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THE AGRICULTURE AND AGRI-FOOD SYSTEM IN CANADA

Paper submitted by Statistics Canada *

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The Agriculture and Agri-Food System in Canada

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1. Introduction

Agricultural policy in Canada has shifted from a focus on farm commodities to a broader focus on the agriculture and agri-food system (Agriculture and Agri-food Canada (AAFC), 2000, 2004). Hence Statistics Canada has seen its data provider and analysis role expand to cover statistical issues related to agri-food.

The purpose of this paper is to review some of the statistical dimensions of the agriculture and agri-food system in Canada and the nature of the expanded statistical coverage and possible analyses.

2. What is the "agriculture and agri-food system"?

First, a small point – since there is a federal ministry of fisheries and oceans in Canada, food from lakes and oceans is covered under the value-chain of fisheries. Thus, "agri-food" is explicitly related to food from agricultural production.

Now, to the larger question, what is the "agriculture and agri-food system"? It covers every stage of food production and preparation – literally from the farm to the fork.

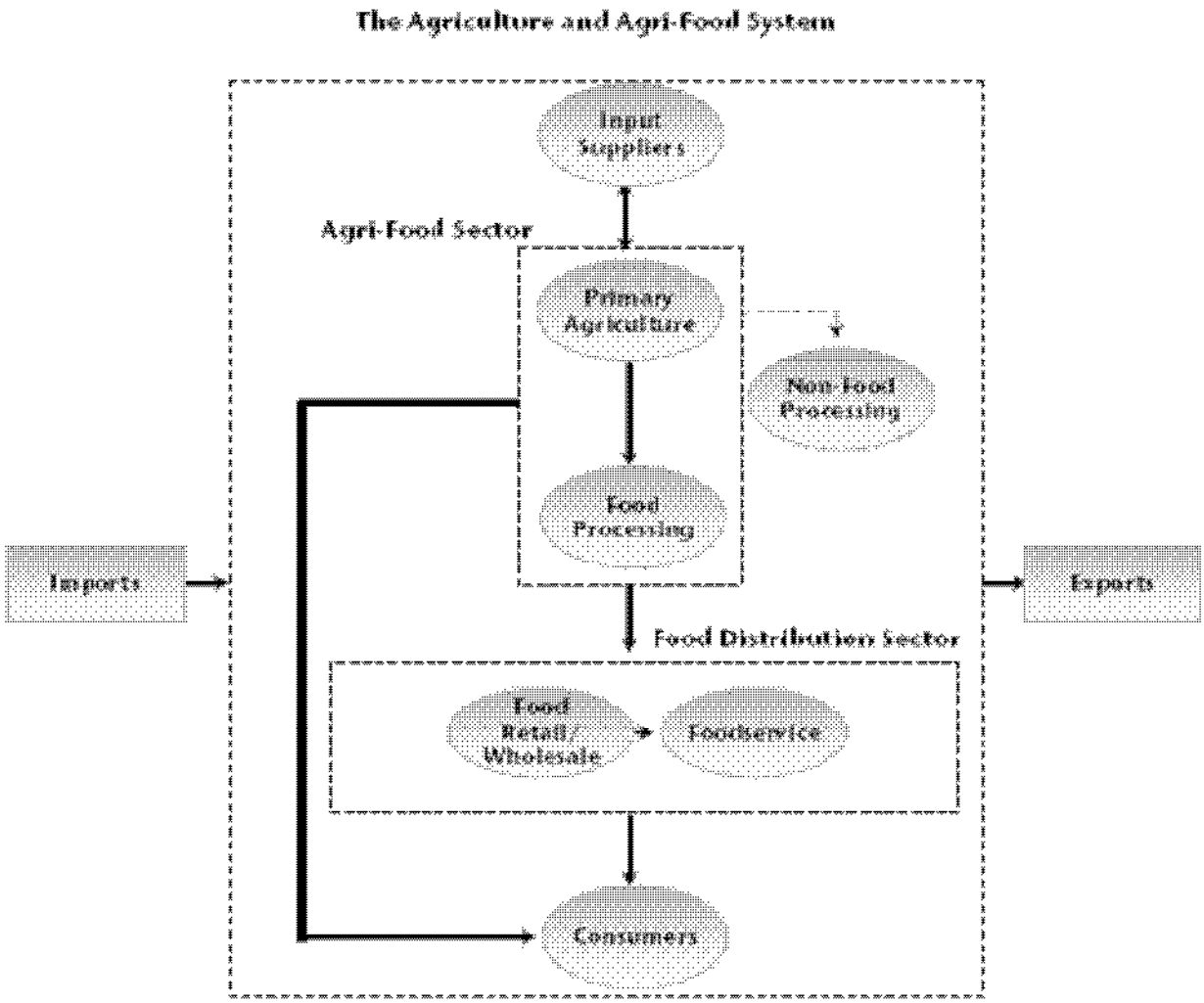
AAFC has defined the agriculture and agri-food system to be:

> " . . . a value chain of industries focused on producing agricultural and food products. It includes agricultural input and service suppliers, primary agriculture, food processors, food retailers / wholesalers, and food service establishments." (AAFC, 2004, p. 98)

Specific 4-digit and 5-digit sectors in the North American Industrial Classification System (NAICS) were then identified to statistically represent this system (Appendix 1).

Figure 1 provides a schematic view of the agriculture and agri-food system.

Figure 1



Source: AAFC (2004).

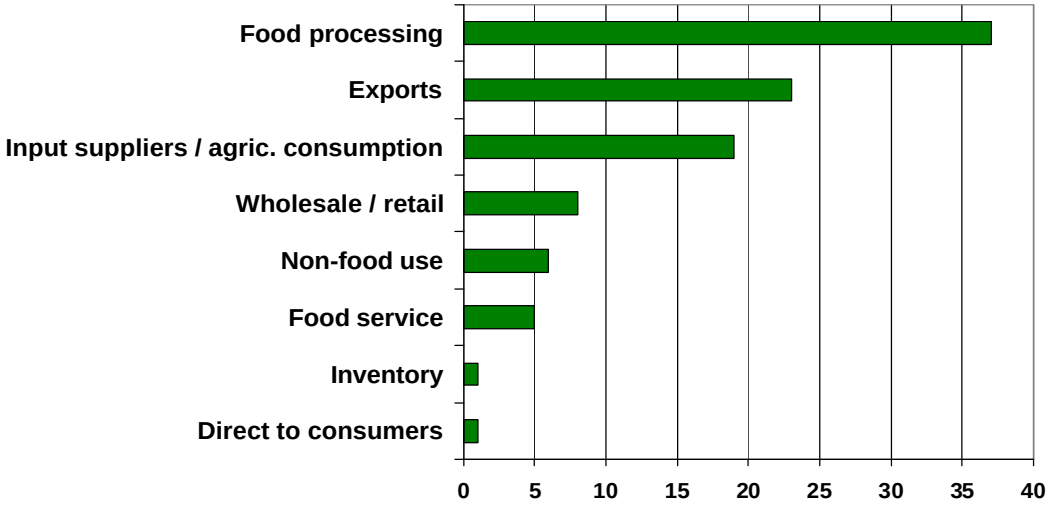
3. Where does agricultural production go?

The Input-Output Accounts in Statistics Canada provide an estimate of where the agricultural production on farms flows to. In 1999, 37 percent of the agricultural production on farms flowed to the food processing sector (Figure 2)[1]. Note that an important feature of Canada's agricultural production system is that 23 percent of production from farms flows directly to export markets. The third major destination of agricultural production is the 19 percent share used on farms. One major item in this component is feed grain – either used on the farm where it was produced or sold directly to another farmer or passed through a feed mill (i.e. the input supply sector in the Input-Output accounts).

[1] This paper has benefited from the compilation of data and analysis of data provided by Agriculture and Agri-food Canada (2000, 2004).

Figure 2

In 1999, 37 percent of agricultural production flowed to the food processing sector



Percent distribution of destination of on-farm agricultural production, Canada, 1999

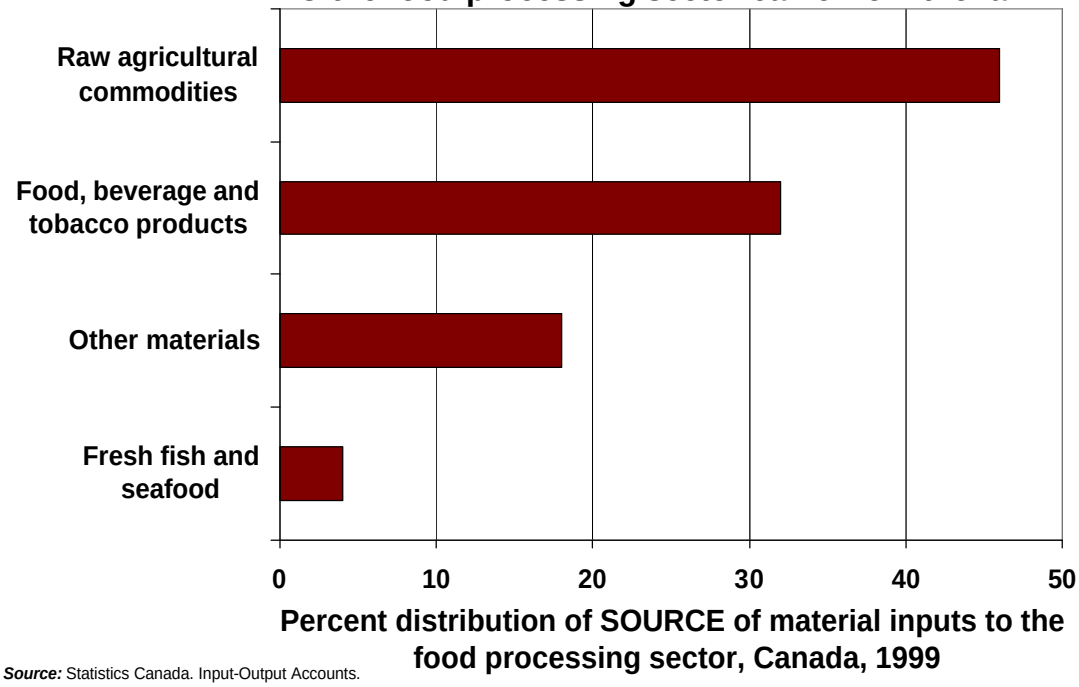
Source: Statistics Canada. Input-Output Accounts.

4. The flow of materials into and out of the food processing sector

Again, from the Input-Output Accounts, we can see that 46 percent of the material inputs to the food processing sector come from the primary agricultural sector (Figure 3). Note that 32 percent of the material flowing into the food processing sector actually is material ("food, beverage and tobacco products") from other parts of the food processing sector that is being further processed.

Figure 3

In 1999, 46 percent of the material inputs FLOWING INTO the food processing sector came from the farm

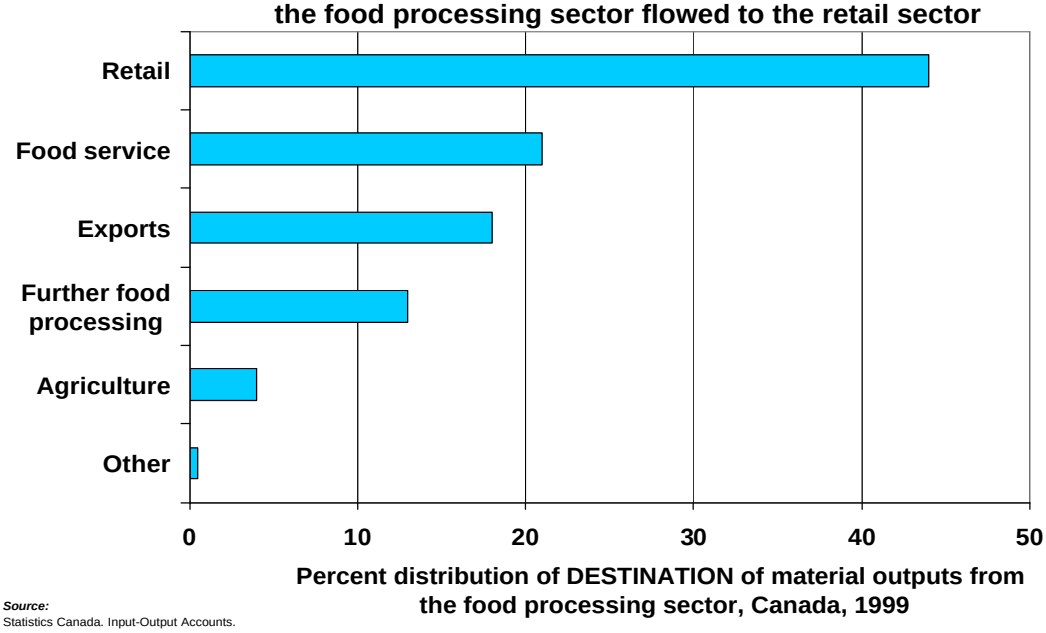


Source: Statistics Canada. Input-Output Accounts.

When we look at the flow of material outputs out of the food processing sector, we see that 44 percent flows to the retail sector (i.e. grocery stores), 21 percent flows to the food service sector (i.e. restaurants) and, importantly for Canada, 18 percent is exported (Figure 4).

Figure 4

In 1999, 44 percent of the material outputs FLOWING OUT OF the food processing sector flowed to the retail sector



Source:
Statistics Canada. Input-Output Accounts.

5. Agriculture and agri-food gross domestic product

The gross domestic product (GDP) is a measure of the value of production in the economy. In 2002, the Canadian agriculture and agri-food sector was estimated to contribute $81 billion to Canada's gross domestic product – representing 8 percent of Canada's GDP[2] (Table 1).

However, the estimated $81 billion (or 8 percent of GDP) gives a different perspective on the 'importance' of the agriculture and agri-food sector than would be illustrated with simply looking at the primary sector GDP. In 2002, GDP from agriculture represented 1 percent of Canada's GDP and only 15 percent of the GDP of the agriculture and agri-food sector. Within the agriculture and agri-food sector, the food retail / wholesale sector was the largest (30 percent of overall agriculture and agri-food), food processing represented 27 percent of the agriculture and agri-food GDP and the food service sectors contributed another 19 percent of the agriculture and agri-food GDP. Each of these sectors was larger than the primary agriculture contribution of 15 percent.

Earlier we noted that the food processing sector is the major destination for raw agricultural products leaving the farm. Also, we saw that a significant share of the output of the food processing sector is exported. Here we have seen that food processing is the second largest component of the agriculture and agri-food sector. If we were to compare the food processing sector to the other manufacturing sectors, we would see that:

- the food processing sector is the second largest manufacturing sector in Canada, measured in terms of its contribution to manufacturing GDP. Food and beverage processing contributed 16 percent of total manufacturing GDP in 2002 (AAFC, 2004, Chart B3.2); and

- the value of the flow of processed products out of the food and beverage sector was $78 billion in 2002, up by $30 billion since the beginning of the 1990s (AAFC, 2004, Chart B3.4).

Table 1. Contribution of the agriculture and agri-food sector to Canada's GDP

	*** Gross domestic product ($ billion) ***				As percent of agriculture and agri-food (sub-total)	As percent of Canada's GDP
	1991	1995	2000	2002	2002	2002
Input suppliers (1)	6	7	8	7	9.1	0.7
Primary agriculture	12	12	14	12	14.8	1.2
Food service	11	12	15	16	19.3	1.6
Food processing	18	19	20	22	26.8	2.2
Food retail / wholesale (2)	16	19	22	24	29.9	2.4
Agriculture and agri-food (sub-total)	**63**	**69**	**79**	**81**	**100.0**	**8.2**
Canada, all industries	680	773	946	992		100.0

Source: Statistics Canada. CANSIM Table 379-0017 (for the 2000 and 2002 data tabulated according to the North American Industrial Classification System((NAICS)) and Statistics Canada. CANSIM Table 379-0004 (for the 1991 and 1995 data tabulated according to the 1980 Standard Industrial Classification System) (as calculated in AAFC, 2004, Table A1.2).

(1) The gross domestic product (GDP) for input suppliers is the sum of the GDP arising from their manufacturing activiites and from their wholesale activities. GDP for their wholesale activiites was estimated as an employment weighted share of the total GDP for the wholesale trade sector. The employment data were taken from the Labour Force Survey and from the Survey of Employment, Payroll and Hours.

(2) GDP for food retail / wholesale was calculated as an employment share of the total GDP for the retail / wholesale sector. Employment numbers were taken from the Labour Force Survey.

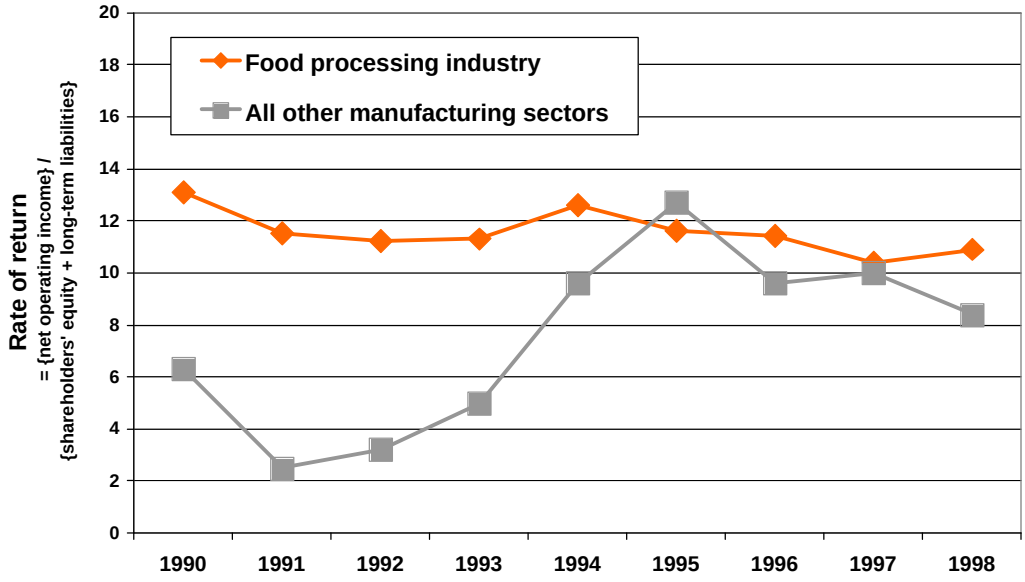
[2] As noted in the footnote to Table 1, the published GDP data for some sectors (such as retail / wholesale trade) was disaggregated by using the share of employment in the food component of retail / wholesale trade in order to generate an estimate of the "food retail / wholesale" sector. Note also that the data for GDP is available for a different grouping of 3-digit and 4-digit NAICS (North American Industrial Classification System) codes than is the employment data from the Census of Population that is tabulated according to the 1980 Standard Industrial Classification (SIC) (Appendix 3) in Section 7, below.

6. Profits in food processing and in food retailing.

An analysis of the rate of profit in the food processing sector has indicated that the food processing sector was more profitable than the manufacturing sector as a whole in the 1990s and, contrary to previous research, the food processing sector appeared to be more stable than the rest of the manufacturing sector (Figure 5) (Burroughs and Harper, 2002).

Figure 5

During the 1990s, food processing profits were generally higher and more stable than other manufacturing sectors



Source: Burroughs and Harper (2002).

An examination of the rate of profit in the food retailing sector (calculated as the ratio of operating income to long-term capital) indicated that the rate of return in the food retailing sector (12.2 percent) was higher than in non-food retailing and in the general economy (Table 2) (Smith and Trant, 2002). However, this higher rate of return was only obtained by larger food retailing firms (with sales of $100 million or over). As the price of food was falling in real terms (i.e. increasing at a slower pace than the general rate of inflation) over the study period (1990 to 1998), they suggested that the higher rates of return were not due to market power of the larger firms, but rather due to cost efficiencies among the larger firms.

Table 2. Average rate of return (1) in food retailing and non-food retailing, Canada, 1990 - 1998

	Size of firm			
	Sales less than $10million	Sales $10 to $99 million	Sales $100 million or over	All firms
Food retailing	8.0	7.3	14.4	12.2
Non-food retailing	9.0	7.4	4.9	7.0
General economy	5.9	6.4	8.0	7.3

Source: Smith and Trant (2002)

(1) Rate of return is calculated as operating income divided by long-term capital.

7. Employment in the "agriculture and agri-food system"

7.1 Size

When measured in terms of total employment, agriculture and agri-food represented 15 percent of total Canadian employment in 2001[3] (Table 3). Employment in agriculture amounted to 456 thousand workers in 2001 (comprised of 410 thousand workers on farms and 46 thousand workers in "services incidental to agriculture[4]"). Employment in agriculture represented 2.9 percent of all workers in Canada and only 11.6 percent of the total employment in the agriculture and agri-food sector. Thus, within the agriculture and agri-food sector, employment in agriculture represents one in nine workers. Agriculture employment includes self-employed workers, paid workers and unpaid family workers whose main job is working for an enterprise classified as an "Agricultural and Related Services Industry" according to 1980 Standard Industrial Classification.

[3] To maintain historical continuity for the data series, we have classified individuals according to the 1980 Canadian Standard Industrial Classification (SIC). (The 1981 data are coded to the 1970 SIC.)

[4] The largest "service incidental to agriculture" is veterinary services and one-third of these jobs are in predominantly urban regions (Appendix Table 3).

Table 3. Employment in agriculture and agri-food, Canada, 1981 to 2001

	All industrial sectors	Agriculture and agri-food		
		Total	Agriculture(1)	Agri-food(2)
	**** number employed ****			
1981	11,876,990	1,725,315	487,025	1,238,290
1986	12,740,205	1,932,535	512,740	1,419,795
1991	14,220,210	2,120,505	521,320	1,599,185
1996	14,317,485	2,144,330	485,635	1,658,695
2001	15,576,540	2,263,790	456,065	1,807,725
	**** percent change from 1981 to 2001 ****			
1981 to 2001	31.1	31.2	-6.4	46.0
	**** as percent of all industrial sectors ****			
1981	100.0	14.5	4.1	10.4
1986	100.0	15.2	4.0	11.1
1991	100.0	14.9	3.7	11.2
1996	100.0	15.0	3.4	11.6
2001	100.0	14.5	2.9	11.6
	**** as percent of agriculture and agri-food ****			
1981	n.a.	100.0	28.2	71.8
1986	n.a.	100.0	26.5	73.5
1991	n.a.	100.0	24.6	75.4
1996	n.a.	100.0	22.6	77.4
2001	n.a.	100.0	20.1	79.9

(1) "Agriculture" includes (paid, self-employed and unpaid family) workers on farms plus employment in agricultural services.

(2) "Agri-food" refers to employment with food processing establishments, wholesale and retail trade of farm inputs and food products (including grocery stores) and restaurants and taverns providing food and beverage services.

Note that the 1981 data are classified according to the 1970 Standard Industrial Classification (SIC) and the data for 1981 to 2001 are classified according to the 1980 SIC.

Source **:** Statistics Canada. Census of Population, 1981 to 2001.

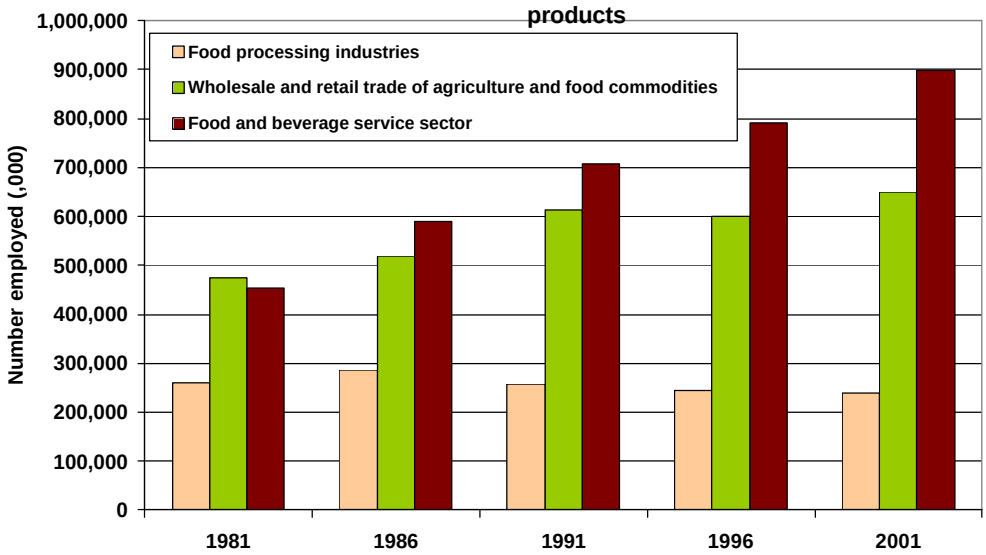
7.2 Trends

Over the 1981 to 2001 period, the agriculture and agri-food sector has maintained about a 15 percent share of total employment in Canada (ranging between 15.2 percent in 1986 and 14.5 percent in 2001). Within this constant share, the contribution of employment in agriculture has decreased from 4.1 percent in 1981 to 2.9 percent in 2001. At the same time, the share of Canada's total employment contributed by the agri-food sector has increased from 10.4 percent in 1981 to 11.6 percent in 2001.

The growth in employment in the agri-food sector was due to growth in the food service sector and the beverage service sector (i.e. employees of restaurants and drinking places) (Figure 6). Note that employment in the food processing sector declined from 1986 to 2001 and employment in the wholesale and retail trade of agricultural and food products declined in the 1991 to 1996 period. The growth in employment in the agri-food sector was almost entirely due to growth in employment in restaurants and drinking places.

Figure 6

Most employment in agri-food is in the food and beverage service sector and the wholesale / retail trade of agriculture and food products



Source : Statistics Canada. Census of Population, 1981 to 2001. "Agri-food" refers to employment in food processing establishments, wholesale and retail trade of farm inputs and food products (including grocery stores) and restaurants and taverns providing food and beverage services (plus small employment sectors of agricultural implement manufacturers, mixed fertilizer manufacturers and the grain storage sector, not shown here).

It is interesting to note that in 1981, more people worked on farms than worked in restaurants, bars and taverns. By 2001, employment in the food and beverage *services* sector was double the level of employment on farms.

7.3 Is the agriculture and agri-food sector a rural sector?

We use the OECD typology of regions (Appendix 2) to offer a measure of whether the agriculture and agri-food sector is a rural or an urban sector. The results indicate that:

Rural is not only agriculture. In Canada, in 2001, only 6 percent of employment in predominantly rural regions was in primary agriculture (i.e., employment on farms) (Table 3 – see Appendix Table 3 for details). The policy point of this observation is that policy directed to agriculture will directly impact only 6 percent of employment in predominantly rural Canada.

Agriculture is not only rural. In Canada, in 2001, 71 percent of employment in agriculture was in predominantly rural regions (Table 4). Intermediate regions accounted for 16 percent and predominantly urban regions accounted for 13 percent of employment in agriculture. The policy point of this observation is that only 71 percent of policy directed to agriculture will impact predominantly rural regions.

Table 4. Distribution of employment by industrial sector and type of region, Canada, 2001

	Predominantly urban regions	Intermediate regions	Predominantly rural regions	All regions
Employment in primary agriculture	52,435	67,100	290,075	409,610
Employment in agri-food	894,905	364,750	548,070	1,807,725
Employment in all sectors	7,988,585	3,071,020	4,516,935	15,576,540
	*** Number employed as percent of employment in the sector (row percent) ***			
Employment in primary agriculture	13	16	71	100
Employment in agri-food	50	20	30	100
Employment in all sectors	51	20	29	100
	*** Number employed as percent of employment in the region (column percent) ***			
Employment in primary agriculture	1	2	6	3
Employment in agri-food	11	12	12	12
Employment in all sectors	100	100	100	100

Source: Statistics Canada, Census of Population, 2001.

8. Summary

Agricultural policy in Canada has shifted from a focus on farm commodities to a broader focus on the agriculture and agri-food system. Hence there are increased demands for "agri-food" related statistics.

In 2002, 8 percent of Canada's GDP was estimated to have been generated by the agriculture and agri-food sectors. The primary agriculture sector represented 1 percent while the "agri-food" sector represented 7 percent.

Employment growth in agriculture and agri-food was solely due to the growth of employment in restaurants, bars and taverns. Employment is declining on farms and in the food processing sector. In 1981, more people worked on farms than worked in restaurants, bars and taverns. By 2001, the employment in the food and beverage services sector was double the level of employment on farms.

Rural is not only agriculture – only 6 percent of 2001 employment in predominantly rural regions of Canada was related to primary agriculture (i.e. employment on farms). Employment in agri-food represented another 12 percent of total employment in these regions.

Agriculture is not only rural – 71 percent of agriculture employment is in predominantly rural regions and the remaining 29 percent is in intermediate or predominantly urban regions.

The shift from a farm commodity focus to a broader focus on the agriculture and agri-food system implies that agricultural statisticians need to broaden their data provision and analysis role to include information from sources other than agricultural surveys. It also implies that compatible classification systems need to be promoted to permit proper comparisons of the tabulated data series.

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Appendix 1. List of Sectors Coded to "Agriculture" and "Agri-Food" (using the North American Industrial Classification System (NAICS))

The following NAICS codes were used to indentify the agriculture and agri-food sectors:

Input suppliers:

1151 Support activities for crop production
1152 Support activities for animal production
3253 Pesticide, fertilizer and other agricultural chemical manufacturing
4171 Farm, lawn and garden machinery and equipment wholesaler - distributors
4183 Agricultural supplies wholesaler - distributors
33311 Agricultural implement manufacturing

Primary agriculture

1111 Grain and oilseed farming
1112 Vegetable and melon farming
1113 Fruit and tree nut farming
1114 Greenhouse, nursery and floriculture production
1119 Other crop farming
1121 Cattle ranching and farming
1122 Hog and pig farming
1123 Poultry and egg production
1124 Sheep and goat farming
1125 Animal acquaculture
1129 Other animal production

Food service

772 Food services and drinking places
4542 Vending machine operators

Food processing

311 Food manufacturing
312 Beverage and tobacco product manufacturing

Food retail / wholesale

411 Farm product wholesaler - distributor
413 Food, beverage and tobacco wholesaler - distributor
445 Food and beverage stores
41911 Farm product agents and brokers
41913 Food, beverage and tobacco agents and brokers
44422 Nursery stores and garden centres
49312 Refrigerated warehousing and storage
49313 Farm product warehousing and storage

Appendix 2. Definition of the geographic units of analysis

In this study, we use the OECD typology of regions (OECD, 1994, 1996; du Plessis *et al.,* 2001; Cloutier, 1997) to classify Canadian census divisions as follows:

- **Predominantly rural regions:** more than 50 percent of the population resides in a rural community where a "rural community" has a population density of less than 150 persons per square kilometre;
- **Intermediate regions:** 15 to 49 percent of the population lives in a rural community; and
- **Predominantly urban regions**: less than 15 percent of the population lives in a rural community.

Following Ehrensaft and Beeman (1992), the predominantly rural regions are further disaggregated into:
- Rural metro-adjacent regions;
- Rural non-metro-adjacent regions; and
- Rural northern regions.

Appendix 3. List of sectors coded to "agriculture" and to "agri-food"
(using the 1980 Standard Industrial Classification (Statistics Canada, 1980))

"Agriculture" Group
"Agriculture" sector
011 Livestock Farms (Except Animal Specialties)
012 Other Animal Specialty Farms
013 Field Crop Farms
014 Field Crop Combination Farms
015 Fruit and other Vegetable Farms
016 Horticultural Specialties
017 Livestock, Field Crop and Horticultural Combination Farms
"Services Incidental to Agriculture" sector
021 Services Incidental to Livestock and Animal Specialties
022 Services Incidental to Agricultural Crops
023 Other Services Incidental to Agriculture
"Agri-food" Group
"Food and Fibre Processing" Subgroup
"Food and fibre processing industries" sector
101 – Meat and poultry products industries
103 – Fruit and vegetable industries
104 – Dairy products industry
105 – Flour, prepared cereal food and feed industries
106 – Vegetable oil mills (except corn oil)
107 – Bakery products industry
108 – Sugar and sugar confectionery industries
109 – Other food products industries
111 – Soft drink industry
112 – Distillery products industry
113 – Brewery products industry
114 – Wine industry
121 - Leaf Tobacco Industry
122 - Tobacco Products Industry
171 - Leather and Allied Products Industries
182 - Spun Yarn and Woven Cloth Industries
"Inputs Supplier Industries" Subgroup
"**Inputs Supplier Industries" sector**
311 - Agricultural Implement Industry
372 - Agricultural Chemical Industries
"Agriculture Storage and Warehousing Industries" Subgroup
471 Grain Elevator Industry
"Agricultural Wholesale and Retail Trade Industries" Subgroup
"Agricultural Wholesale trade" sector
501 Farm products, wholesale
521 Food, wholesale
522 Beverages, wholesale
524 Tobacco products, wholesale
571 Farm machinery, equipment and supplies, wholesale
593 Agricultural supplies, wholesale
"Retail trade" sector
601 Food Stores
602 Liquor, Wine and Beer Stores
652 Florists, lawn and garden centres
"Food and Beverage Service Industries" Subgroup
"Food and beverage service industries" sector
921 Food Services
922 Taverns, Bars and Night Clubs