.

The irregularly released input-output tables, which do allow for the identification of the linkages between industry sectors at fairly disaggregated levels, are by and large also organised according to ANZSIC structures, thereby making them less useful for our purposes.

Input-output tables are also relatively expensive and time consuming tools to compile and consequently are normally only updated over longer periods. While it is possible to update the information through indexation and other adjustments, this does not take into account changes that may occur within industries and sectors. The ScoreCard however, is designed to capture results of any production and strategic changes.

Another important criteria for the ScoreCard is the ability to trace and estimate the flows of commodities and produce between States. None of the models analysed specifically analysed interstate (as opposed to international or 'outside' exports. With no reliable data on interstate movements, by establishing the *Scorecard* around a combination of production and consumption and trade indicators, as well as having both dual volume and value (hence prices) measures within each of the food chains, we are able to put reliable estimates of interstate (and interregional) net trade movements. The methodology for doing this is explained in detail in Attachment 2, and is based around tracing flows of a product from production to consumption, where in simplistic terms, all production not consumed in the State must be either traded interstate or overseas. This is detailed by the following equation:

$$X_{isX} - M_{isX} = P_{saX} - C_{saX} + M_{oX} - X_{oX}$$

Where interstate exports of X minus interstate imports of X ($X_{isX} - M_{isX}$) equals SA production of X minus consumption of X ($P_{saX} - C_{saX}$) plus overseas imports minus exports ($M_{oX} - X_{oX}$).

A further limitation of the available measures is underestimation and under-enumeration, particularly at the production level. Statistical limitations, including the lack of coverage detail, data unreliability or simply being out of date, were a major factor in encouraging us to develop estimates direct from industry.

Successful outcome of the analysis depends to a large degree on the cooperation of industry and its willingness to provide required data. Industry sources are generally forthcoming in providing information although sometimes for commercial reasons, information cannot be shared.

Frequent consultation occurs with industry leaders which makes development of the *ScoreCard* a collaborative effort.

Nevertheless, in developing the final Gross Food Revenue estimate in the *ScoreCard*, turnover and 'value-added' information obtained from the ABS and other sources covering processing, trade, retail, hospitality and consumption, are used as indicative benchmarks. These aggregate level estimates are used as key indicators to both test the validity of our own 'in-house' estimates as well as providing a consistent and reliable basis underpinning the model.

In summary, although all of the models and information that were scrutinised have contributed to the compilation of the *ScoreCard*, no individual model was able to address the full criteria identified. For this reason, we have developed our own estimates, applied to food production sectors, and in turn, aggregated to industries. The full listing of data variables as well as the approach taken by the team is detailed below and in Attachment 1.

5. The ScoreCard and its Methodology

As detailed, the *ScoreCard* is the tool used to measure and evaluate the contribution to the South Australian economy of food (and beverage) at each stage of production through to consumption.

The stages of production include primary production (fishing and farming), through secondary manufacturing (or processing), to overseas and interstate exports and finally through the tertiary sectors of retailing and consumption. In this way, the *ScoreCard* measures the value of the industry as food goes from the “paddock (or ocean) to the plate”.

Measures used in the *ScoreCard* to value the agri-food industry include: local value farm production values; value-added processing; overseas and interstate trade exports and imports (at both a commodity and processed level); as well as consumption through food retail and food hospitality. The *ScoreCard* analyses both the volume and value of sales at each stage, as well as looking at associated indicators of economic performance such as employment and capital investment. The key measures used in the *ScoreCard* are described in detail in Attachment 1.

A summary figure used in the *ScoreCard* is called **Gross Food Revenue**. This figure comprises the total consumption value of food and beverages measured in current prices at the point of consumption (either at the retail or food service level), as well as net interstate and international exports (measured at their point of exit from the State). Gross Food Revenue, (which includes the value of imports from both interstate and overseas), measures the final contribution made by each of the stages of production and value adding, from the paddock to the plate, for products consumed in South Australia as well as those that have been exported either interstate or overseas.

An additional summary measure called the **Net Food Revenue** has been included to exclude the value of food imports (at their point of entry into South Australia) but includes the value adding that occurs to imported food within South Australia to the point of consumption. By excluding imports (either processed or raw), Net Food Revenue provides a realistic measure of the actual contribution made by South Australians to the food sector.

Net Food Revenue can be represented by the following equation:

$$\text{Net Food Revenue} = C + (X_o - M_o) + (X_s - M_s)$$

C = Consumption (made up of retail and food service consumption)

$X_o - M_o$ = net overseas trade or exports-imports

$X_s - M_s$ = net inter State trade or inter State exports minus inter State imports

Table 1 shows, in summary form, some of the detail contained in the *ScoreCard*. As shown in the table, the Gross Food Revenue for South Australia is \$7.22b. Food imports (from overseas and interstate) are estimated to be \$0.97b. Therefore, Net Food Revenue in South Australia is \$6.25b. South Australia remains a food importer- especially of processed products, which represents an import replacement opportunity.

**Table 1: South Australia Food ScoreCard By Industry 1999-2000,
\$ million**

Industry	Farm Gross Value	Food Processing Value	Exports InterState Overseas	Retail & Food Service	Net Food Revenue	Gross Food Revenue
Field Crops	541.5	714.5	810.5	1207.0	1805.8	2017.5
Livestock	530.4	752.5	472.6	1227.8	1608.3	1700.4
Dairy	181.6	262.0	103.9	413.3	479.3	517.2
Horticulture	483.7	744.1	465.7	1041.1	1,295.2	1,506.8
Seafood	405.2	429.3	515.4	144.5	513.5	659.9
NEA	0.0	350.0	5.8	814.6	547.6	820.4
Grand Total	2,142.5	3252.4	2373.9	4848.4	6249.7	7222.3

Information that appears in the *ScoreCard* summary represents only a fraction of the overall analysis. As well, the *ScoreCard* team provides a detailed sector analysis of the State's food and beverage industry.

The *ScoreCard* includes all food and beverages, either produced or consumed in South Australia and detailed analysis is made of key areas of South Australia's food value chains.

The food industry is split into five broad industry areas (producing categories): field crops, horticulture and livestock (including eggs and dairy) and seafood. The *ScoreCard* is calculated with and without grapes and wine. Under these headings information is collated for the major products (such as wheat, beef, potatoes and lobster) derived from primary products.

In this process, the *ScoreCard* measures value-chains of over fifty individual agri-food sectors or commodities, which are categorised into 5 broad industry groupings.

For example, beer production and consumption revenue appears under the field crops because malt and beer are the end products of barley. Also included under field crops are estimates of the value, at wholesale and retail level, of products such as pasta, bread, cakes and pastries which are derived from durum wheat semolina and wheat flour respectively

A combination of measures and data, from a range of sources are used in preparing the *ScoreCard* including from the ABS, ABARE, Australian Horticultural Corporation (AHC), and South Australian Government agencies (such as SARDI). However, the verification and greater detail is largely obtained from either primary sources or through industry and regional bodies.

6. Using the *ScoreCard* – exploiting it's potential

The *ScoreCard* analysis goes beyond providing a mechanism to track South Australia's food and beverage performance. While the summary measures present aggregate findings, behind this information are detailed analysis and other key performance indicators which can be used as signposts to expanding production, import replacement, enhancing exports and identifying value-adding and capital investment opportunities.

For example, the examination of prices at farm gate, wholesale and retail level can show South Australia's competitiveness in markets. Further, the analysis of consumption and production reveal the extent of South Australia's self-sufficiency and processing potential.

In addition, the analysis provided by the *ScoreCard* is dynamic, with each additional year of *ScoreCard* analysis enabling detailed comparisons possible over time. For example, production, value-adding, consumption and trade indicators can all be examined over time, revealing underlying trends, and seasonal variations which, in turn, identify capabilities and opportunities.

The results of these analyses are communicated routinely to Industry Development Boards and frequently direct to the industries concerned.

This “on the ground” communication gives the *ScoreCard* analysis potentially the greatest impact. Getting information directly from industry sources, and sharing it directly with those best able to use it, is clearly a powerful strategy for expanding SA's Food and Beverage industries.

7. Conclusion

The revenue approach described to measuring the size and structure of the South Australian food industry is but one means of food sector analysis. Other approaches achieve different ends, for different purposes. For example, input-output models provide an indication of linkages between industries in the economy; while reverse pricing models (such as in the Queensland value chain approach) give detailed price based analysis of particular food items along a chain.

Our preferred approach has several key advantages: it provides detailed information for easily recognisable agri-food groups of values and prices at points in the value chain (from the paddock to the plate); gives a consistent indication of growth in agri-food groups over time; and by analysing volume consumption and production, can be used to measure trade and freight distributions (intra/interstate and overseas). Together, the data and analysis provided by the *ScoreCard* is a valuable tool in both understanding and progressing the agri-food industries in South Australia.

ScoreCard Team

Food for the Future

Primary Industries and Resources, South Australia

January 2000

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ATTACHMENT 1: - ELEMENTS OF THE SCORECARD

A. PERFORMANCE INDICATORS

Production (Farm Level)

This is a measure of the value of a commodity at the local level of production (ie. farm gate). Farm value is calculated by multiplying the volume of production by the price received and, therefore, represents the value of production to the farmer or fisher person. This value can be used as a baseline for estimating the additions to the price of a product (and through this, its value) as it moves through the value chain from production to consumption. The volume of production can also be traced through the value chain, giving an indication of availability and location of supply for all stages of the value chain.

Processed Food (measured in wholesale prices)

This measures the value of foods and beverages that are processed (at their highest level of processing) within South Australia. The measure includes the value of imports used by South Australian processors but excludes the value that is added to the product by the retailer.

Processed foods may be minimally or highly processed, and the value is represented by their wholesale price into the SA retail or export markets. The volume of raw commodity that is used in calculating this value, can also be used to monitor the present capabilities of the processing industry within each commodity sector.

Overseas Exports – Commodity and Processed

This consists of the value of overseas exports of agricultural commodities and food products sold overseas by South Australian firms (calculated by using free on board prices). Raw commodity exports consists of products that have had a minimal change from their natural form, (eg live sheep or bulk wheat) before being sold to an overseas destination. Processed exports are commodities that have had further value-added to them from the point of production (ranging from flour up to bakery products or could be vegetables simply cleaned and packed for marketing). Both commodity and processed export volumes and values give another indication of the level of activity along the value chain of each individual commodity.

Overseas Imports – Commodity and Processed

This is the measure of value of either agriculture commodities or processed food products that are purchased from overseas. Import volumes and values are quantified at their South Australian landed value (at the port of shipment). This measurement is monitored by our analysts to assess the success that South Australian industry is achieving in obtaining import replacement for their product.

Net Interstate Trade – Commodity and Processed

This value represents the difference in the value of goods exported interstate from those imported from interstate.

- A positive value represents net interstate exports. (ie exports exceed imports)
- A negative value represents net interstate imports. (ie imports exceed exports)

In most cases net Interstate transfer volumes are calculated from using the difference between production and consumption, taking overseas net exports into account. The value is then calculated by using an appropriate market price. This value gives an indication of self sufficiency or opportunities that South Australia is either gaining or losing from interstate trade.

Food Retail Sales

This comprises the value of sales (turnover) of food made through all retail stores including supermarkets and grocery stores, takeaway food retailing, fresh meat, fish and poultry retailing, fruit and vegetable retailing, liquor retailing, bread and cake, and specialist food retailing.

This measure includes the value of imports that South Australian retailers purchase from overseas and interstate as well as the value that is added to the product by the retailer. Internal analysis also indicates the volume of raw commodity or processed product that has been used to obtain the finished retail product. This can be useful in assessing the amount of South Australian raw commodity and processed product that is being sold at the retail level within the State.

Food Service Sale Value

This comprises the value of sales of food and beverages through restaurants, hotels, and tourism operations within South Australia. This is calculated by estimating the percentage of total sales that occur through these type of outlets. Prices used in this calculation is usually considerably higher than those used at the retail level.

B. SUMMARY INDICATORS

GROSS STATE FOOD REVENUE (SA)

This is an aggregate measure of revenue that includes food and beverage exports (international and interstate) and the value of food and beverage retail and service sales contributing to the South Australian economy. It is calculated by taking the sum of the following:

Overseas Export Value (Commodity and Processed)

Consists of the value of overseas exports of food and agricultural products sold overseas (measured in free on board prices).

Plus

Positive Net Interstate Trade Value - Commodity and Processed

This is when the value of goods exported interstate exceeds those imported from interstate.

Plus

Food Retail Sales

Comprising the value of sales (turnover) of food made through all retail stores including supermarkets and grocery stores, takeaway food retailing, fresh meat fish and poultry retailing, fruit and vegetable retailing, liquor retailing, bread and cake, and specialist food retailing.

Plus

Food Service Sales

Sales of food and beverages through restaurants, hotels, and tourism operations within South Australia.

NET STATE FOOD REVENUE (SA)

A measure of the food revenue derived within South Australia. It is calculated by subtracting food and beverage imports (FOB value) from the Gross State Food Revenue (SA). This is done in the following way:

Gross State Food Revenue (SA)

Measures the value of food and beverage retail and service sales and food and beverage exports contributing to the South Australian economy.

Less

Overseas Import Values – Commodity and Processed

Goods purchased from overseas, categorised into either raw commodity or processed imports. Import volumes and values are quantified at their South Australian landed value (at the port of shipment).

Less

Negative Interstate Trade Values - Commodity and Processed

This is when the value of goods imported from interstate exceeds those exported interstate

ATTACHMENT 2: - Identifying Net Interstate Trade

Net interstate trade represents the difference in the value of goods exported interstate from those imported from interstate.

Due to the difficulty in tracing interstate trade volumes and values, it is necessary to make some calculated estimates of interstate trade values. The method of estimating interstate trade is through the analysis of production and consumption flows, where by definition, production not directly consumed in the State and not used in either storage or wasted, must be exported. Equally, of SA consumption, what is not consumed from State production must be imported either from interstate or overseas.

As the Scorecard deals with the different stages of the value chain when each commodity is in both the raw and processed form, it is necessary to measure interstate transfers in both of these forms. This is dealt with by regarding the processor as the consumer of the raw material and the producer of the processed product. By doing this it is possible to calculate the volume of both the raw material and processed product that is transferred across State borders.

To calculate these net transfer figures, it is necessary to know the volume of a good that is produced, processed and consumed within the State, as well as the volume that is traded overseas. In most cases in South Australia this data is available through various statistical aggregates. Where the information is not available it needs to be sourced from relevant industry organisations or, where necessary, making some basic assumptions.

The net interstate transfer figures are derived in terms of volume. These volumes need to be converted to a common measurement. For example in the case of beef cattle, all volumes are converted to a dressed weight volume.

The value of the interstate transfer is calculated by using the assessed volume and appropriate price. In the case of the raw product it is most likely that the farm gate price is used, while wholesale prices are used in relation to processed goods.

The model relies on the assumption that the products flowing interstate are perfect substitutes, and in this, there is a preference and price advantage for consumers to purchase local products over their interstate counterparts (where additional costs due to transport would make them less competitive.)

As the method of calculating net interstate trade involves taking interstate imports away from interstate exports, then by definition, a net positive number is a net export, while a negative number is a net import.

Using the example of product X, the derivation of interstate trade can be represented using the following equations:

SA Consumption of X is made up of SA produced and consumed X (C_{sapX}) as well as overseas imports (M_{oX}) and interstate imports (M_{isX}), as represented by:

$$C_{saX} = C_{sapX} + M_{oX} + M_{isX}$$

Similarly, SA Production of X is either exported overseas (X_{oX}), exported interstate (X_{isX}) or consumed in SA (C_{sapX}) and can be represented by:

$$P_{saX} = X_{oX} + C_{sapX} + X_{isX}$$

Through rearranging the above equations, to reveal consumption of SA production (C_{sapX}) you get:

$$C_{sapX} = C_{saX} - M_{oX} - M_{isX} \quad \text{and} \quad C_{sapX} = P_{saX} - X_{oX} - X_{isX}$$

And joining the two equations, using the common variable of consumption of SA production (C_{sapX}) shows that consumption take imports of X equals production less exports of X:

$$C_{saX} - M_{oX} - M_{isX} = P_{saX} - X_{oX} - X_{isX}$$

Further rearranging of this equation is used to derive net interstate trade ($X_{isX} - M_{isX}$), where: interstate exports of X minus interstate imports of X equals SA production of X minus consumption of X plus overseas imports minus exports.

$$X_{isX} - M_{isX} = P_{saX} - C_{saX} + M_{oX} - X_{oX}$$