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# Input-output models for agriculture and agri-food industries

**Pre-conference: Canadian Agricultural  
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# Overview

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- Economic impact related to agriculture and agri-food
- Outputs of Statistics Canada's Economic Impact Simulation Model
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# Introduction

- The input-output multipliers and Economic Impact Simulation Model are derived directly from the supply and use tables (SUT).
  - They are updated annually.
  - Employment estimates come from an outside source ([CANSIM table 383-0030](#)).
- They are some of the most popular SUT-derived products used outside of Statistics Canada.
  - They are improved regularly.
  - The model and customized multipliers are available only on a cost-recovery basis.

# Introduction

- They are used to determine
  - the economic impact of an exogenous shock to the economy (such as an increase in agriculture or agri-food production)
  - the “upstream” inter-industry relationships
  - the economic contribution or “footprint” of a given establishment or industry

# Economic impact related to agriculture and agri-foods

- The Statistics Canada input-output economic impact simulation models (Catalogue nos. [15F0004X](#) and [15F0009X](#)) are well suited to determine the economic impact of agriculture and agri-food industries.

# Economic impact related to agriculture and agri-foods

- They can be used to determine the economic impact of
  - capital investment
    - e.g., investing in structures, machinery and equipment for a farm or food processing facility
  - operations
    - e.g., operating a farm or food processing facility
  - exports
    - e.g., increasing exports of agriculture and agri-food products

# Economic impact related to agriculture and agri-foods

- The model is based on a simple set of input-output coefficients.
  - Supply patterns and production functions are fixed.
  - Prices are fixed and cannot be altered (a change in price would be interpreted as a change in volume).
  - The model is not dynamic and is not a general equilibrium model.

# Economic impact related to agriculture and agri-foods

- Users must provide data (exogenous shock values) to run the model:
  - e.g., value of machinery and equipment investment
  - e.g., payroll associated with the farm operations
  - e.g., value of exports
  - A Statistics Canada analyst can assist with the allocation by industry or product.
- Statistics Canada houses the model, and provides only access to the model (on a cost-recovery basis).



# Economic impact related to agriculture and agri-foods

- Two approaches are possible:
  - The client provides data and Statistics Canada runs the model
    - e.g., work done with clients (such as the Ontario Ministry of Agriculture, Food and Rural Affairs, and Agriculture and Agri-Food Canada) on the economic impact of producing various crops, food production, and exports from Canada or from a particular province.
  - The client provides the specifications for custom multipliers, and a custom model is created
    - e.g., the Parks Canada and Department of Canadian Heritage economic impact models.

# Outputs of the Statistics Canada Economic Impact Simulation Model

- Economic impacts are expressed in terms of impact variables and type of impact.
- Information is limited to the agriculture and agri-food industries and products of the supply and use tables:
  - 3 agriculture industries (based on North American Industry Classification System [NAICS] 111 and 112)
  - 10 food-processing industries (based on NAICS 311 and 31211)
  - 16 agriculture products
    - 9 crop products and 7 animal products
  - 29 processed food products

# Outputs of the Statistics Canada Economic Impact Simulation Model

- The agriculture industries include
  - BS111A00: Crop production (except greenhouse, nursery and floriculture production)
  - BS111400: Greenhouse, nursery and floriculture production
  - BS112000: Animal production

# Outputs of the Statistics Canada Economic Impact Simulation Model

- The food processing industries include
  - BS311100: Animal food manufacturing
  - BS311200: Grain and oilseed milling
  - BS311300: Sugar and confectionery product manufacturing
  - BS311400: Fruit and vegetable preserving and specialty food manufacturing
  - BS311500: Dairy product manufacturing
  - BS311600: Meat product manufacturing
  - BS311700: Seafood product preparation and packaging
  - BS311800: Bakeries and tortilla manufacturing
  - BS311900: Other food manufacturing
  - BS312110: Soft drink and ice manufacturing

# Outputs of the Statistics Canada Economic Impact Simulation Model

- The crop products include
  - MPG111A01: Canola
  - MPG111A02: Oilseeds (except canola)
  - MPG111A03: Wheat
  - MPG111A04: Grains (except wheat)
  - MPG111A05: Potatoes
  - MPG111A06: Fruits and tree nuts
  - MPG111A07: Other crop products
  - MPG111A08: Vegetables (except potatoes)
  - MPG111400: Nursery and floriculture products

# Outputs of the Statistics Canada Economic Impact Simulation Model

- The animal products include
  - MPG112001: Cattle and calves
  - MPG112002: Unprocessed fluid milk
  - MPG112003: Hogs
  - MPG112004: Eggs in shell
  - MPG112005: Live poultry
  - MPG112006: Other miscellaneous live animals
  - MPG112007: Raw fur skins; animal production not elsewhere classified

# Outputs of the Statistics Canada Economic Impact Simulation Model

- The processed food products include
  - MPG311101: Dog and cat food products
  - MPG311109: Other animal feed
  - MPG311201: Flour and other grain mill products
  - MPG311202: Margarine and cooking oils
  - MPG311203: Breakfast cereal and other cereal products
  - MPG311209: Grain and oilseed products, not elsewhere classified
  - MPG311301: Sugar and sugar mill by-products
  - MPG311302: Chocolate (except confectionery)
  - MPG311303: Confectionery products
  - MPG311401: Fruit and vegetable juices (including frozen concentrated)

# Outputs of the Statistics Canada Economic Impact Simulation Model

- The processed food products include (continued)
  - MPG311402: Preserved fruit and vegetables and frozen foods
  - MPG311501: Fluid milk and processed milk products (except frozen)
  - MPG311502: Cheese and cheese products
  - MPG311503: Other dairy products
  - MPG311504: Ice cream and frozen desserts
  - MPG311601: Fresh and frozen beef and veal
  - MPG311602: Fresh and frozen pork
  - MPG311603: Fresh and frozen poultry and fowl
  - MPG311604: Fresh and frozen lamb and goat meat
  - MPG311605: Processed meat products and animal by-products



# Outputs of the Statistics Canada Economic Impact Simulation Model

- The processed food products include (continued)
  - MPG311700: Prepared and packaged seafood products
  - MPG311801: Bread and rolls
  - MPG311802: Cookies, crackers and baked sweet goods
  - MPG311803: Flour mixes, dough and dry pasta
  - MPG311901: Snack food products
  - MPG311902: Coffee and tea
  - MPG311903: Flavouring syrups, seasonings and dressings
  - MPG311909: Other miscellaneous food products
  - MPG312110: Bottled water, soft drinks and ice

# Outputs of the Statistics Canada Economic Impact Simulation Model

- Impact variables include
  - output/production
  - gross domestic product (GDP) and the GDP components (income side)
  - employment (jobs and full-time equivalents)
  - imports and interprovincial trade flows
  - taxes on production and products by level of government (federal, provincial and municipal)

# Outputs of the Statistics Canada Economic Impact Simulation Model

- Impact variables are also shown by
  - province
  - industry, based on the Input-Output Industry Classification (IOIC)
    - for output, GDP and employment
  - products, based on the Input-Output Commodity Classification (IOCC)
    - for output and imports

# Outputs of the Statistics Canada Economic Impact Simulation Model

- Types of impact include
  - direct impact
  - open impact
    - sum of the direct and indirect impact
  - closed impact
    - sum of the direct, indirect and induced impact

# Outputs of the Statistics Canada Economic Impact Simulation Model

- Direct impact:
  - Impact attributed to the phenomenon directly under study
    - e.g., GDP directly attributed to the construction of a new slaughtering plant
    - e.g., number of people directly employed at this plant

# Outputs of the Statistics Canada Economic Impact Simulation Model

- Indirect impact
  - attributed to the suppliers of the goods and services required for the direct and indirect impacts
    - e.g., GDP attributed to the suppliers of the building materials used in the construction of a slaughtering plant
    - e.g., number of people employed in these supplying industries
    - e.g., number of full-time equivalents employed at the farms supplying the slaughtering plant with livestock

# Outputs of the Statistics Canada Economic Impact Simulation Model

- Induced impact
  - attributed to the suppliers of the goods and services demanded by the workers spending their wages and salaries in the marketplace as a result of the direct and indirect impacts
  - amount spent is after taxes and savings

# Modifying the model to include additional agriculture detail

- The small number of agriculture industries seriously limits the usefulness of the model and multipliers for agriculture analysis.
  - For example, a \$100 million increase in the production or exports of wheat would yield almost the same economic impact as a \$100 million increase in the production or exports of potatoes or fruits and nuts.
  - Similarly, a \$100 million increase in the production or exports of cattle and calves would yield almost the same economic impact as a \$100 million increase in the production or exports of unprocessed milk or eggs in shell.



# Modifying the model to include additional agriculture detail

- This limitation could be reduced by increasing the number of agricultural industries in the supply and use tables.
  - This would allow for the creation of more specific production functions that would yield more specific and accurate impact information.
  - This was done in reference year 2008.

# Modifying the model to include additional agriculture detail

- Industry 111A00, crop production (except greenhouse, nursery and floriculture production), was expanded to
  - 111a01: Wheat production
  - 111a02: Feed grain production
  - 111a03: Oilseed production
  - 111a04: Potato production
  - 111a05: Fruit and vegetable production
  - 111a06: Other crop production

# Modifying the model to include additional agriculture detail

- Industry 112A00, animal production (except animal aquaculture), was expanded to
  - 112a01: Dairy production
  - 112a02: Cattle production
  - 112a03: Hog production
  - 112a04: Poultry and egg production
  - 112a05: Other livestock production

# Modifying the model to include additional agriculture detail

- Increasing the number of industries in the supply and use tables requires additional resources.
  - Resources are limited.
    - specialist to modify the supply and use tables (EC-05 for about six months)
    - specialist to modify the model and multipliers (EC-06 or EC-07 for about six to eight weeks)
  - Source data must be available.
  - The decision to proceed must be negotiated with Ziad Ghanem, Director of Industry Accounts Division, Statistics Canada.

# Conclusion

- Statistics Canada is happy to work with anyone on projects related to economic impact analysis.
- We offer a [workshop](#) to help users better understand the supply and use tables and derived products, such as the multipliers and models.