

THE UNIVERSITY OF MANITOBA
AN ALTERNATIVE SYSTEM OF FINANCIAL ACCOUNTING FOR THE CANADIAN
AGRICULTURAL PRODUCTION SECTOR

by

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AN ALTERNATIVE SYSTEM OF FINANCIAL ACCOUNTING FOR THE CANADIAN
AGRICULTURAL PRODUCTION SECTOR

BY

GEORGE W. BEELEN

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the University of Manitoba in partial fulfillment of the requirements
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ABSTRACT

Aggregate financial accounts for Canadian agriculture are subject to increasing obsolescence as the information requirements of decision-makers and the structure of agriculture change. Aggregate income and capital accounts for agriculture should be consistent with accounting principles and relevant to the requirements of data analysts and decision-makers.

Much economic analysis of Canadian agriculture has centered on the equity of income levels and rates of economic returns to farm operators. This research examines the aggregate financial data system and argues for an improved set of accounts that will permit better analysis of farm operator and farm business levels of income and rates of return to factors of production. As well, the expanded accounting approach resolves some accounting inconsistencies present in the current accounting framework. Finally, it provides the data base for other major information requirements such as productivity and capacity analysis, agricultural input demand estimation and forecasting, and the monitoring of the financial position of farm businesses.

Many of the difficulties associated with the present aggregate accounts arise from the mixture of sectoring concepts used in the construction of accounts. This thesis examines alternative sectoring approaches and their advantages. Product and establishment sectoring bases are more appropriate for the analysis of productivity or of the

industry as a group of businesses. Institutional sectoring bases must be applied for the analysis of the equity of incomes or total economic returns.

Accounts are presented and discussed in detail on income from production, cash flows, total incomes of farm operators, capital values, capital balance sheets and capital flows. Accounting details are discussed with respect to procedures used and problems existing in currently estimated data series. Particular emphasis is placed on the design and rationale for establishment based accounts.

It is argued that capital accounting for Canadian agriculture needs to be improved to facilitate the analysis of capital structure and total economic returns earned on factors of production engaged in agriculture. Valid linkages between establishment-based incomes and capital accounts and institutionally-based farm family income accounts are developed. These linkages are important in the analysis of major policy issues such as the survival of the family farm.

Recommendations are made with respect to issues involved in implementation of the proposed accounts, priorities for development and specific accounting series improvements. Major recommendations are (1) the development of accounts on an trial basis with detailed documentation to enable critical review and examination by data analysts and users, (2) the introduction of a cash flow account, (3) greater emphasis on the establishment as the sectoring basis of the income and capital accounts, and (4) the development of a balance sheet of assets and liabilities for the Canadian agricultural production sector.

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Chapter I

INTRODUCTION

1.1 THE PROBLEM STATEMENT

Information systems are created to meet the requirements of decision-makers. Over time, information systems may become obsolete due to changes in these requirements or changes in the structure of the reality represented. The financial accounting system for the Canadian agricultural production sector has become somewhat obsolete as the information requirements of policy-makers, and the structure and organization of the sector have changed over time. Decision-makers require data which reflect the heterogeneous nature of the sector as policies tend to focus on specific commodities and subsectors in agriculture. Additionally, structural changes have created accounting inconsistencies and problems in the interpretation of the financial accounts. For example, changes in tax laws for wages paid to farm operator spouses and children have resulted in the inclusion of these wages in the wage expense series. This has changed the meaning of the farm net income measure since some income of farm operator families from farming operations is excluded from the farm net income measure.

An obsolete data system affects the quality and amount of information available to decision-makers and, ultimately, affects the quality of decisions. It is argued in this thesis that the aggregate farm financial data system can be improved with an expanded set of financial accounts.

These accounts should result in better information and thus, facilitate better decisions by decision-makers.

The data system examined in this study consists of a number of financial accounts, produced mainly by federal and provincial government agencies. Currently, aggregate accounts are produced for income, the value of farm capital, and farm debt outstanding. Recently, data on the income sources of farm taxfilers have been developed. Other components of the data system are financial series produced by various provincial governments, data developed from special surveys or studies by Agriculture Canada and others, and financial data derived from the quinquennial Census of Agriculture. Data requirements for the analysis of food systems and other relationships of the production sector with the rest of the economy are not specifically addressed in this study. However, the accounts developed here are designed to be consistent with accounts for related industries.

The financial information system for the Canadian agricultural production sector serves public and private decision-makers, using information for a variety of purposes. Public policy-makers require information to monitor the financial situation of the sector and subsectors, and to develop and evaluate the effectiveness of policies and programs. Agricultural policies and programs have impacts on, among other things, the efficiency of production of agricultural products, the prices of those products, and the distribution of income to farmers, consumers, and others. Private sector decision-makers require information on the financial situation of the sector to anticipate the demand for inputs and the financing requirements of the sector. As well, information is

required for general use to permit informed public debate on issues affecting agriculture and the country as a whole.

1.2 OBJECTIVES AND RESEARCH APPROACH

The purpose of this thesis is to analyse and propose improvements to the aggregate financial data system for the Canadian agricultural production sector. The development of disaggregated financial data by type and size of farm establishment is of the highest priority for improvement of the information base.¹ However, it is also essential that the aggregate financial accounts be improved to reflect current data requirements and accounting consistency principles. Alternatives in the construction and estimation of aggregate accounts are examined in this thesis. The principal objective is to propose an improved system of aggregate financial accounts which better serves the needs of decision-makers. Other objectives of this study are to identify the problems associated with the current data system and to stimulate progress towards the implementation of a better data system. The study will:

1. Summarize a theory of information systems and relate it to the financial information system for the agricultural production sector in Canada.
2. Describe the sources and context of problems associated with the existing data system.
3. Discuss alternative approaches to defining the production sector and propose an operational definition of the sector.

¹ For example, researchers at Statistics Canada are presently attempting to develop such data from taxfiler sources and probability surveys.

4. Present and explain a series of accounts on income and capital for the sector. These accounts will be justified in terms of their effectiveness in resolving problems associated with the present data system, and in terms of their potential usefulness. In addition, their relationship to existing accounts will be discussed.
5. Discuss the implementation of such a system of accounts, given the nature of the Canadian agricultural statistics system.

The thesis consists of six chapters. Chapter I has briefly introduced the problem, listed the objectives of the study and outlined the research approach. Chapter II presents a theory of information systems and details of the system being examined in this study. The purposes of this system are discussed and problems associated with its obsolescence are explained. Chapter III examines alternative sectoring concepts and proposes an operational definition of the agricultural production sector. Chapter IV presents the format and rationale of a series of income accounts for the sector. Accounts for current production income, cash flows and total incomes of farm operators are detailed. Chapter V presents the format and rationale for sector capital accounts. The accounts discussed are the capital value statement, the balance sheet, and the capital flows account. Finally, chapter VI discusses some of the issues in the implementation of the proposed data system and presents some conclusions and recommendations for further research. It is expected that this study will form the basis of discussion for the eventual development and implementation of an expanded aggregate financial accounting system.

Chapter II

PROBLEMS IN THE FINANCIAL INFORMATION SYSTEM

2.1 INTRODUCTION

There are many problems associated with the compilation and use of aggregate financial accounts for the Canadian agricultural production sector. Questions concerning: (1) the theoretical constructs to be measured, (2) the validity of estimation methods, (3) the format and coverage of accounts, and (4) the interpretation of data have been raised. Many of these problems are well known to statisticians producing the accounts, economic and financial analysts, and other data users. The origin of these problems can be understood in the context of a theory of an information system. This theory also provides a model for analysing the effectiveness of the agricultural production sector's financial accounts.

This chapter examines a part of the financial data subsystem within the information system for the Canadian agricultural production sector. Problems in the financial accounts are argued to be the result of obsolescence in their design, which cause accounting inconsistencies, interpretation problems, and data gaps which limit the utility of the accounts. Some of the major uses of the system are examined to provide indications of possible improvements in the accounts.

2.2 CONCEPTUAL OBSOLESCENCE IN INFORMATION SYSTEMS

To understand the nature and sources of problems in the data system under consideration, the nature of information systems in general is discussed. Data are "names identifying real world entities or referents".² They are comprised of identifiers, descriptors and quantifiers, although it is not necessary that data contain all three components. An example of a datum is that total net income of farm operators from farming operations for Canada in 1980 was \$3.2 billion. This datum consists of a descriptor, (total net income of farm operators from farming operations), two identifiers, (Canada and 1980), and a quantifier, (\$3.2 billion).

Information is an act or process that informs a decision-maker and, thus, data and information are not equivalent concepts. To become information, data require analysis and interpretation to place them in a decision-making context. For example, data on farm net income might become information when used to analyse the effects of a government program on changes in farm net income. The information processing task is purposeful by its nature and data can be seen as raw material inputs into the information process. It is noteworthy that the formatting of data is part of the interpretation and analysis function. Thus, statistical analysis is implied even in the publication of data.³

² These definitions of data and information are developed by E.S. Dunn, Social Information Processing and Statistical Systems--Change and Reform, (New York: Wiley Interscience, 1974), pp. 19-20.

³ Charles H. Riemenschneider and James T. Bonnen, "National Agricultural Information Systems: Design and Assessment", in Information Systems for Agriculture, edited by M.J. Blackie and J.B. Dent, (London, U.K.: Applied Science Publishers Ltd., 1979), p. 151.

The data collection process involves the conceptualization, operationalization, and measurement of data entities.⁴ Theoretical conceptualization is the process of construction of abstract ideas relating to a representation of reality. These theoretical concepts are designed to systematize and categorize reality accurately so it can be understood by data users. For example, the concept of net farm income refers to the theoretical meaning of such a measure. Net farm income might be conceptualized as the current production return to the factors of production engaged in the agricultural production sector. Theoretical concepts are abstract ideas and cannot be measured as such. Concepts are operationalized by the process of defining categories of empirical variables as representative as possible of the theoretical concepts. Operationalization of the farm net income concept involves defining the factors to be identified and the incomes to be measured. Farm net income might be operationally defined as the returns to farm operator families from farming operations.⁵

Data concepts are the guidelines by which data are collected, and are made meaningful by a set of purposes. Bonnen's model of the information processing system illustrates the relationship between the data and inquiry systems, shown in Figure 2-1. In this model, the information processing system is composed of inquiry and data systems. The inquiry

⁴ A detailed explanation of information processing and data collection is contained in James T. Bonnen, "Assessment of the Current Agricultural Data Base: An Information System Approach", in A Survey of Agricultural Economics Literature, Volume 2, edited by L. R. Martin, (Minneapolis: University of Minnesota Press, 1977), pp. 386-407.

⁵ See Charles H. Riemenschneider and James T. Bonnen, "National Agricultural Information Systems: Design and Assessment" in Information Systems for Agriculture, edited by M.J. Blackie and J.B. Dent, p. 149.

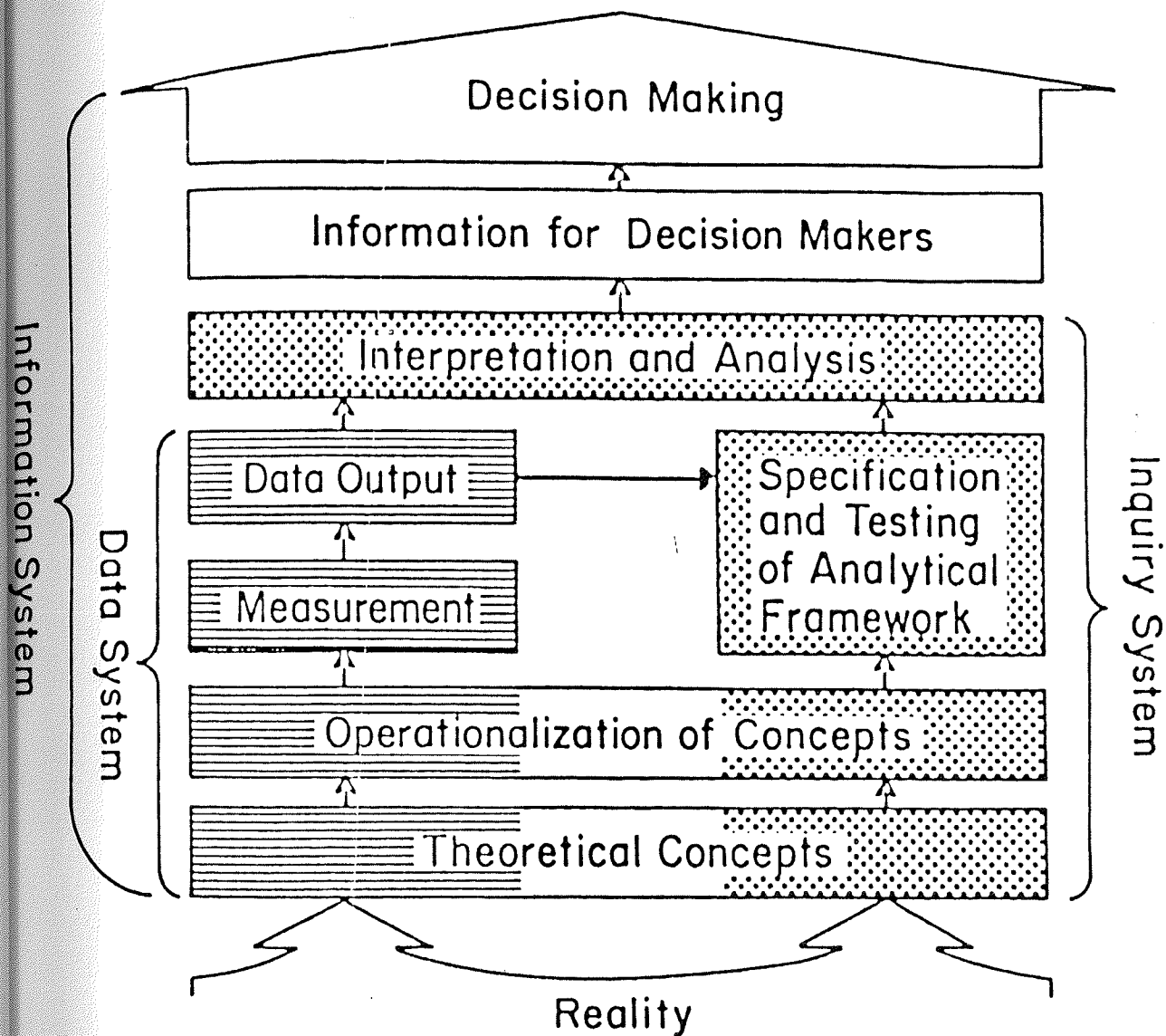
system consists of information processors searching for data helpful in answering questions or solving problems. It is concerned with the specification and testing of analytical procedures in order to generate information for decision-makers. The data system is the data collection and formulation part of the process. It is concerned with the identification and measurement of operationalized concepts, and the compilation and dissemination of data. The data system must resolve issues concerning both what to measure as well as how to measure, on the basis of the types of decisions made using information derived from the data.

Both systems create theoretical concepts and operationalize these concepts to facilitate empirical analysis. The major data entity problem in the production of data is making adequate representation of concepts for the purposes intended. In this context, Bonnen has identified three types of reliability of data as: (1) conceptual, (2) operational, and (3) measurement reliability.⁶

The relevance of the information system is affected by the arbitrariness of the boundaries of data conceptual constructs. As Bonnen has pointed out, obsolescence can develop as reality changes.⁷ Since most social data entities are not physical object representations, but abstract constructs with arbitrary definitional boundaries, these entities are likely to be variable over time. For example, the concept of an atom has changed over time as information on its nature and characteristics became available. It did not change because the nature of the atom

⁶ James T. Bonnen, "Assessment of the Current Agricultural Data Base: An Information System Approach", in A Survey of Agricultural Economics Literature, Volume 2, edited by L.R. Martin, p. 395.

⁷ Ibid.



SOURCE: James T. Bonnen, "Improving Information on Agriculture and Rural Life", *American Journal of Agricultural Economics* 57, No. 5, (December, 1975), p. 758.

Figure 2.1: Representation of An Information System

itself changed. On the other hand, the concept of a farm may become obsolete over time as the nature of agriculture and the farm changes. Thus, entity instability arises from both changes in the environment which the entities describe and changes in the purposes of the system. These changes can invalidate the theoretical concept, operational definition, or measurement of the data entity. In addition, the interpretation of time series data may be affected by changes in measurement reliability over time. Data entities are designed with specific purposes in mind which guide the processes of data conceptualization, operationalization, and measurement. When the purposes of the system change, the existing entity definitional boundaries may become inappropriate for decision-making. The data entities can become irrelevant or misleading. For example, the aggregate net farm income account can be misleading if used as an indicator of the financial situation of specific subsectors within agriculture.

This model of an information processing system has several important implications for any operational information system. It is apparent that both data producers and users must work together in the development of common concepts, operational definitions of these concepts, and measurement procedures. The inquiry and data systems are integral and related parts in the overall information system. Also, since facilitating decisions is the purpose of the system, evaluation of any information system should be in terms of its usefulness in making decisions. Information systems should reflect the purposes for which they are designed. For example,

An information system designed for farm policy decisions by government policy-makers would...differ from an information system used by a farmer in the day-to-day operations of a farm

business because of the difference in decision-makers.⁸

Also, data are not used directly, but rather must be formatted, interpreted, analysed and placed in the context of specific decisions. Finally, obsolescence in information systems arises from either changes in the reality which theoretical concepts represent or changes in the types of decisions made by decision-makers using the information.

2.3 PURPOSES OF THE INFORMATION SYSTEM

Ultimately, accounts are estimated for the purpose of satisfying demands for information by decision-makers, so it is appropriate to consider the purposes of the accounting system to be examined. The types of decisions made by users of the information system provide the basis for the construction of more useful accounts.

Penson and Lins identify five general reasons for compiling aggregate agricultural financial accounts.⁹ These are to provide information relating to the:

1. equity of returns to people engaged in farming.
2. productivity of the sector.
3. capacity of the sector.
4. potential demand for inputs.
5. financial position of farm businesses.

⁸ Charles H. Riemenschneider and James T. Bonnen, "National Agricultural Information Systems: Design and Assessment", in Information Systems for Agriculture, edited by M.J. Blackie and J.B. Dent, p. 148.

⁹ John B. Penson, Jr. and David A. Lins, Agricultural Finance: An Introduction to Micro and Macro Concepts, (Englewood Cliffs, N.J.: Prentice-Hall Inc., 1980), pp. 291-293.

These purposes represent classes of policy issues which require data for monitoring economic conditions, developing and evaluating the effectiveness of public policies and programs, and making private sector decisions. In addition, the aggregate sector financial accounts are used in the compilation of the Canadian System of National Accounts (CSNA). The CSNA framework is useful in general economic analysis and forecasting. Additionally, it permits intersectoral comparisons of structure and economic performance on a consistent basis.

The equity of returns to people engaged in farming activities involves two different concepts for policy purposes. The analysis of economic welfare of sector participants involves the comparison of the income and wealth positions of different population groups in the sector and with groups in other sectors. The most common unit of observation for welfare purposes appears to be the family. Penson and Lins identified five groups of possible interest as: resident operator families, nonresident operator families, resident hired labour families, nonresident hired labour families and nonoperator landlord families.¹⁰ Since economic welfare involves both income and wealth considerations, the data system should include accounts on both income and assets owned by sector participants. A second concept of equity relates to equity of returns to comparable resources. This implies that measures must be available to calculate rates of return to investment for groups within agriculture and between agriculture and other industries. Subsector data are needed since the heterogeneous nature of the sector implies that rates of return are likely to vary greatly by product type and size

¹⁰ Ibid., p. 294.

of operation. Data on demographic characteristics and levels of investment also are necessary for farm and nonfarm groups in the analysis of rates of return.

Productivity analysis refers to comparing production with resources used in that production. For the total aggregate account, accurate measurement of outputs and corresponding inputs used is essential for productivity analysis.

Agricultural capacity measures refer to the ability of the sector to produce under various policy and economic conditions.¹¹ Capacity and utilization rates for an industry are indicators of current and future capital requirements, and of cost, price and profit conditions of the sector. Spielmann and Weeks concluded that special survey approaches for selected samples of producers of various major commodities may be most desirable for developing adequate capacity measures.¹² The lack of a sufficient conceptual basis for capacity utilization measurement gives little guidance in the compilation of aggregate data series to support such measurement. However, it can be concluded that accurate measures of capital used in the sector are essential requirements in the analysis of capacity.

Input suppliers use aggregate agricultural financial data to assess potential demand for inputs. Many inputs are specific to particular types of production so it can be anticipated that data by type of farm are useful in this application. Demand estimation requires data on in-

¹¹ A discussion of capacity measurement is contained in H. Spielmann and E.E. Weeks, "Inventory and Critique of Estimates of U.S. Agricultural Capacity", American Journal of Agricultural Economics 57, No. 5, (December, 1975), pp. 922-928.

¹² Ibid., pp. 296-297.

come and wealth positions of farm holdings and on expected production plans and structural changes in the sector. Balance sheets and financial flows accounts are particularly useful in the analysis of the financial requirements of the sector.

Finally, monitoring the financial position of farm businesses implies data requirements on the cash position, assets, debt position and incomes of farms businesses. Again, differences between types and size classes of farms are important due to the degree of heterogeneity in the sector.

The information system for agriculture also encompasses food system analysis and other areas relating the production sector to the rest of the economy. Data on the production sector should be compiled on a consistent basis with other sectors of the economy to maximize the usefulness of the accounts.

Aggregate financial accounts are used extensively by decision-makers affecting the agricultural production sector. A study of United States Department of Agriculture (USDA) income data found that the principal uses of the data were public policy analysis and input demand estimation. Public uses were in general policy applications, program evaluation, tax revenue planning, and the allocation of public research funds. Private sector uses were in production planning, marketing, advertising, investment decisions, credit analysis, and forecasting applications.¹³ An informal review of mailing lists and other Statistics Canada documents indicates that user categories are very similar for the Canadian data system. Agriculture Canada, provincial departments of agriculture,

¹³ Charles H. Riemenschneider, "An Information Systems Analysis of USDA Farm Income Data", (Ph.D dissertation, Michigan State University, 1978), p. 101.

and other federal and provincial government agencies are major public sector users of the financial accounts for agriculture. Private sector users are mainly farm input supply firms and financial institutions. Many agricultural industry associations and producer groups receive data directly from Statistics Canada and provincial government statistical offices. Thus, there is evidence that the uses of the aggregate accounts in Canada are similar to those in the United States, on the basis of user groups.

Riemenschneider's study of the data priorities and uses of the U.S. farm income data system provides some indications of the types of data required.¹⁴ He found that data tended to be used in conjunction with other information sources. The aggregate income data tended to provide the context of policy decisions but generally were not the principal data sources used for policy monitoring or development. Users confirmed that data by size and type of farm were the most essential for program development and evaluation. Problems caused by the skewed distribution of income in agriculture were felt to be addressed insufficiently due partly to the lack of data available on subsector formats. The lack of disaggregated data was felt to contribute to the masking of these structural problems. Riemenschneider concluded that the usefulness of the aggregate farm income data format was declining due to the need to develop and monitor policy on a subsector basis. The mixture of income concepts in the accounts further reduced the utility of the data. It may be concluded that, as the structure of farming has changed, and sector incomes have become less directly associated with many farm fami-

¹⁴ Ibid., pp. 162-174.

lies' incomes, accounts are needed separating sector and operator incomes.

2.4 PROBLEMS IN THE DATA SYSTEM

Problems in the data system must be examined in some detail to understand the extent of obsolescence present in the system. Although inter-related, two sources of pressures on the data system can be identified. Changes in the scope of agricultural public policy have created pressures for new data series and more disaggregated data for existing series. Also, changes in the structure of the sector have affected the conceptual, operational, and measurement reliability of many data series.

The existing financial data system was developed in the 1930's and 1940's in response to pressures for financial information. Early agricultural policy in Canada concentrated on research and development in crop production and animal husbandry and on improving methods of marketing grain. With the onset of the Depression, there was a shift to policy designed to improve the income position of farmers and to increase their market power through centralized marketing. During World War II, production maximization was emphasized. In the post-war period, policies concentrating on productivity, marketing, price stability and the adequacy of incomes were developed. Recently, agricultural policy initiatives have expanded to include goals such as stable food prices with adequate supplies, stable and fair producer returns, and reduced disparities within agriculture. Some other major policy concerns are: the quality of rural life, conservation of soil and other resources, rural-

urban balances and the fulfillment of international food supply responsibilities.¹⁵ This expansion of the scope of agricultural policy has created pressures for more data. For example, financial data are needed to permit the analysis of flows of agricultural products through the food system, and income disparities within agriculture by type and size of farm.

Changes in the structure of the production sector also have had impacts on the policy initiatives being developed. Some of the structural changes in agriculture include: larger production units, greater product specialization, greater capital requirements, greater reliance on purchased farm inputs, vertical integration, increasing reliance by many farmers on nonfarm sources of income, and more incorporation of farms.¹⁶ These structural changes have implications for the design of the information system supporting decisions affecting the sector. For example, higher degrees of heterogeneity in production and lower reliance on agriculture for income by many farmers have decreased the usefulness of the existing aggregate series, in applications such as farm program impact analysis and welfare analysis. Similarly, more commodity-specific programs have been developed, reflecting increased product specialization and creating the need for accounts on "commodity" or "type-of-farm"

¹⁵ See Elmer L. Menzie, "Developments in Canadian Agricultural Policy, 1929-1979", Canadian Farm Economics, 15, No. 2, (April, 1980), pp. 15-19.

¹⁶ Two U.S. studies of the impacts of these structural changes on the information system are M.L. Upchurch, Steps Toward Better Data For The Food Industry, Economic Research Report 2, U.S. Department of Commerce, Bureau of the Census, (Washington: 1979); and AAEA Committee on Economic Statistics, "Our Obsolete Data Systems: New Directions and Opportunities", American Journal of Agricultural Economics 54, No. 5, (December, 1972), pp. 1552-1564.

bases. In addition, changes in the agricultural production sector and its relationship to other industries in the food system have created pressures for more consistent data for flows of agricultural products through the economy.

Changes in the structure of the sector also have affected the quality of existing data concepts and methods. For example, farm-gate prices of products of vertically-integrated operations are difficult to identify or interpret since no market transactions occur before products are processed. Vertical integration of farm operations with processing or marketing firms may present valuation problems when accounting for the sector's output. In addition, the agricultural production sector is not defined adequately for statistical purposes. While there is general agreement that grain production and animal husbandry are part of the agricultural production sector, there are problems in defining the boundaries of the sector. For example, while farm woodlot production currently is included in the sector as agricultural production, there are questions as to whether poplar tree farming should be classified in agriculture or forestry. The use of ponds for fish farming raises the question of the boundary between the agricultural production and fishing industries. The boundary between production and marketing also presents difficulties in defining the sector, especially as the marketing activities of farms become more complex. Data requirements for the analysis of issues related to the food processing, distribution and retailing (PDR) sectors have also expanded due to structural changes. For example, food production and marketing have become more highly specialized, new ownership patterns have emerged and contract operations now predomi-

nonfarmers, it becomes more difficult to estimate this ratio accurately, especially in the short term.

An additional problem is the inconsistent accounting procedures used for inventories in the present accounts. Input expenses are estimated annually on a cash basis with no adjustment for input inventory changes. Only output inventories are accounted for in the income statement through the value of inventory change series. The method of valuation of inventory change also presents problems as wide variations in commodity prices within a year can create problems in estimating an appropriate annual value for the physical change in inventories.

Changes in tax laws have also affected the reliability of the data system. For example, the net income of farm operators has traditionally been measured as the return to the farm family's equity, unpaid labour, management, and entrepreneurial inputs. Recent changes in tax laws allow wages paid to spouses of farm operators to be deducted as farm business expenses. Estimates for wage expenditures now include these wages paid to spouses of operators. As a result, the measurement of net farm income has changed significantly due to the change in the coverage of the wage expense series.

Changes in the structure of agriculture also have created pressures for additional data series. The Canadian financial accounts have never included a balance sheet for the sector. With the growing importance of debt financing and larger capital requirements of the sector, a set of capital accounts, especially a balance sheet, is needed. Furthermore, the accounts have often been used as indicators of the economic welfare of farm operators. The importance of nonfarm income and wealth sources

nate some farm products.¹⁷ These changes are important in the analysis of food prices and other issues.¹⁸ Furthermore, there has been some controversy with respect to which activities of farm operators are associated with the sector, and with respect to what constitutes a farm holding.

Changes in the structure of the sector have had serious impacts on the reliability of the methods used to estimate individual receipt and expenditure series for the sector. Most receipts data are estimated from market sources by commodity, where it is assumed that all such marketings originate from the agriculture sector. Expenditures, on the other hand, are estimated primarily from surveys of farm holdings. Consequently, problems have arisen in matching receipts and expenditures for income estimation. For example, hog production may be contracted by a feed mill with the farmer paying all expenses except feed. These feed expenses may be missed in surveys of farm holdings' expenses. However, the receipts earned when the hogs are sold are included in the income of the sector through the marketing sources used to estimate receipts. Thus, the net income measure does not match incomes against associated production expenses. Also, the methods used to estimate farm debt expenses and depreciation allowances are based on an estimate of the proportion of farm debt and farm capital held in the sector. As this proportion changes over time, with more assets and farm debt held by

¹⁷ Shirley Kallek, Foreword to Steps Toward Better Data For The Food Industry, by M.L. Upchurch, p. iii.

¹⁸ The data implications for food systems analysis are not investigated in this study. A summary of some of the data implications for Canada is Phil Jensen, "Selected Public Policy Issues For The Food and Agriculture Sector and Some Implications for Statistics Canada", (Ottawa: Statistics Canada, 1983).

for farm operator families' economic welfare is now well documented.¹⁹ While taxfiler data sources are often used to analyse farmers' welfare, this source is not entirely compatible with the existing aggregate income account. Series for total incomes of farmers have not yet been developed which can be related directly to the sector income account.

All of these problems relate to the reliability of the data system. They arise as changes in the sector invalidate the concepts and measurement methods used in the accounts. Many more minor problems exist with specific data collection methods for various data series. For example, forward pricing of canola makes the estimation of cash receipts for canola difficult, since the timing of product marketings may differ from the timing of payments. Thus, the price prevailing at the time of delivery may not be the actual transaction price.

This section has illustrated the nature of the problems facing the data system. These problems will be addressed in the discussion of the recommended accounting system in chapters IV and V below.

2.5 THE LITERATURE ON DATA CONCEPT PROBLEMS

No major articles have been published in Canada specifically addressing theoretical problems in the financial accounts. Concern over these problems has been expressed in correspondence with statisticians responsible for the accounts, and at statistical conferences and meetings. There exists, however, an extensive literature on the analysis of farmers' economic welfare in Canada.²⁰ The emphasis has been on the role of

¹⁹ See, for example, R. Paul Shaw, "Canadian Farm and Nonfarm Family Incomes", American Journal of Agricultural Economics 61, No. 4, (November, 1979), pp. 676-682.

income and wealth in economic welfare, the importance of nonfarm income sources, and the importance of capital gains in agriculture. Others have pointed out the need for disaggregated data on farm incomes and assets.²¹

A sizable and extensive literature has evolved in the past decade in the U.S. on farm financial data concepts. This literature comprises discussions of limitations and problems in the accounting system and alternative aggregate accounts, which culminated in a revised format for the USDA accounts in 1980. Due to similarities in the construction of Canadian and U.S. accounts up to 1980, it is useful to briefly review some of the American literature on data concept problems.

Grove criticized the concept of 'realized' net income as being outdated because it violated income measurement theory and caused confusion among users.²² Grove's argument is that only income from current production should be shown in the farm accounts in an income statement. He argued that the role of an income statement is to match current value of production against the value of inputs used in that production. The realized net income concept ignores inventory adjustments but continues to account for other nonmoney expenses such as depreciation. Thus, the realized net income series is a mixture of money and nonmoney income and

²⁰ See, for example, bibliographic references to Bollman (1980); Brinkman (1980), (1981); Chase (1980); Chase and Lerohl (1981); Gray and Prentice (1980); and McClatchy and Campbell (1975).

²¹ See, for example, Marjorie Bursa, "Analysis and Discussion of Farm Financial and Aggregate Statistics", in Summary Report of the Thirtieth Federal-Provincial Committee on Agricultural Statistics, (Ottawa: Statistics Canada, 1979), pp. 149-157.

²² Ernest W. Grove, "Realized Farm Income: An Outmoded Concept", Journal of Farm Economics 49, No. 4, (November, 1967), pp. 795-805.

expenditures, and consequently, it represents neither a cash flow summary nor any identifiable concept of current income.

Irwin argued that the increasing separation of ownership of farm assets and farm operation results in divergence of returns to farm production and returns to farm operators.²³ This necessitates separate measurement of these concepts to recognize that farm income accrues to both farm operators and nonoperators. Lee defined returns to the farm operator as the value added by the act of bringing together resource services plus the returns to any operator-owned farm resources.²⁴ Different series are thus implied for sector returns and operator incomes. Farm operators also earn income from nonfarm sources which should be estimated for welfare policy issues.

The American Agricultural Economics Association (AAEA) Committee on Economic Statistics summarized the problem of conceptual obsolescence in the accounts for the "food and fiber industry".²⁵ The committee argued that the farm as the primary unit of observation is obsolete since

no longer can groups of farms be compared or aggregated to a commodity or industry level with statistical results capable of clear interpretation...the basic unit of observation should be compatible across data systems of the entire United States industrial structure.²⁶

²³ George D. Irwin, "Three Myths About the Balance Sheet: The Changing Financial Structure of Farming," American Journal of Agricultural Economics 50, No. 5, (December, 1968), pp.1596-1599.

²⁴ John E. Lee, "Changes in the Financial Structure of the Farm Sector and Implications for Research," American Journal of Agricultural Economics 50, No. 5, (December, 1968), pp. 1552-1564.

²⁵ AAEA Committee on Economic Statistics, "Our Obsolete Data Systems: New Directions and Opportunities," American Journal of Agricultural Economics 54, No. 5, (December, 1972), pp. 867-875.

²⁶ *Ibid.*, p. 868.

This implies use of the establishment concept in the construction of agricultural accounts.²⁷ They also pointed out the importance of capital stock data in the understanding of sector structural issues. Weeks et al. pointed out that the current data system was constructed to meet specific information needs related to equity and viability.²⁸ They indicated that the income accounts were never designed to represent, and should not be interpreted as measuring, all income originating in agriculture or all income of farm people. The revised U.S. accounts were developed in the literature through the 1970's. The rationale for these expanded accounting formats is that factor incomes earned in farming and the personal incomes of farm operator families should be identified separately.

2.6 SUMMARY

The need for a review of the present accounting format is apparent. While some data series have been developed to address particular data needs, these developments have been largely independent of the sector financial data system. An improved aggregate format of accounts can serve as a basis for continued development of subsector accounts as well as better reflect the structure and organization of modern Canadian agricultural production.

²⁷ See section 3.2 below.

²⁸ Eldon E. Weeks, G.E.Schluter and L.W.Southard, "Monitoring the Agricultural Economy: Strains on the Data System," American Journal of Agricultural Economics 56, No. 5, (December, 1974), pp. 976-983.

This chapter has summarized some of the problems facing the financial data system. The problems associated with obsolescence arise both from changes in the structure of the sector and from changes in the demands being made of the system. Conceptual, operational and measurement reliability are affected by these changes. The uses of the information system are primarily public policy development and analysis and input demand estimation. Reliable accounts are needed to provide the data base for these uses.

Aggregate series can be compiled on the basis of several different units of aggregation, such as physical products, establishments, firms, or population groups. Any system of accounts which aggregates individual units must be based on a concept of sectoring. The next chapter discusses alternative sectoring approaches for agriculture, and explains the sectoring concept and definition of the sector to be used in the proposed set of accounts developed in chapters IV and V below.

Chapter III

DEFINING THE AGRICULTURAL PRODUCTION SECTOR

3.1 INTRODUCTION

Problems in the current financial accounts for the agricultural production sector have developed because of changes in the structure and organization of agriculture and in the uses made of the information system. The success of any accounting approach depends on whether it provides a good description of the sector and facilitates analysis of the main issues. A fundamental problem in the construction of financial accounts is the definition of the sector. Theoretical and operational definitions must be developed for the agricultural production sector to provide guidelines for the development of measurement procedures. These definitions should be developed on the basis of the requirements of users of the information system and the structural reality of the sector.²⁹ Other factors influencing the implementation of accounts are the costs of data collection, data availability, accounting consistency, and compatibility with related accounting systems.

This chapter discusses alternative concepts of sectoring, current sectoring practice in Canada, and approaches suggested by the United Nations framework and the revised U.S. system of accounts. The relationship between sectoring approaches and uses of the accounts is discussed to provide the rationale for the sectoring approach proposed. Finally,

²⁹ See section 2.2 above.

primary and secondary agricultural activities of farm establishments are defined to clarify the coverage of the sector and relate the sector definition to other industries in the economy.

3.2 SECTORING CONCEPTS

Sectoring refers to the manner in which individuals, firms and institutions are aggregated into distinct groups or sectors.³⁰ Sectoring affects the usefulness of aggregate accounts since a sectoring concept may or may not be appropriate for the purposes of the data system.

Several alternative sectoring concepts can be identified. In the National Accounts framework, the standard unit of aggregation is the "establishment". The "establishment" is defined for statistical purposes as:

The smallest operating entity which produces as homogeneous a set of goods as possible and for which records provide data on the value of output together with the cost of materials used and cost and quantity of labour resources employed to produce the output, and for which records or estimated allocations can provide the full range of production account variables to calculate "value added".³¹

The purpose of the establishment unit is "to provide a unit small enough to permit a high degree of industrial disaggregation of data into relatively homogeneous industry classes..."³² The national economy consists of industries which are groups of producing units or establishments en-

³⁰ John B. Penson, Jr. and David A. Lins, Agricultural Finance: An Introduction to Micro and Macro Concepts, (Englewood Cliffs, N.J.: Prentice-Hall Inc., 1980), p. 293.

³¹ Statistics Canada, Standard Industrial Classification, 1980 edition, Catalogue 12-501, p. 16.

³² Statistics Canada, Standard Industrial Classification, 1970 edition, Catalogue 12-501, p. 9.

gaged in similar types of economic activity in relation to goods and services. The activities of an establishment are classified as: (1) primary technical activities, (2) secondary technical activities, and (3) ancillary activities. Technical activities are "any operation or combination of operations that produce commodities primary or secondary to the establishment."³³ Primary technical activities are the principal economic activities of the establishment. Secondary technical activities include: (1) own-account capital formation, (2) activities provided on a significant scale for other establishments as well as for internal use, and (3) activities producing goods or services which become a physical part of produced commodities, such as packaging material for products of the establishment. Ancillary activities provide nondurable goods and services primarily for the use of the parent producing units, and are in the nature of support activities such as administration.³⁴ The classification of an establishment to an industry is based on the primary and secondary technical activities performed by the establishment, and is normally defined on the basis of the greatest share of value added. Ancillary activities are not included in the classification process for an establishment since they are mainly intermediate activities, internal to the establishment.

The establishment concept can be applied to accounts for the agricultural production sector. Under this concept, the sector consists of all establishments where the principal economic activity is the production

³³ Statistics Canada, Standard Industrial Classification, 1980 edition, Catalogue 12-501, p. 19.

³⁴ For a complete explanation of the establishment concept in the CSNA, see Statistics Canada, "Introduction", Standard Industrial Classification, 1980 edition, Catalogue 12-501, pp. 11-26.

of characteristic agricultural products. Thus, the production of the sector is all production activities of all establishments defined as farm establishments. This production includes both agricultural production (primary technical activity) and nonagricultural production, such as own-account capital formation and production of nonagricultural goods (i.e. secondary technical activities of establishments).

The product concept is an alternative basis for defining the sector and compiling financial accounts. This sectoring approach is based on agricultural production activity, regardless of the type of unit where such activity occurs. Thus, under the product concept, the sector comprises all production of agricultural commodities. The relationship between the establishment and product concepts of the sector is demonstrated in Figure 3.1. The difference between the two concepts is that the product concept refers to the production activities associated with agricultural commodities, regardless of the origin of product, while the establishment concept refers to the production activities of farm establishments, regardless of the nature of those activities. Agricultural production activities of nonagricultural establishments are included in the sector only under the product concept, and nonagricultural production activities of farming establishments are included in the sector only under the establishment concept.

For purposes of estimation of accounts, the agricultural production sector is commonly defined on the basis of "holdings" with a minimum level of sales of agricultural products. For example, the 1981 Census of Agriculture for Canada defined the farm unit as any "farm, ranch or other agricultural holding with sales of agricultural products...of \$250

Types of establishment and activities	Type of Product		Farm commodities	Nonagricultural commodities and services	
	Farming (major activity)	Nonagricultural (minor activity)			
Farming establishment	Farming (major activity)		All		Establishment concept of agriculture All + A22
	Nonagricultural (minor activity)			A22	
Nonagricultural establishment	Farming (minor activity)		A31		
	Nonagricultural (major activity)			A42	
			Product concept of agriculture All + A31		

Source: Eldon E. Weeks. Proceedings of Workshop on Farm Sector Financial Accounts, April 14-15, 1977, U.S.D.A. Agricultural Economic Report #413, Washington, p. 80.

Figure 3.1: Establishment and Product Concepts

or more".³⁵ Thus, a "holding" concept of the sector can be defined which refers to holdings with more than a specified level of potential sales.³⁶ The holding concept of a farm unit can be used to operationalize either the product or establishment concept of the agricultural production sector. Currently, sector expenditures data are estimated from surveys of farm holdings, estimating all expenditures associated with agricultural production activities. Thus, the product concept is operationalized using the holding as a unit of collection. The establishment concept can be approximated using the holding as the unit of data collection, as well. In this case, all production activities of farm holdings, both agricultural and nonagricultural, are accounted for in the data. The distinction between the holding and establishment is illustrated in Figure 3.2. The vertical axis represents the level of sales and the horizontal axis shows the percentage of production which is primary agricultural production, measured as a percentage of sales. The establishment concept of the sector includes all production units in groups B and C while the holding concept includes all units in groups A and B. If the minimum sales level used to define a farm holding is low, then group C is insignificant and the size of group A determines the difference between the two sectoring concepts.

Accounts also may be developed on the basis of an "institutional" concept such as farm operator families.³⁷ Accounts on this basis refer to the economic situation of groups of sector participants. Accounts

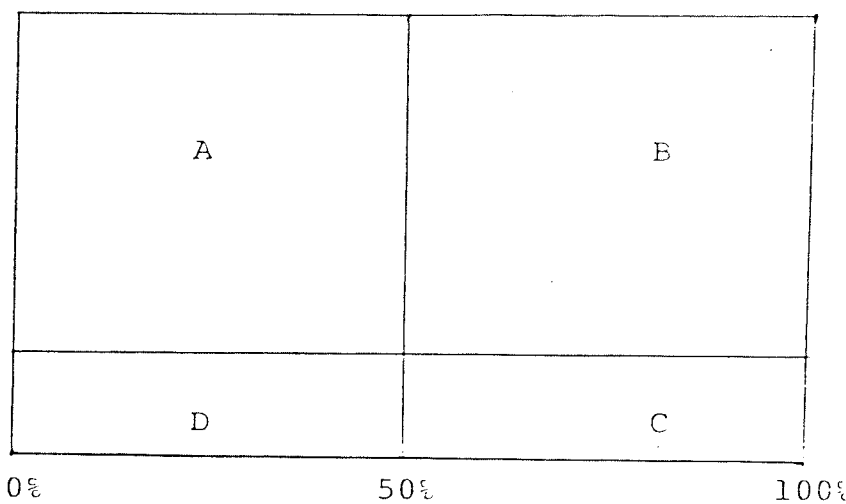
³⁵ Statistics Canada, 1981 Census of Agriculture Questionnaire, p. 1.

³⁶ While value added is the preferred measure, in practice, sales level is usually the only measure available for defining farm holdings.

³⁷ John B. Penson, Jr. and David A. Lins, Agricultural Finance, p. 295.

Ranking by
value of
sales of
agricultural
product

\$250



Ranking by percent of all production which is
agricultural production

Figure 3.2: Establishment and Holding Concepts

based on the activities of particular groups of families are relevant for many analytical and policy applications in agriculture. Such accounts are especially important given the agricultural production sector's predominantly single proprietor structure, since some public policies are aimed at preserving this structure.

Any sectoring concept used for agricultural production accounts affects their comprehensiveness and compatibility with other industry definitions. The Standard Industrial Classification (SIC) is designed to ensure that all production activity of the market economy is classified into industries without duplication. Industries are groups of establishments engaged in the same or similar kinds of economic activity. The SIC classifies the agricultural production sector separately from sectors engaged in the processing, distribution and retailing (PDR) of agricultural products.³⁸ Many policy issues and analyses deal with questions concerning the food system, encompassing the production sector, farm input industries, and related PDR industries. Compatibility of industry definitions helps to facilitate these types of analyses.³⁹ The

³⁸ Other sectors directly related to the agricultural production sector in the SIC are Major Groups: 10, "Food Industries", 11, "Beverage Industries", 12, "Tobacco Products Industries", 17, "Leather and Allied Products Industries", 18, "Primary Textile Industries", 19, "Textile Products Industries", 37, "Chemical and Chemical Products Industries", 45, "Transportation Industries", 47, "Storage and Warehousing Industries", 50, "Farm Products Industries, Wholesale", 52, "Food, Beverage, Drug and Tobacco Industries, Wholesale", 59, "Other Products Industries, Wholesale", 60, "Food, Beverage, and Drug Industries, Retail", and 92, "Food and Beverage Service Industries". See Statistics Canada, Standard Industrial Classification, 1980 edition, Catalogue 12-501.

³⁹ Issues in the development of better food systems data for Canada are discussed in Phil Jensen, "Selected Public Policy Issues For The Food and Agriculture Sector and Some Implications for Statistics Canada", (unpublished Report 2, Agriculture Statistics Division, Statistics Canada, 1982).

same statistical unit, the establishment, should be used for all industries in the classification to ensure consistency between industry definitions. In addition, the same means of classification, (value added), should be used to determine the economic classification of establishments.

3.2.1 Sectoring and Agricultural Production

Sector concepts are tools for the compilation of aggregate accounts and each have particular advantages and disadvantages depending on their intended uses and data availability. Penson and Lins state that:

Often there appears to be little theoretical basis for preferring one sectoring concept over another. Rather, the sectoring decisions are generally based upon the intended use of the financial statements and may be guided to a large extent by the availability of data.⁴⁰

Welfare analysis may require institutionally-based accounts that refer to the financial position of specific population groups. Productivity analysis, on the other hand, requires accounts relating production and associated inputs and may better be served with product- or establishment-based accounts.

Public and private sector decision-makers increasingly are concerned with issues on a commodity or enterprise specific basis. As discussed above in Section 2.3, decision-makers require information on the agricultural industry at subsector levels of aggregation, by commodity and enterprise. Many public programs are commodity specific, developing the requirements for data on a commodity basis for program design and evaluation tasks. At the same time, both public and private sector decision-

⁴⁰ John B. Penson, Jr. and David A. Lins, Agricultural Finance, p. 293.

makers require data on the financial position of farm businesses in order to develop and analyse public programs and forecast demand for agricultural inputs.

These information requirements imply the need for data sectored on the product and establishment bases. Commodity specific data can be generated from product-based sector data while enterprise related data can be estimated using the establishment sectoring concept. Both concepts are valid sectoring approaches depending on the purpose of the accounts to be generated.

The sectoring basis of the accounting system should reflect the importance of agricultural subsectors, as well as provide interpretable data for the sector as a whole. Overall aggregate accounts for the sector cannot, by their nature, reveal structural differences between groups of units within the sector.⁴¹ One objective of a revised format of aggregate accounts is increased compatibility with subsector data series. However, there are other purposes for the aggregate sector accounts apart from providing a means of subsector analysis. Increased compatibility with the CSNA would facilitate better comparisons of the sector with other sectors in the economy. Riemenschneider found that U.S. decision-makers rated comparability of accounts on agricultural production with other sectors less important than comparability of subsectors within agriculture. However, as the interdependence of agricul-

⁴¹ Subsector data have been developed for incomes and assets in Canadian agriculture from different data sources by different agencies. See W. Darcovich, and J. Gellner, Farm Budgets: Receipts, Expenses and Incomes by Type and Size of Farm, 1974, Seven Volumes, (Ottawa: Agriculture Canada, 1978); Farm Credit Corporation, Farm Survey, (Ottawa: 1981); Statistics Canada experimental data on Incomes and Expenditures by type of farm; and various provincial government series.

ture with other sectors increases, the need for intersectoral analyses, such as analyses of the effects of price changes in agriculture on prices in other sectors, may create a need for greater emphasis on consistent intersectoral accounts.⁴²

There are several advantages to sectoring agricultural production on an establishment basis. Since, under an establishment concept, the sector accounts relate to the total spectrum of the activities (primary, secondary and ancillary) of designated establishments, it is easier to measure the financial health of the sector. All production and associated input expenditures arising from these units are estimated in the accounts. Accounts constructed on the basis of establishments, rather than products, are more compatible with subsector data estimation and analysis because subsector data can be estimated on the same basis as aggregate data. For example, it would be difficult to estimate or interpret a balance sheet for grain production, since many assets would properly be allocated partly to grain production and partly to, say, livestock production. However, a balance sheet for grain establishments could be compiled consistent with an aggregate balance sheet by disaggregating on the basis of an appropriate definition of a grain production establishment.

The establishment approach to sectoring also resolves, in part, some classification problems involved with multi-establishment business firms. So long as each group of activities is significant, a firm can be defined as comprising several establishments, each classified to sub-

⁴² Charles H. Riemenschneider, "An Information Systems Analysis of USDA Farm Income Data", (Ph.D. dissertation, Michigan State University, 1978), pp. 163-164.

sectors on the basis of its major group of economic activity. Also, where farm production units are integrated with processing or farm input firms, the farm production unit can be defined separately from other establishments in the firm. In this way, only the primary agricultural production establishment is included in the sector. Other establishments are defined and classified to other industries, ensuring comprehensive coverage of the economic activities of these firms.

Agricultural financial accounts would be more compatible with the Canadian System of National Accounts (CSNA) if the establishment concept were used, since a common conceptual basis would exist for all these accounts. However, there are some problems with the use of the establishment concept for agriculture. The basis of the sector financial accounts would differ from the basis of the agricultural commodity accounts. For example, some agricultural products originate in other sectors as secondary production of nonagricultural establishments. As a result, the relationships between commodity supply-disposition positions and their financial impacts on the sector would be more difficult to determine using establishment-based accounts. In addition, the use of the establishment concept implies that some characteristic agricultural production is excluded from the accounts. For example, broiler production increasingly is integrated with meat processing firms. Separate farm establishments are difficult to define in such cases. For many analytical purposes, it may be desirable to classify the establishment entirely to the meat processing industry. The SIC approach is that:

so long as sales of products at a crude or intermediate stage do not predominate, the objective of the operation is the final product and a realistic value can be applied only at the

point of sale of the final product.⁴³

In such cases, no market transactions occur at the agricultural production level and the principal economic activity of the establishment is meat processing. In summary, use of the establishment concept would present some problems for some analytical purposes. However, it is the most widely used basis of aggregate accounting and its advantages should outweigh its limitations.

In addition to analytical problems, there are some operational problems in the use of the establishment concept. The Census of Agriculture currently is based on a farm holding concept with no reference to whether the farm holding's primary activity is agricultural production. Also, the Census of Agriculture does not separate farm firms into separate holdings in all cases.⁴⁴ Consequently, Census of Agriculture data are based on a mix of firm and holding units of aggregation. The Census of Agriculture has many purposes and these procedures may be justified, given these purposes. However, they present problems in the application of Census of Agriculture data to financial accounts based on the establishment concept. In some cases, it may be necessary to use a modified holdings concept since many current data sources refer to farm holdings rather than farm establishments. It may be necessary to implement the establishment concept gradually, given current data sources and estima-

⁴³ Statistics Canada, Standard Industrial Classification, 1970 edition, Catalogue 12-501, p. 10.

⁴⁴ According to Statistics Canada officials, if a farm firm has several holdings in the same enumeration area, it is usually counted as a single farm in the Census. The Census does not necessarily treat such firms consistently and they may be separated into component establishments in some cases.

tion procedures.⁴⁵

3.3 SECTORING PRACTICE IN CANADIAN STATISTICS

National agricultural statistics are published by Statistics Canada's Agriculture Statistics Division (ASD) and in the Canadian System of National Accounts (CSNA).⁴⁶ The ASD accounts presently use a product concept of the sector. This results in some incompatibility with the CSNA. The CSNA uses ASD data based on the product concept, implicitly assuming that:

1. All primary agricultural production activities are carried on by agricultural establishments.
2. Agricultural establishments engage solely in primary agricultural production activities.

If these assumptions hold, the product and establishment concepts are identical, since activities in sets A22 and A31 in Figure 3.1 are nonexistent. Presently, the CSNA double-counts production to the extent that primary agricultural production is carried on by nonfarm establishments and ignores production to the extent that farming establishments carry on nonagricultural production activities.⁴⁷

⁴⁵ Based on unincorporated individual taxfiler data, the empirical difference between the holding and establishment concepts is likely to be small. However, there are some problems with determining the impacts of the establishment concept on the accounts using taxfiler data. Further analysis on the empirical significance of alternative sectoring concepts is needed.

⁴⁶ See, for example, Statistics Canada, Farm Net Income, Annual, Catalogue 21-202, and National Income and Expenditure Accounts, Annual, Catalogue 13-201, Tables 30 and 31.

⁴⁷ As well, some adjustments are made to the agricultural accounts by the CSNA to reflect different accounting formats and sector boundaries. For example, the corporate sector is identified separately in

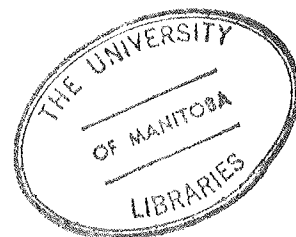
While the present ASD accounts are based mainly on the product concept, all three sectoring approaches seem to influence the structure of the accounts. Income earned in the sector is determined mainly by estimating the value of sales of agricultural products from aggregate data sources. However, most farm expenses are estimated from surveys of farm holdings. An attempt is made to collect expenses associated only with primary agricultural production although many expenses associated with secondary activities are included. For example, all farm capital costs are included in farm expense estimates although some of these capital costs are associated with secondary production activities.

The mixture of concepts in the accounts is reflected in the treatment of imputed farm house rents. For many years, the farm income account included the imputed rental value of farm dwellings as income and associated farm dwelling expenses in the farm operating expense series. This was done because it was difficult to estimate expenses associated with farm dwellings separately from other expenses of farm holdings. It was easier to add an imputed rental value of the farm dwelling to income. Over time, the imputed rental value of the farm dwelling became a significant income category, to the point that many farmers were estimated to earn more income from imputed house rent than from agricultural production. In 1979, the net income series was revised by excluding the

the CSNA and thus, farm corporate income is separated from unincorporated farm income in the Gross National Product account. An explanation of the reconciliation of Agriculture Statistics Division's income account with the Gross National Product Accrued Net Income account is shown in National Income and Expenditure Accounts, Volume Three, A Guide To the National Income and Expenditure Accounts, Definitions-Concepts-Sources-Methods, Statistics Canada, Catalogue 13-549E, (Ottawa: 1975), pp. 139-142. The reconciliation statement appears annually in National Income and Expenditure Accounts, Annual, Statistics Canada, Catalogue 13-201, Table 57.

imputed rental value of farm dwellings from farm net income and by excluding the farm dwelling expenses from farm production expenses in the time series. The net effect of this revision was to exclude from the account an income component previously included in the account. Therefore, the operational concept of income for the sector was changed. The new treatment of imputed rents of farm dwellings is more consistent with an establishment approach while the previous method is consistent with an institutional concept based on farm operators, since net imputed house rents are income directly associated with the farm operator family group.

The present sector income statement does not account for all income earned in the sector. Rather, income is estimated as the difference between gross farm income and farm operating and depreciation charges. Consequently, factor payments to nonoperators, such as rents to landlords, are deducted as expenses. The accounting format used is more consistent with an institutionally-based account, defined for farm operators. A product-based account normally would not focus on only one income-earning group in the sector. Also, the account includes only primary agricultural production activity, excluding nonagricultural production activities of farm holdings. This procedure is consistent with product-based accounts but not with establishment- or institutionally-based accounts. Thus, the current data system is based on a mixture of sectoring concepts.



3.4 INTERNATIONAL STATISTICAL APPROACHES TO SECTORING

Sectoring practices in international accounting systems can provide further guidance for the construction of financial accounts. The Food and Agricultural Organization (FAO) of the United Nations has made recommendations for economic accounts for agriculture designed to be compatible with the United Nations concepts for the National Accounts.⁴⁸ The basic unit of account recommended for classification of activities is the "agricultural holding", defined as:

all the land which is used wholly or partly for agricultural production and is operated as one technical unit. Establishments and other units not including any agricultural land but producing livestock or livestock products are also considered as holdings.⁴⁹

For statistical purposes, the FAO recommended that the holding be used as the unit of aggregation for both production and costs. Commodities produced on agricultural holdings include characteristic agricultural commodities as well as nonagricultural products. Secondary activities included were those difficult to separate from the main farming activities with respect to costs or of insufficient significance to define a separate establishment.

Characteristic agricultural commodities are defined as the "result from the activities defined in the ISIC Group 111 Agricultural and Livestock Production"

⁴⁸ Economic Commission For Europe, (ECE), European Handbook of Economic Accounts for Agriculture, draft, GE.82-31683, (Geneva: FAO, United Nations, May, 1982) and Food and Agricultural Organization, Handbook of Economic Accounts For Agriculture, Provisional, WS/E2675, (Rome: Statistical Office of the United Nations, 1973).

⁴⁹ Food and Agricultural Organization, Handbook of Economic Accounts for Agriculture, Provisional, 1973, p. 6 citing Programme for the 1970 World Census of Agriculture, World Census of Agriculture, (Rome: FAO, 1965).

This definition of characteristic agricultural commodities is equivalent to the Canadian SIC Major Group 01, "Agricultural Industries".⁵⁰

In 1973, the FAO also recommended that:

only the ancillary nonagricultural activities should be considered as part of agricultural production... The resulting concept of agriculture does not include any other activities even if they are carried out on the same location and by the same technical decision-making unit.⁵¹

With this approach, the only nonagricultural activities to be included in the sector accounts are own-account capital formation and fish and forest production of farm holdings. This position is closer to a product concept than a holding concept of the sector since only the primary agricultural production activities of holdings are included.

In 1982, the FAO proposed that the scope of the sector include primary technical activities as well as some specific secondary activities. These were: (1) agricultural contract work, (2) minor processing of agricultural production, and (3) production of other commodities which are produced with labour and capital mainly employed in primary technical activities. The FAO stated that "it is difficult to give uniform guidelines on the scope and size..." of these activities.⁵² Fishing and forestry production of farm holdings are included as well as transportation, storage and trading activities. However, the FAO recommended exclusion of own-account construction of farm buildings and machinery,

⁵⁰ See *Ibid.*, p. 6 and Statistics Canada, Standard Industrial Classification, 1980 edition, p. 29 and 51-57.

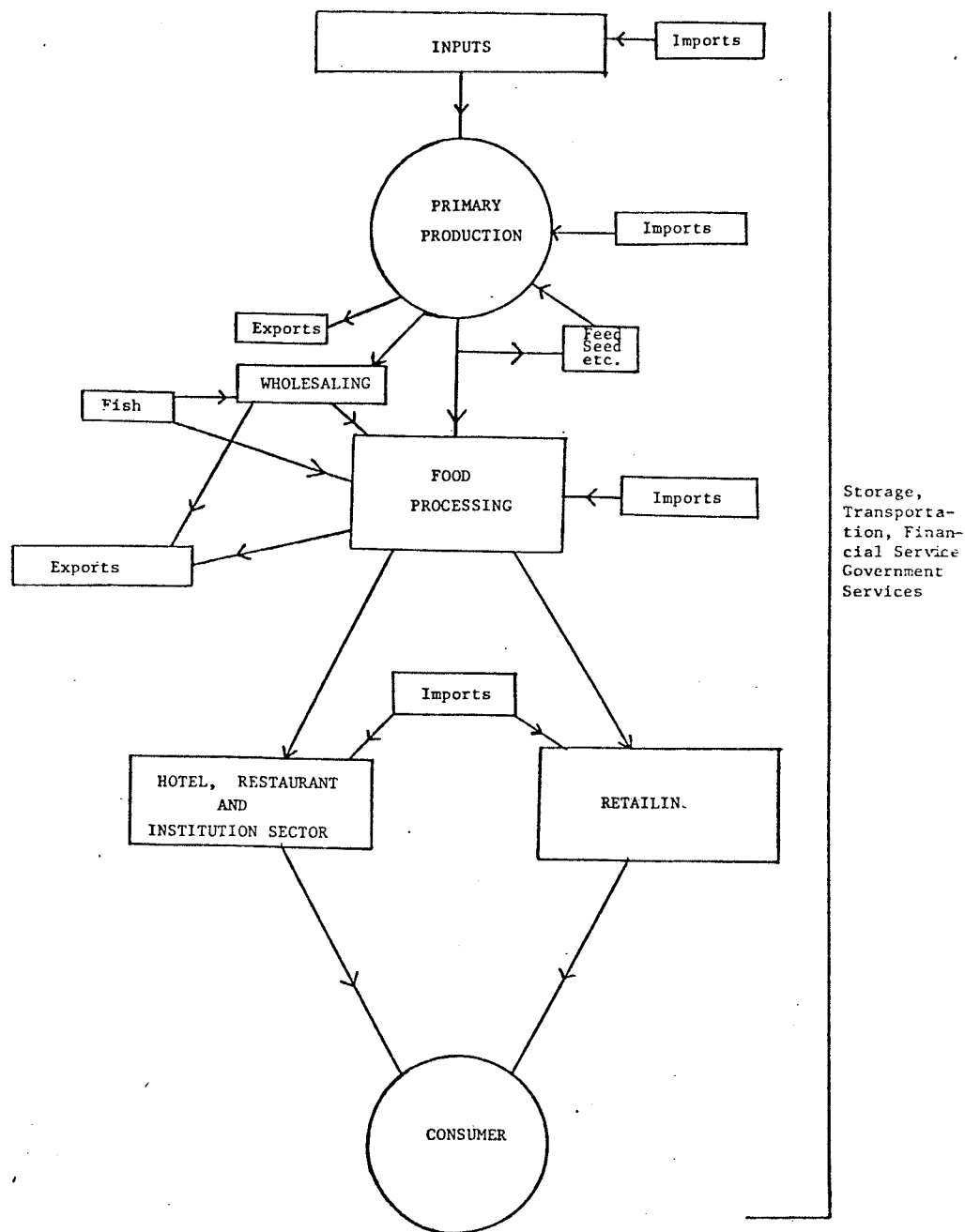
⁵¹ Food and Agricultural Organization, Handbook of Economic Accounts for Agriculture, Provisional, 1973, p. 6-7.

⁵² Economic Commission for Europe, European Handbook of Economic Accounts for Agriculture, 1982, p. 42.

and recreational income earned by holdings from farm tourism. Therefore, the sectoring approach recommended by the FAO in 1982 is a modified holdings concept, since only some of the holdings' secondary production activities are included. The approach taken is that "activities should be limited to the minimum possible, but with due consideration for consistency requirements, between the data on output, intermediate consumption, labour, and capital."⁵³

The revised U.S. accounts also use an agricultural holding approach to sectoring. The goals of the 1980 USDA revision to U.S. farm financial accounts were to permit the earnings of the farm business unit to be distinguished from farm family income, and to facilitate better analysis of the wealth and income status of production units and their operators. The revised USDA accounts are designed to disaggregate incomes earned in the sector by factors of production. In addition, it is intended to identify sector incomes and total incomes of sector participants separately. The holding concept is used, where a farm holding is defined as a production unit with sales or potential sales of more than \$1,000 of agricultural products. Secondary activities of holdings are reflected in the accounts, unless these activities are of significant scale. In such cases, separate establishments in different industries are defined. In these accounts, secondary technical activities are defined to include rental or custom hiring of machinery, and recreational income sources. Thus, this approach encompasses a greater number of secondary activities than is recommended by the FAO. For example, recreational income is included in the USDA account but is not included in

⁵³ Ibid.



Storage,
Transportation,
Financial Service
Government
Services

SOURCE: Jensen, Phil. The Canadian Agriculture and Food System. Ottawa: Statistics Canada, 1982, p. 3.

Figure 3.3: The Canadian Food and Agriculture System

the recommended European accounting format.

The degree to which secondary production activities are included in the sector accounts varies widely in alternative accounting systems. Strict application of the establishment concept implies that all secondary activities of establishments are included. For other sectoring concepts, the coverage of production activities is less clear. However, for all accounting concepts, principles of comprehensiveness without duplication and matching of associated incomes and expenses must guide the construction of accounts.

3.5 A PROPOSED DEFINITION OF THE AGRICULTURAL PRODUCTION SECTOR

This section develops a proposed definition of the agricultural production sector. Primary and secondary technical activities are defined to clarify the coverage of the accounts discussed in later chapters.

The definition of the production sector developed in this section is designed to facilitate accounts consistent with data for related sectors in the food and agriculture system. The agriculture and food system consists of the farm production sector, farm input industries, the processing, distribution, and retailing (PDR) sectors, and the hotel, restaurant, and institution sector. Other sectors supporting the system are the transportation and storage industries, financial institutions, governments, and educational institutions.⁵⁴ The food and agriculture system is illustrated in Figure 3.3.

⁵⁴ Phil Jensen, "The Canadian Food and Agriculture System", (Agriculture Statistics Division, Statistics Canada, 1982), p. 1.

3.5.1 Primary and Secondary Activities

The sector must be defined in terms of its coverage of economic activities. It is proposed that sector production be defined as the primary and secondary technical activities of farm establishments. It is important to clarify the meaning of primary and secondary technical activities to differentiate them from other economic activities of farm sector participants.

Primary technical activity for agriculture is defined as the result of the cultivation of land, animal husbandry, and the tending of trees and other perennials. Products and services resulting from these activities must be identified to define the coverage of the sector. A list of primary agricultural commodities is shown in Figure 3.4, drawn from Major Group 01 of the SIC for Canada, 1980 version.⁵⁵ This list is revised periodically to include new products and reflect changes in production technology and practices. Some commodities not included in Figure 3.4 can be argued to be primary agricultural commodities. Fish farming in land-based ponds and the growing of poplar trees for pulp can be argued to be farming activities. Establishments primarily engaged in such activities might usefully be defined in the agricultural production sector for some purposes. For example, if the production of ethanol from trees and primary agricultural commodities increases, data on the fuel production of farms may become important in agricultural policy analysis.⁵⁶

⁵⁵ Fish farms are classified in Major Group 03, "Fishing and Trapping Industries" and tree farming and forest nursery stock production are classified in Major Groups 04, "Logging Industry" and 05, "Forestry Service Industry", respectively.

⁵⁶ Marshall A. Martin, "Reconciling Agricultural Pricing, Environmental,

Code	Type of Farm and Associated Products
011	Livestock Farms
0111	Dairy Farms-Milk, Cream
0112	Cattle Farms-Beef Cattle, Dairy Cattle
0113	Hog Farms-Hogs, Weanling Pigs
0114	Poultry and Egg Farms-Capons, Pullets, Chickens, Eggs, Geese
0115	Sheep and Goat Farms-Sheep, Lambs, Wool, Goat's Milk
0119	Livestock Combination Farms
012	Other Animal Specialty Farms
0121	Honey and Other Apiary Product Farms-Honey, Beeswax
0122	Horse and Other Equine Farms-Race Horses, Saddle Horses, Pregnant Mares' Urine
0123	Furs and Skins, Ranch-Chincilla, Fox, Mink, etcetera
0129	Other Animal Specialty Farms-Birds, Cats, Dogs, Pets, Worms, Rodents, Pheasants
013	Field Crop Farms
0131	Wheat Farms-Wheat
0132	Small Grains Farms-Barley, Buckwheat, Canary Seed, Faba Beans, Millet, Mixed Grains, Oats, Rye
0133	Oilseed Farms-Canola, Flaxseed, Mustard Seed, Soybeans, Sunflowers
0134	Grain Corn Farms-Grain Corn, Corn For Popping
0135	Forage, Seed and Hay Farms-Alfalfa, Clover, Fodder Corn, Faba Beans for Forage, Hay Forage Seeds, Grass Seeds, Lawn Grass Seeds, Oats for Fodder
0136	Dry Field Peas and Beans Farms-Dry Field Beans and Peas, Dry Lentils and Pulses
0137	Tobacco Farms-Tobacco
0138	Potato Farms-Table, Processing and Seed Potatoes
0139	Other Field Crop Farms-Hops, Mangels, Sugar Beets
014	Field Crop Combination Farms
0141	Field Crop Combination Farms

015	Fruit and Other Vegetable Farms
0151	Fruit Farms-Apples, Apricots, Berries, Blueberries, Cherries, Cranberries, Currants, Filberts, Grapes, Hazelnuts, Loganberries, Nectarines, Peaches, Pears, Plums, Prunes, Raspberries, Strawberries, Walnuts
0152	Other Vegetable Farms-Artichokes, Asparagus, Broccoli, Wax Beans, Green Beans, Table Beets, Cabbage, Carrots, Brussels Sprouts, Cauliflower, Celery, Sweet Corn, Cucumber, Garlic, Horseradish, Leeks, Lettuce, Onions, Green Peas, Peppers, Pumpkins, Radishes, Rhubarb, Rutabagas, Spinach, Squash, Tomatoes, Turnips, Vegetable Seeds
0159	Fruit and Vegetable Combination Farms
016	Horticultural Specialties
0161	Mushroom Farms-Mushrooms
0162	Greenhouse Product Farms-Bulbs, Cut Flowers, Floral Plants, Greenhouse Vegetables
0163	Nursery Product Farms-Bedding Plants, Shrubs, Ornamentals, Flower Seeds, Field Grown Flowers, Fruit Tree Stock, Hedging, Sod, Nursery Plant Stock
0169	Other Horticultural Specialty Farms- Christmas Trees, Ginseng, Herbs, Holly, Maple Sugar, Maple Syrup, Maple Taffy
017	Livestock, Field Crop and Horticultural Cominations
0171	Livestock, Field Crop and Horticultural Combination Farms

SOURCE: Statistics Canada, Standard Industrial Classification, 1980 edition, Catalogue 12-501, pp. 51-57.

Figure 3.4: Primary Agricultural Production Commodities

The definition of the sector must be clarified in relation to the production of horses and pets. Horse racing stables are classified in the SIC in Major Group 96, "Amusement and Recreational Service Industries". Only establishments whose principal activity is the production, rather than the keeping of race horses, should be included in the agricultural production sector, under current definitions. In the case of riding stables, the principal activity of most establishments is the recreational service provided, which is classified in Group 9699 of the SIC, "Other Amusement and Recreational Services n.e.c.". For most pet farms, the principal service is the keeping and training of animals for pets which currently is classified in Major Group 50, "Farm Products Industries, Wholesale". For statistical purposes, the agricultural production sector should include as livestock establishments only those primarily engaged in animal husbandry activities.

Agricultural production activities need to be differentiated from those of related sectors of the economy. Products are defined as leaving the sector when transferred from the site of production in order to facilitate transfer of ownership and/or marketing or processing.⁵⁷ The implications of this definition are that products transferred from farm establishments purely for storage purposes without sale are defined not to have left the production sector. Any other transfer is defined as movement from the production sector, regardless of transfer of owner-

Conservation, Energy, and Structural Concerns", American Journal of Agricultural Economics 63, No. 2, (May, 1981), pp. 312-313.

⁵⁷ Essentially the same definition is adopted by Nicol in the USDA accounts. See Ken Nicol, Economic Information For the U.S. Farm Sector: A Revised Format, Staff Report, Economics, Statistics and Cooperatives Service, National Economics Division, (Washington: USDA, 1980), pp. 2-3.

ship. This definition allows the production component of integrated operations to be identified up to the point of transfer of products from the production unit. Some problems in data estimation may exist with this definition where integrated operations control a large proportion of the total market for a product. Imputed market values of the production component may not be available in such cases. However, for virtually all agricultural products, it is possible to impute production values for agricultural products under this definition.

Secondary technical activities are other economic activities of farm establishments, such as own-account capital formation and the processing of agricultural products. In all cases, if the secondary activities of an establishment are of major scale, a separate establishment should be defined for those activities. Some PDR activities are performed by farm establishments and should be included as secondary economic activities in the sector accounts. The provision of farm tourism services also can be interpreted as secondary technical activities of farm establishments.

Some income is earned by farm establishments from the ownership of farm property, independently of farming operations. For example, quarry and topsoil sales, oil lease revenues, hunting rights and "right-of-access" revenues, such as hydroelectric lines, derive from the ownership of farm property. Since the costs associated with the ownership of farm land are included as expenses of the sector, all incomes earned from farm land should be included as income received by the sector.

Secondary activities are associated with the establishment and holding concepts and must be differentiated from other economic activities of sector participants. Economic activities of farm sector participants

should not be reflected in accounts for the sector under the establishment or holding concepts. The agricultural production sector traditionally has been associated with single proprietor farms, operated by one family. All economic activities of the operating family are relevant to the issue of farm operator welfare but only the production of farm businesses is relevant to issues such as productivity and rates of return to resources. Incomes of farm operators earned from nonfarm sources such as wages and salaries and business income earned from off-farm businesses should not be reflected in the sector accounts, except in the account for total incomes of operators.

The consumption of own-produced products on farm establishments currently is treated as "income-in-kind". Some of this income-in-kind can be argued to be earned from the economic activities of the farm operator family and not to be directly associated with the farm establishment. For example, garden production of fruits and vegetables by farm establishments usually is entirely for the operator family's own use and not offered for sale. It may be more consistent with the establishment concept to exclude garden production for own-consumption from the accounts. Income-in-kind can be defined as production of farm establishments diverted from marketing channels. Therefore, income-in-kind would consist of killed and eaten livestock, own-consumed milk, and any other products consumed by operator families on establishments also producing the product for sale.⁵⁸

⁵⁸ It should be noted that current estimates of income-in-kind for many commodities including fruits and vegetables are not reliable. Estimation methods rely on a benchmark from a 1958 survey of own-consumption and year-to-year price changes. More reliable methods of estimation must be developed if these items are to be estimated at all.

3.6 SUMMARY

The definition of the production sector affects the form of the accounts in the data system. This chapter has described alternative concepts of sectoring for agriculture. The establishment concept is proposed as the most desirable basis for the construction of accounts.

Financial accounting systems consist of a number of accounts on income and capital. The next two chapters discuss, respectively, income and capital accounts, based on the definition of the sector developed in this chapter.

Chapter IV

INCOME AND CASH FLOW ACCOUNTS

4.1 INTRODUCTION

This chapter examines income accounts for the production sector. Alternative definitions of income are discussed briefly to clarify the terminology used in the accounts. The format of the present income account is discussed and some problems in its analysis are summarized. An alternative approach is presented which could resolve many of the limitations of the income account as it is currently estimated. In addition, some problems in the methods used to estimate specific components of the income account are examined.

The alternative accounting approach distinguishes sector income from the incomes of sector participants.⁵⁹ Three accounts are considered: (1) the production income account, which matches the value of production against costs and factor payments, (2) the cash flow statement, which balances cash sources and uses for the sector, and (3) the total income of farm operators account, which details all income sources of farm operator families. This accounting system expands on the limited agricultural sector data compiled in the Canadian System of National Accounts

⁵⁹ Many studies have examined similar accounting formats and the reasons for their compilation. The accounting formats used in this thesis have benefitted from these previous papers. See bibliographic references to: Weeks et al. (1972); Carlin and Smith (1973); Carlin and Handy (1974); Hildreth et al. (1975); Food and Agricultural Organization (1975); Penson and Lins (1980); Nicol (1980); and Economic Commission For Europe (1982).

(CSNA). It is intended to be compatible with the CSNA but, additionally, it should serve decision-makers directly concerned with the economic situation of the agricultural production sector and farm operator families.

4.2 DEFINING INCOME

Several alternative definitions of income exist which are useful for different purposes. One definition of income is based on the value of economic production in a time period. Economic production is any process which creates value or adds value to existing goods. This definition of income is central to the measurement of national income in the Canadian System of National Accounts (CSNA). Thus, national income data reflect the level of economic activity in a time period and should not reflect changes in the value of existing assets (i.e. capital gains or losses). Agricultural production sector income thus measures the value of production in the sector.

For individuals or businesses, there are alternative definitions of income. For welfare purposes, income may be defined as:

A man's income in any period is equal to the money value of his consumption plus the increase in the money value of his capital assets. For the sum of these two is the amount which he could have spent on consumption while maintaining the money value of his capital stock.⁶⁰

⁶⁰ J.E. Meade and J.R.N. Stone, "The Construction of Tables of National Income, Expenditure, Savings, And Investment", In Readings in the Concept and Measurement of Income, Edited by R.H. Parker and G.C. Harcourt, (Cambridge, U.K.: Cambridge at the University Press, 1969), p. 332.

The "money income" concept of income reflects consumption in a time period plus changes in the asset position of the individual, business or sector for which income is being measured. As such, it represents "returns" in the terminology adopted for this study. "Returns" consist of income from current production plus realized or unrealized asset value changes in the time period.

It is important to distinguish between "income" and "returns", since both are legitimate analytical concepts for specific purposes. The production income account and total income account of farm operator families discussed in this study use the "income" definition discussed above. The analysis of "returns" is facilitated by the use of these accounts in conjunction with the capital accounts discussed in chapter V.

Other accounting income concepts of business income exist which are not relevant directly for the accounts discussed in this thesis. For example, Parker and Harcourt identify four alternative business income definitions as (1) "accounting profit", (2) "adjusted accounting profit", (3) "real income", and (4) "current operating profit".⁶¹

4.3 THE PRESENT ACCOUNTING FORMAT

4.3.1 Description

The present aggregate income account for the sector is called the "Income of Farm Operators From Farming Operations".⁶² Gross farm income

⁶¹ R.H. Parker and G.C. Harcourt, "Introduction" to Readings in the Concept and Measurement of Income, Edited by R.H. Parker and G.C. Harcourt, (1969), pp. 10-15.

⁶² Statistics Canada, Farm Net Income, Annual, Catalogue 21-202, Table One. A summary description of the sources and methods used to estimate farm net income is included in the introduction to this publication.

is estimated as the sum of: (1) farm cash receipts, the value of all agricultural products moving from the sector at farm-gate or first-delivery point prices, (2) the value of home-consumed agricultural products (income-in-kind), and (3) the value of inventory changes (VIC). Government subsidy payments on farm production activities are included explicitly as part of farm cash receipts. Any government programs which decrease the cost of farm inputs are accounted for implicitly in the expense series as lower expense estimates. For example, gasoline tax refunds reduce the expense estimate for fuel. All expenses associated with agricultural production incurred by farm operators are deducted from gross farm income, including business taxes and allowances for capital consumption (depreciation). The residual difference is the estimate of the total net income of farm operators, representing the return to their unpaid labour, management, equity capital, and entrepreneurial inputs. "Realized Net Income" is calculated similarly, except the value of inventory change is excluded. This measure is intended to represent the net returns from farming operations which are immediately available to farmers for investment or living expenses.⁶³

4.3.2 Some Analytical Limitations

The total and realized net income measures are major indicators of the income position of the agricultural production sector and of farm operators. Public agricultural policies and programs often are developed and evaluated partly on the basis of changes in farm net income.

⁶³ Statistics Canada, "Outline of Methods, Sources, and Concepts Used in Estimating Farm Income of Farm Operators from Farming Operations", Methodology Paper prepared by W.G. Morris, February, 1963, p. 10.

In addition, these measures and their component series are used to forecast input demand and the financial requirements of the sector.⁶⁴

Current sector and taxfiler income data are very useful for many analytical uses. However, some problems of accounting inconsistency and a somewhat archaic format limit the usefulness of these data, particularly the income account.⁶⁵ The income account is a poor indicator of the income position of farm operators since off-farm income sources are significant for many farmers. Taxfiler sources on farmers' total incomes provide much better data on the income position of farmers; however, these data sources have some conceptual limitations and no total income series consistent with the present income account has been developed.

The exclusion of intraprovincial interfarm sales has implications in the analysis of the account. Receipts and expenses from interfarm agricultural product sales in the same province are assumed to be equal and thus, provincial net income estimates are unaffected by their exclusion from the account. Measures of grain cash receipts and feed expenses fail to indicate the volume of sales between farms. As farms become more specialized by product type, the volume of sales between farms increases; for example, feed grain sales from grain farms to livestock farms increase. As a result, the levels of receipts and expenses are poor indicators for allocating income to product subsectors and for the analysis of the relationships among subsectors in agriculture.

⁶⁴ For a detailed description of the reasons for compilation of an income account, see section 2.3 above.

⁶⁵ See section 2.4 for a discussion of the sources of some of these problems and some additional examples.

The legal form of farm businesses affects the current income account. For proprietorships, total net income represents the return to unpaid operator and operator family labour, management, equity capital, and entrepreneurial inputs. For corporate farms, a greater portion of labour and management inputs may be reported as paid production costs. For these farms, the net income account represents only the returns to equity capital and entrepreneurial inputs. Consequently, the net income measure represents a mixture of factor returns, depending on the legal form of farm businesses. Over time, as a greater portion of farm businesses are incorporated, time series data for farm net income represents a changing mix of factor returns.

A comprehensive review of the current income account is not attempted in this section.⁶⁶ Additional problems in the analysis of farm income and some problems associated with the methods used to estimate income are discussed as the components of the proposed account are explained.

4.4 A REVISED PRODUCTION INCOME ACCOUNT

4.4.1 General Description and Rationale

The account presented in this section is designed to record the value of production in the sector in a time period. The incomes earned in this production are identified with the factors of production claiming them. The establishment concept is used as the basis of this account, recording primary and secondary production of farm establishments.⁶⁷ The format of the production income account is shown in Figure 4.1.⁶⁸ Sourc-

⁶⁶ See section 2.4 above.

⁶⁷ As defined in section 3.5.1 above.

es of income are identified as: (1) sales of agricultural products, (2) sales of nonagricultural products, (3) other income sources, and (4) own-account uses of production. Income sources are allocated to intermediate product expenditures and gross value added. Gross value added consists of: (1) indirect business taxes, (2) capital consumption allowances, and (3) net value added. Net value added represents incomes earned by factors used in production. Factor incomes should be identified in as much detail as is feasible to maximize the information content of the aggregate account. The proposed account is conceptually consistent based on accounting principles for aggregate financial accounts.

The primary purpose of any sector financial account is to portray some aspects of the economic condition of an industry.⁶⁸ The production income account is intended to identify factor incomes earned in agricultural production. Incomes earned in agricultural production accrue to many sector participants: farm operators, managers, hired labourers, corporate shareholders, landlords, financial institutions, and others. Consequently, policy decisions affect nonfarm owners of resources employed in farm production. "Benefits from farm programs designed to improve incomes of farm people may be siphoned into nonfarm sectors."⁷⁰

⁶⁸ The formats shown for all accounts in this thesis are for the purposes of explaining the structure of the accounts. Possible publication formats are not addressed in this thesis. Such formats should be developed on the basis of the needs of data users and is beyond the scope of this thesis.

⁶⁹ Thomas A. Carlin and Allen G. Smith, "A New Approach in Accounting for Our Nation's Farm Income", Agricultural Finance Review 33, (1973), p. 2.

⁷⁰ *Ibid.*, p. 3.

Sources of Income -----	Allocations of Income -----
Sales of Agricultural Products	Intermediate Product Expenditures
- To other farm establishments	- From other farm establishments
- To other sectors	- From other sectors
Sales of Nonagricultural Products	Gross Value Added
- Farm Woodlot Sales	Indirect Business Taxes
- Recreational Service Sales	Depreciation Allowances
- Other Product Sales	Net Value Added
Other Income Sources	- Nonoperator Hired Labour Compensation
- Custom Work Receipts	- Rent to Nonoperator Landlords
- Government Payments	- Interest on Farm Business Debt
- Farm Cooperative Dividends	- Profits to Production Contractors
- Investment Income	- Nonoperator-Owned Corporation Profits
- Perquisite Rents	- Operator-Owned Corporation Profits
- Farm Land Rents	- Unincorporated Operator Family Returns
Own-account Production Uses	
- Income-in-kind	
- Value of Inventory Change	
- Own-account Capital Formation	

Figure 4.1: Proposed Production Income Account

Incomes earned by various groups of sector participants must be identified to permit valid analysis of the effects of policies on farm incomes as they affect different groups of sector participants. Valid linkages are established in the proposed account between sector income and those of the farm operator family "institutional" group through the specific identification of farm sector income accruing to farm operator families.

The proposed establishment-based production income account relates to policy questions concerning supply management, efficiency, capacity, and rates of returns to resources. The business orientation of this account should "deter the use of business information for drawing welfare implications of people involved in the sector."⁷¹ Welfare policy analyses are served by institutional accounts, such as the total income of farm operators account.⁷²

4.4.2 Components of The Production Income Account

The proposed income account is intended to represent more satisfactorily the income position of the agricultural production sector. Each component of this account is explained. Accounting consistency arguments are developed where applicable, including discussions of changes from current estimation practices. The empirical significance of some of these changes is not expected to be great. However, for completeness and consistency, even minor accounting problems are discussed. It is

⁷¹ Thomas A. Carlin and Charles R. Handy, "Concepts of The Agricultural Economy and Economic Accounting", American Journal of Agricultural Economics 56, No. 5, (December, 1974), p. 969.

⁷² See section 4.6 below.

recognized that some of these changes may have low priority for implementation due to their empirical insignificance.⁷³ Where possible, these changes are related to issues in the interpretation of the account in analytical applications.

4.4.2.1 Sources of Income: Sales of Agricultural Products

All sales of agricultural products from farm establishments should be included in the production income account by type of product.⁷⁴ The present approach measures the sales of agricultural products sold by the sector to nonagricultural sectors. Intraprovincial interfarm transfers of agricultural products are not included in the current income account. Interprovincial interfarm product sales are included because the account is designed to provide data on a provincial basis. In effect, each province is treated as a single farm in the accounts. Interm transfers are important for accounts constructed for sectors within agriculture. They do not affect the aggregate net farm income estimates since any receipts of one farm establishment are approximately offset by the expenses of another.⁷⁵ Significant movement of intermediate farm products occurs between subsectors, such as from the grain to the livestock subsector. All interfarm transfers are included in the proposed account to increase the compatibility of the aggregate account with subsector

⁷³ See section 6.2 below.

⁷⁴ The present format of this account details cash receipts by product, including specific identification of government payments on production activities.

⁷⁵ Expenses may exceed receipts for interfarm transfers due to transfer costs for products moving between farm establishments. It is assumed that interfarm transfers exactly offset in the current income account.

accounts. It is anticipated that a major application of the aggregate account will be the making of comparisons to subsector accounts once similar subsector accounts are developed.

It is necessary to clarify how secondary processing activities of farm establishments should be valued. Many products undergo some processing activity on farms before marketing. Such processing activity includes product transformation (such as the milling of grain and cream separation from milk), packaging, and transportation. The value of these activities is difficult or impossible to separate from the value of the raw agricultural product, especially if the activities are commonly performed on farms. No attempt should be made to separate these values in the accounts, except where separate establishments are defined. This procedure is consistent with European recommendations for the account, where it is argued that minor processing activities of farm establishments cannot be separated from production activities without undue imputation of raw product values and costs associated with processing activities.⁷⁶ Difficulties arise with integrated operations where processing activities are significant economic activities of the firm. In such cases, two separate establishments should be defined. An imputed farm product price based on the market values of unprocessed products should be used to value the production of farm establishments. This procedure ensures interpretable sector estimates based on market transactions without an undue degree of imputation.

⁷⁶ Economic Commission For Europe, European Handbook of Economic Accounts for Agriculture, (1982), p. 40-41.

4.4.2.2 Sources of Income: Sales of Nonagricultural Products

The use of the establishment concept implies that all secondary production activities of farm establishments should be included in the production income account. Income earned from all secondary technical activities, such as tourist and recreational services and farm woodlot production, should be included. The matching of all incomes and associated expenses is increased with the inclusion of all empirically significant secondary production activities of establishments.

4.4.2.3 Sources of Income: Other Income Sources

Other income sources of farm establishments must be included in the production income account to account for all income earned by farm establishments. Any income sources directly associated with farm establishments are included since expenses incurred in earning these incomes generally are included on the expenses side of the account. Currently, custom work receipts are included in the custom work expenditures series as negative expenditures, that is, only the net custom work expenditures by the agricultural production sector to other sectors are estimated as expenses. Since data on gross flows provide the means of generating consistent subsector accounts, custom work receipts and expenses should be identified separately in the proposed production income account.

Federal and provincial government payments are received by farm establishments for participation in a variety of support and stabilization programs. These payments are identified explicitly since analysts often are concerned with the effects of these payments on sector income. All government payments associated directly with the production activities

of farm establishments should be included. These payments include subsidies in the form of federal and provincial stabilization and deficiency payments, including dairy supplementary payments, and other payments currently recorded in the income account as supplementary payments. Government transfers to farm establishments for the purposes of capital formation or improvement, or to compensate for the destruction of capital are treated as capital transfers and are excluded from the production income account. Such capital assistance payments affect the capital flows account.⁷⁷ The treatment of government payments in the present income account is similar to that proposed here. No changes in methods are required.

Another income source of the farm sector is income received from financial accounts and cooperative investments. A distinction must be made between financial investments of establishments and those of proprietors. Only income accruing directly to farm establishments should be included in the proposed account. Farm cooperative dividends are essentially a delayed form of payment for the production and marketing activities of establishments and thus, are included as income in the proposed account. Personal income sources of proprietor-owners are excluded on the basis of the concept used to define the sector. For example, bank interest earned on the personal savings of farm operators is not included as sector income.

The farm establishment may receive income in the form of services or money from its capital assets. As such, perquisite rents on dwellings and rental income on land should be included as an income source for the

⁷⁷ See section 5.4 below.

sector. The value of room and board provided to hired labour is included on the expense side of the account. A compensating entry for perquisite rents earned by establishments is needed to balance the board portion of the room and board expense estimates. Otherwise, board expenses are double-counted, first as board expenses and again as expenses associated with the depreciation and maintenance of hired labourers' dwellings.

Currently, rents paid by a farm establishment to another are included as rent expenses in the income account but corresponding rents earned on farm assets are not included on the receipts side of the account. Therefore, in any year, if more land and buildings are rented between establishments, the net income estimate is decreased, despite the fact that no change in net income due to rents occurred for the sector. A balancing entry on the income side of the account is needed to offset rent expenses between farm establishments. Other rents earned on farm real estate assets also should be included so far as possible, since the costs of real estate assets are included on the expenditure side of the account.⁷⁸

4.4.2.4 Sources of Income: Own-account Production Uses

The value of production in a time period may be estimated directly from the product of the estimated quantities produced and observed market values. Alternatively, it can be estimated from the sum of cash receipts, income-in-kind, and the value of changes in inventories. The latter approach is used in the income accounts for Canada since it pro-

⁷⁸ Machinery rents are included with custom work expenses in the Canadian accounts.

vides a more useful set of component data series for analysis.

Own final demand uses of farm production are currently measured as income-in-kind. Income-in-kind is the farm value of any agricultural products produced and consumed on farm establishments. Production of the establishment, which is diverted from regular marketing channels for operator or employee consumption should be included in the account. Production from farm gardens kept solely for own-consumption purposes can be interpreted as operator household activity and defined outside the domain of the sector.⁷⁹ Empirically, income-in-kind is minor and current estimates are of low quality.

The value of changes in inventories adjusts the production income account to allow for the depletion or accumulation of input and output inventories. The present income account reflects only the value of changes in output inventories, while both output and input inventory changes should be measured. Inputs such as fertilizer can be purchased before the end of a calendar year to reduce income tax liability for taxfilers using cash accounting. Expense data reflect expenditures on inputs and are not necessarily measures of the value of inputs used in production in a time period. Without adjustment for changes in input inventories, the net income estimates may be inaccurate. There will be no bias over time, but the year-to-year changes in the estimates of the levels of farm net income may be inaccurate.

The definition of inventory change theoretically includes inputs, work-in-progress, and finished goods. For agriculture, conventional practice has been to define output only when crops are harvested. Thus,

⁷⁹ See section 3.5.1 above.

work-in-progress for crops is ignored in the annual account. For example, fall wheat is seeded in one calendar year and harvested in the next. Expenses and production are not matched appropriately without adjustment for the value of this work-in-progress. The incidence of significant crop work-in-progress at the beginning of the calendar year is relatively small in Canadian agriculture. However, it may be worthwhile to estimate the value of work-in-progress as the costs incurred up to the end of the calendar year for consistency. Work-in-progress for livestock is already reflected in the account with the measurement of changes in inventories of livestock by type of livestock and weight class.

The present method of valuation of inventory change is a calendar year average of prices received weighted by the volume of sales. The annual harvest for most crops occurs during a relatively short period of the calendar year. Marketings usually are spread over a much longer time period, often into the next calendar year. The use of a calendar year average price to value the change in inventories has the effect that all prices observed in the year affect the value of inventory change estimates. If prices vary widely through the year, the average annual price might bear little relation to the realizable value of an increase in inventories or the realized value of a decrease in inventories. For example, most crop production occurs in the third quarter of the year. If prices drop significantly due to a large production increase, the value of the increase in inventories, as measured by the value of inventory change (VIC), would be much higher than the market

value of the increase in inventories.⁸⁰ This problem has been evident for several crops, especially potatoes, in years where the prices of the crops changed significantly.

Aggregate accounting theory suggests that changes to inventory should be valued at prices prevailing when additions or depletions to inventory are made.⁸¹ The aggregate accounting convention has been to use average annual prices as the best approximations of these prices, in the absence of knowledge of when production is placed in inventory. This procedure is justifiable if price variations are small, since the resulting estimates will differ very little from estimates obtained using more refined techniques. Problems arise when price variations are significant due to the use of an average price over a calendar year to value the inventory change. For agricultural products, short-term price variation can be significant. For example, the crop year average price for Prince Edward Island potatoes increased from \$2.52 to \$5.07 between 1974 and 1975, an increase of over 100 percent. To more accurately value changes in inventories, it is necessary to ensure that the price used to value changes more closely reflects prices prevailing when the inventories change.

An alternative method is to sum the value of changes for four quarters to obtain an annual estimate of inventory change. However, this method incorporates inventory revaluation, as well as the valuation of the physical inventory change, in the estimate. For example, it is pos-

⁸⁰ In this example, the estimated average annual price would include six to nine months of higher prices prevailing in the first part of the year on sales from the previous year's crop. The resulting VIC estimate would be higher than the value of the increase in inventory when this increase was harvested.

⁸¹ United Nations, A System of National Accounts, Studies In Methods, Series F, No. 2, Rev. 3, (New York: 1968), p. 111, paragraph 6.109.

sible for an increase in the physical quantity of inventories to occur with a measured decrease in the value of the change in inventories using this method, due to the revaluation component inherent in this method.⁸² An alternative procedure which does not incorporate inventory revaluation is to value the physical change in inventories of crops at average prices prevailing during the harvest to year-end period. This method ensures that the valuation of any increase in inventories is affected only by prices prevailing after production has occurred. When inventories decline, the decrease is valued at prices prevailing when the production shortfall occurred. This valuation method resolves problems with aberrations in the VIC estimates, especially where production is concentrated over a small part of the year and prices can vary widely over a calendar year.

The use of average prices should fully reflect market values. For some crops, notably grains in Western Canada and wheat in Ontario, payment systems exist where initial payments are paid upon marketing, and interim and final payments are made at later dates. Present procedures use only initial prices paid to estimate average annual prices and thus, underestimate the average annual price. A change in initial payments for grain deliveries affects the estimated average annual price. These administrative changes in initial prices have no effect on the total value of these sales and should not affect the average price used in the VIC calculations. Thus, the average prices used to value inventory changes should include interim and final per unit payments to reflect

⁸² Any method which measures only the value of the physical change in inventories must be positive if the physical change is positive and negative if the physical change is negative.

the full value of the physical changes in inventories. The information required to implement this refinement in the estimation of the VIC is already collected by Statistics Canada.

There are other issues associated with the estimation of VIC. Capital stock can be defined as stock whose value derives from the products produced by the stock rather than the final use value of the stock. Currently, the income account includes all crops and livestock on farms in the value of inventory change calculations. However, many livestock categories are capital stock rather than current production. For example, the value of dairy cows is derived primarily from their role as producers of milk and replacement animals rather than their meat value. If capital livestock were to be treated as capital in the accounts framework, changes in inventories of those livestock would be excluded from the value of inventory change calculations and included as capital formation or disappearance. The data required for such treatment in the accounts is extensive. For example, the number and age structure of animals entering and leaving the stock of capital livestock should be known to estimate livestock capital depreciation accurately. As a minimum, accurate data on the average age at culling of each capital livestock category is needed for the estimation of depreciation of livestock.⁸³ All livestock inventory changes should continue to be treated as current production until sufficient livestock flows data are developed to permit valid accounting for capital livestock as capital.⁸⁴

⁸³ See Thomas L. Browning and David R. Dyer, "Alternative Methods of Accounting For Livestock Capital Formation: An Application to Southern U.S. Agriculture", Southern Journal of Agricultural Economics 8, No. 3, (December, 1976), pp. 25-29.

⁸⁴ Dyer attempted to show the implications for farm net income of a

The estimation of the physical change in meat livestock inventories should be on the basis of weight. Changes in livestock inventory categories presently are estimated by calculating the change in the number of head by type of livestock. However, it is possible that the change in the number of head of livestock could be offset by a change in the opposite direction in the average weight per head.⁸⁵ The account could show an increase in inventories when the more relevant variable for livestock held for meat, namely weight, decreased. Detailed livestock weight classes should be used in estimating the value of inventory change to ensure that the physical change measured reflects true changes in inventories.

The final own-account production category is own-account fixed capital formation. Purchased capital inputs are not included as expenses but are depreciated over the life of capital assets in the depreciation allowance series. However, some capital formation activity may be performed by the establishment using current inputs such as labour.

change to a capital basis in the method of accounting for livestock. See David R. Dyer, "Livestock Capital Formation-- A Preliminary Estimation", Western Agricultural Economics Association Proceedings, (July, 1975). Melichar pointed out errors in Dyer's analysis which considerably overestimate the estimated size of the bias due to accounting methods. Melichar showed that the bias due to accounting for all livestock as current production was likely to be small. He further suggested that any change to a capital accounting basis for capital livestock categories should occur only after the requisite data details were developed. See Emanuel Melichar, "Overall Measures of Financial Performance", Agricultural Finance Review 37, (1977), pp. 83-84.

⁸⁵ This point is discussed in Steven R. Guebert, "Farm Income: Data and Concepts In Review", In Proceedings of Workshop on Farm Sector Financial Accounts, April 14-15, 1977, Agricultural Economic Report 412; Economics, Statistics, and Cooperatives Service, (Washington, USDA, November, 1978), p. 18.

Such production includes land improvements, fencing, orchard development, and the construction of buildings. No such activities are presently measured in the accounts as production. It is preferable that, so far as possible, some accounting be made for such activities since some of the costs associated with them are reflected in the current expense series. Estimation of the cost of inputs used in such activities is a possible approach to the estimation of own-account capital formation. These expenditures could be used as a proxy for the value of such activities.

4.4.2.5 Allocations of Income: Intermediate Product Expenditures

In the format of the proposed account, purchased inputs include all goods and services purchased from other sectors of the economy or from other establishments in the agricultural production sector.⁸⁶ The present income account excludes intermediate inputs purchased in the same province from other farm establishments since receipts from such transfers are excluded from income received. If interfarm sales are estimated in sources of income, then an offsetting entry is needed on the expense side of the account.

Custom work expenses are presently estimated on a net basis. That is, receipts earned from agricultural custom work production activities on other establishments are netted from expense estimates for custom work. In the proposed format, custom work receipts are included as in-

⁸⁶ Methods used for the estimation of all purchased inputs in the present income account are documented in May Holbein, Farm Operating Expenses and Depreciation Charges: Data Sources, Concepts and Methods, Farm Income and Prices Section Methodology Paper, Reference #21-X-503E, (Ottawa: Statistics Canada, 1982).

come and all custom work expenses are included as expenses so that gross money flows for custom work can be identified.

All expenses incurred in production activities of the sector should be measured in the account. Where production is contracted on farms by nonfarmers, any inputs supplied or paid for by the production contractor should be included in the intermediate inputs series. Therefore, where feed mills contract hog production and supply feed and other inputs in that production, the value of these inputs should be included as production expenses of the sector.

4.4.2.6 Allocations of Income: Taxes and Depreciation

Gross value added of the sector consists of payments to the factors of production, plus indirect taxes and allowances for capital consumed in the production process. The gross value added estimate for the sector is approximately equal to the CSNA gross value added estimate for agriculture.⁸⁷ Gross value added represents the value of economic production, that is, income earned in the sector after making deductions for the value of intermediate goods and services used in production. Labour, management, capital and entrepreneurship are the factors of production claiming net value added for the sector.

Direct taxes are taxes levied on incomes earned by factors of production. They are not identified in the income account since income is measured gross of income taxes. Strickland has pointed out that expen-

⁸⁷ The estimates differ due to slightly different statistical concepts. For example, the GNP account defines the value of inventory change for crops as the sum of the value of changes in four quarters. Also, it defines the Canadian Wheat Board as part of the sector. See footnote 41 above.

ses incurred for tax accounting, planning, and consultation services are included as expenses of the sector in the income account, while the principal benefits gained from these services, namely reduced tax liabilities, are not included on the income side of the account.⁸⁸ For strict accounting consistency, expenses incurred to reduce tax liabilities of farm proprietors should not be included as production expenses of the sector. The empirical significance of this accounting inconsistency in the current income account is probably small.

Indirect taxes are taxes paid in the course of production activities. These taxes consist of property taxes and taxes on purchased inputs, with the latter included indirectly as part of the expense estimates for purchased inputs. Thus, the tax expense estimates in the account consist only of property taxes net of any rebates. Farm families' personal share of farm dwelling taxes are excluded from the account since these taxes are not associated with farm production. This treatment of taxes in the account is identical to current procedures, and no changes are needed in estimation procedures.

Capital is consumed through accidental damage, wear, tear and obsolescence of capital assets associated with production processes. Currently, depreciation is estimated for all farm buildings situated on owner-operated farm establishments and all machinery owned in the sector. Building depreciation is estimated as 3.5% of the current value of all service buildings on farms and 2.0% of the current value of the farm business share of all dwellings on farms, as estimated by the "Current

⁸⁸ Roger P. Strickland, "Alternative Indicators of Farm Operators' Earnings", Agricultural Economics Research 34, No. 3, (July, 1982), pp. 28-30.

Value of Farm Capital" series.⁸⁹ Machinery depreciation is estimated separately for automobiles, trucks, and other machinery. Rates for automobiles and trucks range from 11 to 13 percent and for other machinery from 10 to 12 percent of the current value, varying by province.⁹⁰ These methods measure consumed capital as a percentage of the current market value of existing capital stock. Depreciation on rented buildings and machinery is included implicitly in gross farm rent. Orchards and capital livestock are not treated as capital in the accounts and so no depreciation estimates are made for such capital.

⁸⁹ The meaning of depreciation in the present income account is unclear.

Published documentation states:

⁹⁰ Depreciation costs charged against the farm business are designed to take account of the declining value of farm buildings and machinery resulting from use. The charge is intended to approximate the replacement cost of the value of farm buildings and machinery used in the year.⁹¹

It is unclear from this statement whether economic or capacity depreciation is estimated. Economic depreciation is the loss in the value of a capital asset in a year. Capacity depreciation is the loss in productive capacity of a capital asset in a year. Depreciation estimates for the sector should provide an indicator of the "amount that farmers would have to pay each year if they had replaced...the amount of buildings and machinery used up in that year."⁹² Clearly, capacity depreciation is im-

⁸⁹ Statistics Canada, Farm Net Income, Annual, Catalogue No. 21-202, Table 6.

⁹⁰ Depreciation rates are based on the 1958 Farm Income and Expenditure Survey, a 1939 Rowell-Sirois Report and Revenue Canada, Taxation data on capacity depreciation. Statistics Canada, Farm Net Income, Annual, Catalogue 21-202, Preliminary 1981, p. 16.

⁹¹ Ibid.

plied by this statement.

The value of capacity depreciation of capital stock in a year is a function of physical deterioration and technological obsolescence. Penson et al., using engineering data, estimated that the productive capacity of farm tractors declines slowly in the first years of use and increases geometrically in the later years of use.⁹³ Therefore, productive capacity in farm tractors deteriorates in a concave rather than convex pattern, as shown in Figure 4.2.

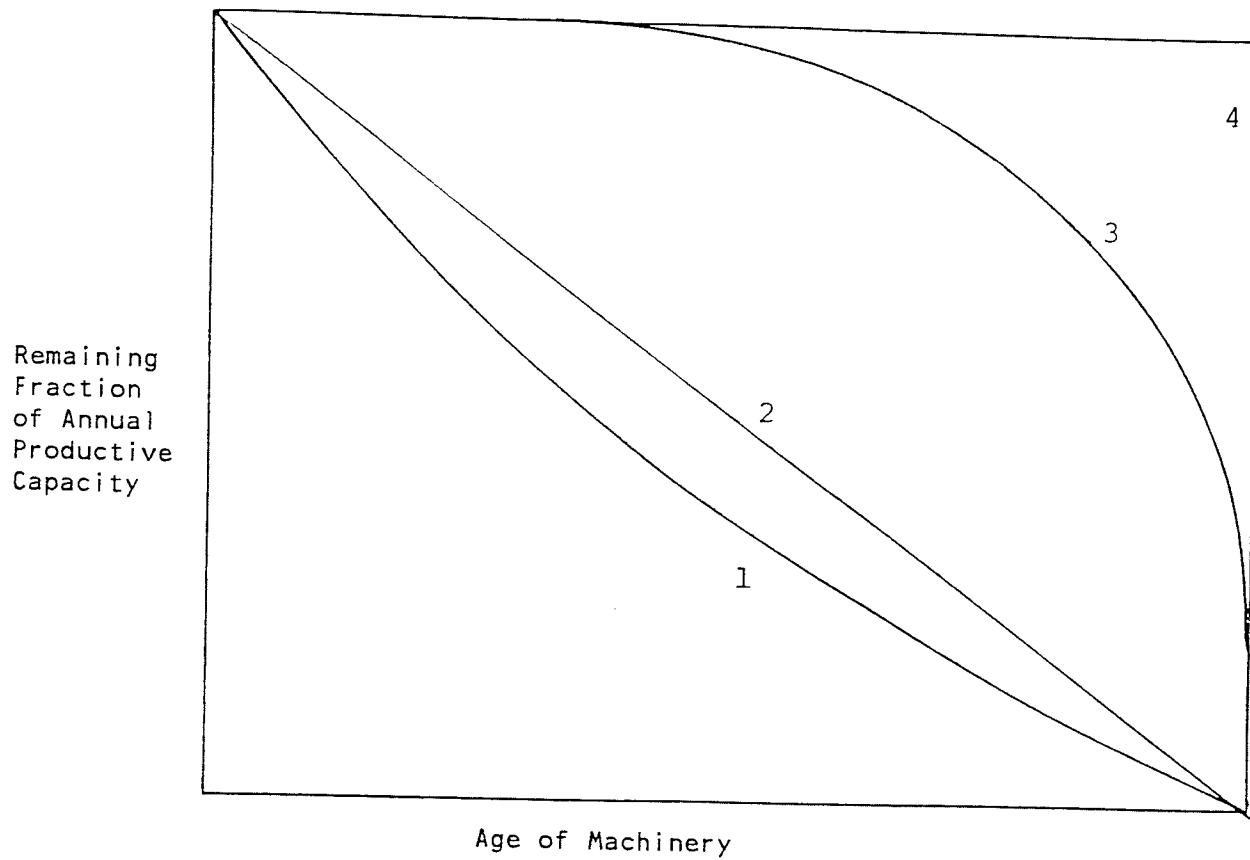
Published documentation states that the depreciation method used is a straight-line method of depreciation.⁹⁴ Depreciation is measured as a percentage of the current market value of the existing capital stock; this is a declining-balance method of depreciation estimation, on a current value basis.⁹⁵ This method implies a greater loss of productive capacity of assets in the early years of the capital stock's life as compared to the later years, implying a productive capacity deterioration pattern convex to the origin. Therefore, the present estimation procedure for depreciation overestimates depreciation and underestimates net

⁹² Statistics Canada, "Outline of Methods, Sources, and Concepts Used in Estimating Farm Income of Farm Operators From Farming Operations", Methodology Paper prepared by W.G. Morris, (February, 1963), p. 79.

⁹³ John B. Penson, Jr., Dean W. Hughes and Glenn L. Nelson, "Measurement of Capacity Depreciation Based on Engineering Data", American Journal of Agricultural Economics 59, No. 2, (May, 1977), pp. 321-329.

⁹⁴ Statistics Canada, Farm Net Income, Annual, Catalogue 21-202, Preliminary 1981, p. 16.

⁹⁵ A straight-line current market value method would take a constant percentage of the capital stock's original cost each year, adjusted to current dollars. Since a percentage is taken of the capital stock's current market value (i.e. original cost less accumulated depreciation, at current market values), the method is a declining-balance method.



- 1 Finite Geometric Decay Pattern
- 2 Straight-line Decay Pattern
- 3 Engineering Data Pattern
- 4 "One-Hoss Shay" Decay Pattern

SOURCE: John B. Penson, Jr., Dean W. Hughes, and Glenn L. Nelson, "Measurement of Capacity Depreciation Based On Engineering Data" *American Journal of Agricultural Economics* 59 No. 2 (May, 1977), p. 324.

Figure 4.2: Capacity Depreciation Patterns

income if the capital stock of the sector is relatively new.

It is important that the methods used in depreciation estimation better reflect the actual consumption of productive capacity of the capital assets used in production. No simple solution exists to this problem since very little information is available on rates of capacity depreciation of agricultural production assets. A comprehensive review of depreciation data is needed to determine the type of depreciation which should be measured and accurate means of measurement. This problem has implications for farm net income and CSNA data for the agricultural production sector.

4.4.2.7 Allocations of Income: Net Value Added

The net value added component of this account apportions factor incomes earned in the sector. Farm operator families provide labour, capital, management and entrepreneurial factors to the production process.⁹⁶ As well, others provide various factor inputs. For example, hired labourers provide additional labour services, hired managers provide management services, financial institutions and others provide financial capital, and entrepreneurial inputs are provided by corporations and others involved in the sector.

It is possible to attempt to identify factor incomes allocated by factor. The various factor services provided by operator families are difficult to value separately. Any valuation of operators' labour and

⁹⁶ Entrepreneurship is the taking of risks, involving judgments regarding resource use, technology, marketing, and production. It is considered as a separate factor input in the production process. See J. Patrick Madden, Economies of Size In Farming, Agricultural Economic Report No. 107, (Washington: USDA, February, 1967), p. 8.

management services must be imputed, based on market rates for hired labour or management services.⁹⁷ A more practical approach for this account is to estimate returns to farm operator families' factor inputs in total and all other factor inputs separately. Thus, the proposed account identifies allocations of income accruing to all factor services other than those provided by operator families, and residually allocates the remainder as returns to the factors provided by farm operator families. The USDA annually publishes a table imputing farm operators' labour and management returns to estimate residual rates of returns to equity capital.⁹⁸ While this table has some limitations due to theoretical problems in the valuation of operators' labour and management inputs,⁹⁹ it provides indicators of returns to equity after deducting for the value of labour and management supplied by operator families. Returns in this table are disaggregated into two components: income returns and capital gains returns. Thus, this table provides data for the analysis of total returns earned by operators in the sector.

Labour compensation consists only of wages paid to hired labour in the proposed account, excluding farm family members for operator-proprietor farms. This procedure ensures that returns to all labour services

⁹⁷ The types of calculations and assumptions needed to estimate factor incomes by factor are outlined by Ken Nicol, Economic Information For The U.S. Farm Sector: A Revised Format, pp. 20-23.

⁹⁸ See, for example, USDA, Economic Indicators of the Farm Sector: Income and Balance Sheet Statistics, 1980, Statistical Bulletin Number 674, (Washington: 1981), Table B23, p. 139.

⁹⁹ For example, the USDA uses the market value of hired labour to value operators' labour and a percentage of adjusted gross income to value operators' management services. Neither of these valuation procedures is strictly correct. In addition, the number of hours of labour supplied by operator families is estimated from aggregate production functions.

provided by farm operator families are included with the estimates of total returns to farm operator families. Hired labour compensation includes employer-paid benefits such as employer contributions to pension and health insurance plans and nonmoney perquisite benefits such as room and board. Contracted labour services are intermediate inputs, included as custom work expenses and excluded from this part of the account.¹⁰⁰

Interest payments are allocations of sector income to borrowed capital supplied from outside the sector and from others in the sector. Interest payments are estimated from data on outstanding farm debts. Care must be taken to ensure that farm debt estimates refer to debt on farm assets and not to the personal debts of farm operators.

Land and building rents paid to other sectors reflect payments made on farm real estate assets rented from nonoperator landlords. Payments for rented land and buildings include the costs incurred in the provision of such assets. For example, interest costs, depreciation, and taxes on rented land and buildings are assumed to be covered in rent payments and are not included in the expense estimates for those items. Any sector rents accruing to farm establishments should be included as profits to the owners of those establishments.

Corporation profits are identified specifically in the proposed account. A distinction should be made between operator-owned corporate income and multi-shareholder corporate income. The operator-owner family of a corporate establishment earns income in the form of corporate profits and wages paid for labour and management inputs. Nonoperator shareholders' corporate establishment income consists only of corporate

¹⁰⁰ Contracted labour includes services classified in Major Group 02 of the SIC, "Service Industries Incidental to Agriculture".

profits.

Profits earned by contractors of farm production should be identified separately since this income represents the profits from contracted farm production accruing to the contractors of such production. The remainder of the profits from such production accrues to the operators of farms where such production is contracted.

Finally, total profits from current production to proprietor-operator families are identified in this account. This income is the current return to factor services provided by farm operator families. They may be earned as profits from farm production activities or as income from the rental of land and buildings to other establishments. This component of the account provides the linkage to the total income of farm operators account discussed in section 4.6 below.

4.5 SECTOR CASH FLOW SUMMARY

The cash flow summary details cash flows into and out of the sector for a time period. Only cash sources of income are included in the account, shown in Figure 4.3. The cash transaction summary identifies cash income from sector production activities accruing to operator-proprietors and shareholders of corporate farm establishments. Cash income from farming is added to the net change in loans outstanding and currency and demand deposits of farm establishments. This total represents the net cash available from sector sources in the time period for capital expenditures, real estate purchases, shareholders' dividends and operator-proprietors' personal use. Deducting machinery and other non-real estate capital purchases yields the residual estimate of cash

available from sector sources for proprietors' uses, such as real estate purchases and cash withdrawals by proprietors or shareholders.

For some purposes, a sector cash flow summary may be a more suitable indicator of the sector's financial situation than the production income account. For example, a cash flow summary is a short-term indicator of financial problems. The aggregate cash flow statement is limited in this function because it is difficult to compile more frequently than annually. Firm level cash flow statements are usually compiled quarterly or even monthly to serve as indicators of short-term cash flow requirements. In addition, a cash flow summary could replace "realized net income" as a better indicator of the cash income generated in the sector immediately available to the sector for investment and withdrawal. Also, the demand for some agricultural inputs such as machinery may be correlated more highly with the cash flow position of the sector than with "realized net income". In conjunction with other accounting statements, the cash flow summary can be used to analyse the sources of financing investment in the sector. For example, the burden of debt payments can be indicated as a percentage of net cash flows. Also, the importance of alternative sources of cash funds in financing capital purchases can be shown with this account.¹⁰¹

This account is based on the establishment concept for consistency with the production income account, which includes both cash and noncash flows. A farm operator cash flow statement also could be compiled to account for all cash sources and uses by farm operators. Such an ac-

¹⁰¹ For an analysis of U.S. farm sector cash flow statements and examples of indicators which can be generated from cash flow accounts, see John B. Penson, Jr., and David A. Lins, Agricultural Finance, pp. 327-329.

Cash Transactions Summary

- (1) Cash Sources
 - Sales of Primary and Secondary Production
 - Government Payments
 - Other Cash Income

- (2) Cash Uses
 - Cash Expenses on Intermediate Inputs
 - Business Taxes
 - Interest
 - Cash Wages to Hired Labour
 - Cash Rent to All Landlords

- (1) - (2) Cash Income To Farm Establishments From Production

Cash Flow Summary

- (1) Cash Income To Farm Establishments From Production
- + (2) Net Change In Loans Outstanding
- + (3) Net Change In Farm Establishments' Currency and Deposits
- = (4) Total Cash Available For Capital Purchases and Proprietors' Use
- (5) Non-Real Estate Capital Purchases
- = (6) Cash Available For Proprietors' and Shareholders' Uses

Figure 4.3: Sector Cash Flow Summary

count may have some additional analytical applications, but is not discussed here since the differences between the two forms of the statement are due only to different sectoring bases. A farm operator cash flow summary includes all nonfarm cash sources and uses in the account and excludes nonoperator sector cash flows.¹⁰²

An ideal format for this account would identify all cash flows in the sector. For example, loans and loan repayments ideally are identified on a gross flows basis, to maximize the information content of the account. However, it is more feasible to compile the cash flow summary on a net flows basis for loans and changes in currency and deposits held. That is, an increase in the total value of loans held is identified as a positive cash source and a decrease is identified as a negative cash source. This limits the usefulness of the cash flow account because the importance of certain cash flows can be masked. For example, the use of annual net changes in debt outstanding can mask the true importance of operating loans to sector cash flows.

The proposed format for this account differs slightly from the format used by the USDA.¹⁰³ The U.S. format defines sector cash flows to include nonoperator landlords to indicate sector-generated cash flows to farm establishments and nonoperator landlords. The account used here defines sector cash flows excluding nonoperator landlords because the account is intended to estimate cash flows to farm establishments only.

¹⁰² The format of a farm operator cash flow summary is illustrated in Jack H. Clark, "Financial Statements for the Canadian Agricultural Sector", (Paper Prepared for the Regional Development and International Affairs Branch, Agriculture Canada, undated), p. 18.

¹⁰³ USDA, Economic Indicators of the Farm Sector: Income and Balance Sheet Statistics, 1980, Statistical Bulletin Number 674, (Washington, 1981), Table 3, page 13.

It is not intended to identify cash flows to hired labour, lenders of financial capital, or nonoperator landlords. A cash flow account on the USDA basis can be derived easily from the format used here with simple arithmetic calculations.

The methods used in estimating expenses for intermediate inputs measure the value of purchased inputs, whether paid for in cash or accumulated as new debt. The format of the cash flow summary does not adjust for this procedure. Thus, it is possible that the estimate of cash flows from production in the account is underestimated if the value of some inputs was accumulated as new debt or financed by depleting demand deposits or the level of currency held by establishments. Any underestimate of the cash income available from production is compensated for by an equal and opposite effect on the estimate in the change in loans outstanding or currency and demand deposits held. Thus, the estimate of total cash available to the sector is unaffected by the current estimation procedures for intermediate input expenses.

The net change in farm loans should be measured as the change in farm debt outstanding held by farm operator-proprietors and farm corporations. The net change in farm currency and demand deposits should include only changes associated with farm establishments and not personal demand deposits of farm operators. Since it is difficult to determine if deposits are mainly for the personal use of the operator or for the establishment, only changes in financial deposits explicitly associated with establishments should be included in this account. It is likely that changes in currency held by farm establishments are not significant empirically and would not need to be measured if this account were estimated.

4.6 TOTAL INCOME OF FARM OPERATORS ACCOUNT

The production income and cash flow summary accounts are sector accounts based on the establishment concept. Together with the capital accounts to be discussed in Chapter V, they describe the size, output, and finance of the sector. The total income of farm operators account is based on an institutional sectoring concept designed to aid in the analysis of economic welfare issues. Figure 4.4 illustrates the format of this account.

The total income account identifies the sources of income of farm operators by source of income. The allocations of income part of the account could be disaggregated in a variety of formats, depending on the data required by data users. Income derived from farming operations consists of unincorporated and incorporated operators' returns from the production income account plus management and labour compensation paid to manager families of corporate farms. The imputed rental value of owned dwellings plus other income sources by source are added to this income to estimate total income to farm operators. Nonfarm sources of income should be identified in as much detail as possible since the sources of income of operators may be important in the analysis and development of programs supporting incomes.

Arguments in support of policies aimed at maintaining the family farm structure in Canadian agriculture are based on: (1) economic factors, (2) social factors, (3) environmental and resource use factors, (4) rural impact factors, and (5) factors relating to the rights of farmers to organize their own industry.¹⁰⁴ Financial data on the economic position

¹⁰⁴ Task Force on the Orientation of Canadian Agriculture, Economic and Social Factors Related to Agriculture and Food, Task Force Report,

Income Sources

Returns From Agriculture

- Unincorporated Operator Returns
- Operator-owned Corporate Profits
- Operator-owned Corporate Wages to Operator Families
- Nonoperator-owned Corporation Manager Wages and Salaries

Other Incomes

- Imputed Rental Value of Farm Dwellings
- Imputed Rental Value of Operator-Occupied Nonfarm Dwellings
- Imputed Net Value of Farm Garden Production
- Nonfarm Wages and Salaries
- Nonfarm Business Income
- Interest and Dividend Income
- Rents
- Transfer Payments
- Other Income

Income Outlays

Dwelling Expenses

Personal Taxes

Income Available For Living Expenses and Investment by Operators

Figure 4.4: Total Incomes of Farm Operators Account

of farm operator families are required, given this policy orientation in Canadian agriculture. National goals for the sector include fair levels of producer returns and reduced economic disparities in agriculture.¹⁰⁵ The former goal refers to the rates of return to resources used in the sector. The latter goal refers to disparities between incomes earned by people in the sector and by people in other sectors, as well as to disparities within agriculture. It is necessary to account for the income level of sector participants to develop and monitor the effectiveness of programs seeking to reduce economic disparities between people in the sector and people in other sectors. The account detailed here is designed to account for the total incomes of farm operators by source of income. The account refers to farm operators since it appears that this group is the primary sector target group for economic policies. For example, instrumental goals intended to fulfill national agricultural goals include the stabilization of producer returns and increased farm unit viability. Both of these goals are implemented with programs which refer directly to the farm operator group.¹⁰⁶

There are many problems in the analysis of returns to sector participants. For example, it is difficult to identify the level of resources used in different occupations. For valid comparisons, labour resources must be standardized for differences in important variables such as age and education levels. In addition, the types of returns earned in dif-

Volume III, (Ottawa: Agriculture Canada, 1977), pp. 66-72.

¹⁰⁵ Task Force on the Orientation of Canadian Agriculture, Domestic Policies and External Factors Which Have Influenced The Development of Canadian Agriculture, Task Force Report, Volume II, (Ottawa: Agriculture Canada, 1977), pp. 15-18.

¹⁰⁶ *Ibid.*, pp. 22-31.

ferent occupations are difficult to compare. For example, nonmonetary benefits of different occupations often are important to the total economic welfare of different groups. Furthermore, capital gains on assets represent a form of deferred income which have been significant in Canadian agriculture during the 1970's.¹⁰⁷

Problems exist in defining the farm operator group for the purposes of this account. The definition used here includes operator-proprietor families of unincorporated farm establishments, operator families of rented farm establishments, any partner families with farm operation responsibilities, and manager and manager-shareholder families of corporate farms. This definition is assumed to cover the population of interest to policy-makers.¹⁰⁸

It is very important that this account be developed with similar disaggregated accounts by type and size of farm. Data presently available indicate that farm operators' degree of reliance on agriculture for economic welfare varies widely. The aggregate account may mask some differences in the importance of agriculture for the welfare of different operator groups. For example, Brinkman has shown that the net farm income of farm operators for holdings with less than \$5,000 of sales has

¹⁰⁷ A summary of the factors involved in comparing economic welfare between groups is S.N. Kulshreshtha, "An Approach to Develop Comparisons of Farm and Nonfarm Incomes in Canada", Canadian Journal of Agricultural Economics 14, No. 1, (February, 1966), pp.61-74. A study comparing rates of return to groups in different sectors is George L. Brinkman and Jack A. Gellner, "Relative Rates of Resource Returns for Ontario Commercial Farms--A Farm to Nonfarm Comparison, 1971-74, Canadian Journal of Agricultural Economics 25, No. 2, (July, 1977), pp. 26-44.

¹⁰⁸ A precise definition of the family also must be developed to implement this account. For example, the point at which children of farm operators are no longer part of the farm operator family must be defined.

been negative from 1971 to 1979.¹⁰⁹ These operators also have the highest average off-farm income of any operator group in the sector. Strickland has indicated similar findings for the U.S. farm sector.¹¹⁰ In addition, he has shown that there are significant implications for this account if operators of holdings with less than \$5,000 sales are excluded from the operator group. Many aggregate sector indicators changed significantly using the higher minimum sales requirement. Several indicators changed in direction from year to year depending on the definition used, indicating the impact of alternative definitions of the farm operator group.

Some problems exist in the use of operator income data based on farm taxfiler sources when comparing the incomes of operator groups within agriculture and between farm operators and other groups in the economy.¹¹¹ Data on total farm incomes currently are estimated using taxfiler sources and Statistics Canada surveys. Taxfiler data refer to individuals rather than households and thus, are based on a different unit of observation than that used in the proposed total operator income account. Also, taxfiler data refer only to unincorporated farm operators

¹⁰⁹ George L. Brinkman, Farm Incomes In Canada, A Study Prepared for the Economic Council of Canada, and The Institute for Research on Public Policy, (Ottawa: Supply and Services Canada, 1981), Table 2-1, pp. 5-6.

¹¹⁰ Roger P. Strickland, "The Negative Income of Small Farms", Agricultural Economics Research 35, No. 1, (January, 1983), pp. 52-55.

¹¹¹ Bollman has used alternative definitions of farmers and farm families to compare money incomes of farmers and nonfarmers. Data sources were taxfiler data from Revenue Canada, Taxation; and Statistics Canada's Survey of Consumer Finances. See Ray D. Bollman, "A Comparison of the Money Incomes of Farmers and Nonfarmers", Canadian Journal of Agricultural Economics, Proceedings, 1980 CAES Annual Meeting, August, 1980, pp. 48-55.

resulting in gaps in population coverage. The number of taxfilers is higher than the number of operators due to partnerships and multiple taxfiling from the same operator family. Differences in the concept of income exist between the theoretical measure of income desired and net income for taxation purposes. For example, tax depreciation rates bear little relationship to either economic or capacity depreciation.

The taxfiler data base represents an important source of information on farm incomes. Many of the conceptual problems can be overcome.¹¹² This data source has already proved very useful for the analysis of economic welfare issues. The development of an account for farm operators with valid linkages to the production income account would further improve its utility.

4.7 SUMMARY

Three income accounts were proposed and discussed in this chapter. The production income account is intended to measure the value of productive activity of the sector, matching incomes and expenses. It estimates factor incomes earned in the sector and provide a link to institutionally-based accounts on total incomes of farm operator families. The cash flow summary adjusts the production income account to a cash basis. It is an indicator of the cash available for investment or withdrawal from the sector. The operator income and outlay account indicates the total income position of the operators of farm establishments.

¹¹² A summary of the issues and progress in developing the taxfiler data base is Ray Bollman, "Ten Years of Taxation Data in the Agriculture Statistics Division", (Ottawa: Statistics Canada, January 16, 1981).

Income accounts are major indicators of the financial situation of an industry. However, capital accounts showing the amount, structure, and formation of capital used and owned in the sector are important for many analytical applications. Chapter V describes several capital accounts for the agricultural production sector.

Chapter V
CAPITAL ACCOUNTS

5.1 INTRODUCTION

Individual farm operators monitor the income and asset position of farms with an integrated set of financial accounts on incomes, cash flows, and assets. No single statement can provide sufficient information for farm management purposes. Similarly, an aggregate financial data system consists of an integrated set of income, cash flow, and asset accounts to provide sufficient information on the sector.

The accounts detailed in this chapter are intended to provide data on the value, change in value, structure, and ownership of assets used in the sector. Capital accounting statements are required for the agricultural production sector to permit the construction of indicators of liquidity, solvency, efficiency, capacity, and profitability. Additionally, changes over time in the structure of assets and liabilities can be monitored using capital accounts. These changes are important in the evaluation of the impacts of agricultural programs.

Three accounts are discussed in this chapter: (1) the farm capital value statement; an inventory of the current market value of capital and current assets in the sector, (2) the balance sheet; which matches the current market value of assets owned in the sector against debt and equity claims, and (3) the capital flows account; which identifies capital formation and disappearance in the sector. Each account is explained and related to its analytical purposes.

5.2 THE FARM CAPITAL VALUE SERIES

Statistics Canada presently estimates the value of farm capital at current market values.¹¹³ This account measures the value of land and buildings, machinery and equipment, and livestock and poultry on all farm holdings. All land and buildings used for agricultural production on farm holdings are included. The nonagricultural value of farm real estate is not included for farms near cities or towns.¹¹⁴ Thus, this account attempts to measure the agricultural use value of farm real estate and underestimates the market value of farm real estate located near urban areas. For purposes of analysis of the production value of farm real estate, this procedure is desirable. However, for purposes of analysis of the equity position of farm establishments, some of the equity held by farm establishments is ignored using this procedure. All other capital assets are valued at observed market values, including owned and rented capital assets. All of the value of farm dwellings is included, although only a portion of the farm dwelling is considered to be used as farm production assets (i.e. the portion of the owner-occupied farm dwelling used as the farm business office) for the depreciation calculation in the income account. Thus, the capital value account reflects all assets used in the sector plus the value of farm dwellings. No other personal assets of operator families are included in the capital value series. The value of assets used for both production and the

¹¹³ Statistics Canada, "Current Value of Farm Capital in Canada", in Farm Net Income, Annual, Catalogue No. 21-202, Table 6.

¹¹⁴ That is, farm land and buildings in urban areas are valued at rates prevailing for similar farm land and buildings in rural areas. A description of the methods used in the estimation of this series is published in Statistics Canada, "Data Description and Methodology", in Farm Net Income, Annual, Catalogue No. 21-202.

personal use of farm operator families is divided into production and personal use components. Only the production use component for such assets is included in the account. An example is the farm use component of automobiles, where one half of the value of operator-owned automobiles is considered to be part of the stock of production assets of the agricultural sector.

The proposed capital value series represents the current value of capital assets used and located on farm establishments, regardless of ownership. Capital assets used in the sector may be owned by farm operators, corporations, and nonoperator landlords. Figure 5.1 illustrates the format of the proposed capital value statement. It differs from the current series only in that the farm establishment concept is its basis of estimation, rather than the holdings approach now used, and all inventories are included for completeness of the account.

Fixed Capital
Land and Buildings
Machinery
Other Equipment
Inventories
Livestock and Poultry
Crops
Inputs
Total Capital Value

Figure 5.1: Farm Capital Value Statement

The primary purpose of the capital value series is to show the size of the agricultural plant and facilitate analyses of sector capacity and

the structure of capital assets.¹¹⁵ The specialization of production activities in agricultural production complicates any analysis of capacity. Farm establishments purchase many input services from agricultural service industries which previously were supplied within the production sector. The capital value account should be used in conjunction with data on the farm production capacity of agricultural service industries, in the analysis of the agricultural productive capacity of the economy.

5.3 THE BALANCE SHEET OF THE FARM SECTOR

A balance sheet is a fundamental accounting statement for the financial management of a farm firm. Aggregate balance sheets for the sector are recommended in international accounting frameworks¹¹⁶ and have been estimated annually in the United States since 1944. A farm sector balance sheet relates sector assets to the liability and equity position of farm establishments. In other words, the values of assets owned by establishments are allocated to the debt and equity claims on those assets, at a point in time.

The balance sheet is shown in Figure 5.2. Assets include all capital, inventory, and financial assets owned in the sector. Thus, the value of land and buildings rented from nonoperator landlords is not included in the balance sheet. Claims against assets are identified as liabilities (ideally by length of term), and equity (by owner group).

¹¹⁵ Thomas A. Carlin and Charles R. Handy, "Concepts of the Agricultural Economy and Economic Accounting", American Journal of Agricultural Economics 56, No. 5, (December, 1974), p. 971.

¹¹⁶ For example, see Economic Commission for Europe, European Handbook of Economic Accounts For Agriculture, 1982, pp. 24-25 and Table 5.1, p. 26.

Assets

Physical Assets

Fixed Capital
 Farm Real Estate
 Machinery and Equipment
 Inventories
 Livestock and Poultry
 Crops
 Inputs

Financial Assets

Currency
 Demand Deposits
 Cooperative Investments
 Accounts Receivable
 Quota Values

Liabilities and Equity

Liabilities

Accounts Payable
 Short-term Debts
 Intermediate-term Debts
 Long-term Debts

Equity

Proprietors' and Partners'
 Equity
 Operator-Owned Corporation
 Equity
 Nonoperator-Owned Corporation
 Equity

Figure 5.2: Sector Balance Sheet

The balance sheet is based on the establishment concept of the sector. Consequently, the assets included in the balance sheet are only production assets of farm establishments and not the personal assets of farm sector participants. However, it is difficult to separate the financial assets of farm operator families from those of farm establishments. Any method used to effect such a separation for financial assets must be somewhat arbitrary since no legal separation exists for farm proprietorships. The accounting framework proposed here is based on a theoretical construct separating the activities and assets of farm establishments from those of sector participants. Only financial assets directly associated with farm establishments should be included in this

balance sheet. The other assets of farm operators are not relevant for this account since these assets generally are not committed to the production activities of farm establishments. For example, the household furnishings of farm operators are excluded from the proposed balance sheet. The balance sheet is consistent conceptually with the production income account for the sector. Thus, it can be used in conjunction with the production income account in the analysis of rates of return and other economic questions.

The balance sheet format used in the USDA farm financial accounts refers to the assets of farm establishments plus the farm assets owned by nonoperator landlords.¹¹⁷ Thus, farm real estate assets and associated farm debts of nonoperator landlords are included in the USDA balance sheet. This basis of the balance sheet may be useful for some analytical applications, such as the analysis of agricultural real estate demand. Relatively little additional data are needed to permit balance sheets on the USDA basis to be compiled in addition to the format shown here.

While the personal assets of farm operator families should be excluded from the sector balance sheet, all farm production assets of farm operator families should be included in the account for completeness. Rodefeld pointed out the problem where the farm family owns assets, which are leased to the corporate entity owned by the farm family.¹¹⁸ Such as-

¹¹⁷ See, for example, Table B1, in Economic Indicators of the Farm Sector, Income and Balance Sheet Statistics, 1980, Economic Research Service, Statistical Research Bulletin Number 674, (Washington: USDA, September, 1981), p. 117.

¹¹⁸ R.D. Rodefeld, "Farm Sector Data: Presentation and Improvement: Discussion", American Journal of Agricultural Economics 63, No. 2, (May, 1981), p. 356.

sets belong in the farm sector for analytical purposes and should be included in the balance sheet. Transfers of ownership between farm corporations and their owner-operators for legal or tax reasons should not affect the analytical usefulness of the balance sheet.

The purpose of the balance sheet is to facilitate measures of liquidity, solvency, and profitability in the sector and to aid in the analysis of the structure of assets and debt.¹¹⁹ Liquidity refers to the ability of the sector to meet short-term financial commitments without disrupting production activities. Two measures of liquidity are directly related to the balance sheet: (1) the current debt-to-asset ratio; the value of current liabilities divided by the market value of current assets, and (2) the debt structure ratio; current liabilities to total liabilities. The analysis of liquidity for the sector as a whole is limited with aggregate balance sheets due to difficulties in identifying short-term and intermediate-term debt and assets. For example, long-term debt due within one year should be included in the balance sheet as short-term debt, but data generally are not available to estimate the portion of long-term debt due in the current time period.

Solvency refers to the financial security of the sector. The leverage ratio of total liabilities to net worth and the equity ratio of net worth to total assets are two indicators of solvency which can be estimated from the balance sheet. U.S. farm balance sheets indicate that the leverage ratio for the sector has trended upwards since 1945. However, this ratio is still at a relatively low level of .17 in the U.S., indicating that there may be substantial credit reserves in the sec-

¹¹⁹ John B. Penson, Jr. and David A. Lins, Agricultural Finance, pp. 311-320.

tor.¹²⁰

Profitability refers to the rate of return on investment. In combination with the production income account, it is possible to estimate rates of return on debt and equity capital using the balance sheet. Profitability analysis is complicated for agriculture because most returns accrue to farm operator families, who provide labour, management, equity capital, and entrepreneurial inputs to the sector. As previously noted, some theoretical formulations of the production income account separate these returns, but important assumptions with respect to the quantity and value of inputs supplied by operator families are necessary to estimate returns to each factor separately.¹²¹ While subject to some limitations, the balance sheet and production income account permit the analysis of profitability for the sector on a consistent basis. The present data system does not estimate a balance sheet making even limited analysis of profitability difficult since estimates of equity capital are not made.

The valuation of farm land and buildings presents problems for purposes of the balance sheet. The value of land and buildings is estimated including the value of farm dwellings. This implies that the value of a major personal asset of operator-proprietors is included in the sector balance sheet. It is important that profitability indicators include the returns to all assets included in the balance sheet. One method of calculating profitability is to impute a value of farm dwellings, using procedures presently used to estimate the debt and deprecia-

¹²⁰ Ibid., p. 313.

¹²¹ See section 4.4.2.7 above.

tion expenses arising from farm dwellings, and deduct this value from the balance sheet. Alternatively, imputed rents to farm operator-owned dwellings on farm establishments, net of dwelling expenses, could be added to production returns when profitability indicators are estimated. However, this method is not conceptually the same since housing services are included in returns to the sector in this procedure.

Canadian balance sheets were estimated for January, 1981 based on a special survey.¹²² These balance sheets demonstrate the information potential of such accounts. For example, the ratio of current liabilities to current assets for Canada in 1981 was .20, based on Farm Credit Corporation (FCC) definitions of current debt and assets. Also, differences in the structure of assets and debt by farm size and product type are demonstrated by FCC balance sheets, disaggregated on the basis of size and product type. Continuous estimation of balance sheets permits the monitoring of changes to the structure of production assets over time. For example, changes in the liquidity structure of the sector over time could be indicated by classifying the relative proportions of liquid to illiquid assets in the balance sheet.¹²³

The meaning of the balance sheet differs by province due to the existence of production quotas for some commodities. Quota values are reflected directly in the balance sheet for provinces where quotas are traded. For provinces where quotas are not permitted to be traded and

¹²² Farm Credit Corporation (FCC), Farm Survey, (Ottawa: 1981).

¹²³ The FCC balance sheets include farm operator assets such as personal financial accounts and other real estate. Because the accounting system proposed here attempts to separate sector and farm operator financial data, these assets are not included in the proposed balance sheet.

do not have a current market value, at least some of the value of quotas gets capitalized into other fixed assets of farm establishments. Thus, the values of quotas are reflected differently in the balance sheet in different provinces.

5.4 THE CAPITAL FLOWS ACCOUNT

The capital value and balance sheet accounts are stock accounts of the sector. That is, these accounts refer to the financial position of the sector at a specific point in time. Changes to balance sheets can be monitored over time with the capital flows account. Capital flows denote "cash and noncash transactions involving capital items. The term capital formation is used to denote expenditures for new capital items".¹²⁴ Thus, expenditures for new capital goods represent both capital flows and capital formation. Purchases of real estate from other sectors represent flows of existing capital and are part of capital formation in the sector, although not for the economy as a whole.¹²⁵ The sum of capital formation and purchases of real estate is termed gross capital accumulation of the sector.

The capital flows statement measures sector capital accumulation against capital disappearance. It permits the analysis of changes in the balance sheet arising from changes in the quantity and value of assets held in the sector. The format of the account is illustrated in Figure 5.3. Gross capital accumulation consists of fixed asset accumulation and changes in the values of inventories. Changes in the total

¹²⁴ John B. Penson, Jr. and David A. Lins, Agricultural Finance, p. 303.

¹²⁵ See *ibid.*, Chapter 13 for detailed examples of capital flows and capital formation.

value of capital can arise from changes in either the quantity or market value of assets held. The total value of assets increases when: (1) new fixed assets are added to the balance sheet, either from own-account activities or purchased from other sectors, and (2) when the values of existing assets change. Capital assistance payments by governments are part of the capital accumulation in the sector in a time period. Thus, these payments should be included in the value of capital accumulation in the capital flows statement.

Gross Capital Accumulation -----	Gross Capital Disappearance -----
Fixed Asset Accumulation	Capital Consumption
Own-account Formation	Buildings
Purchases of New Machinery and Equipment	Machinery and Equipment
Purchases From Other Sectors	Sales of Capital to Other Sectors
Land and Buildings	Land and Buildings
Machinery and Equipment	Machinery and Equipment
Valuation Adjustment	
Changes in Value of Inventory	Net Capital Growth or Decline

Figure 5.3: Capital Flows Account

Estimates of the physical change in quantities of assets accumulated in the sector are made in this account to permit the analysis of real capital changes. This ideally is estimated directly from measures of the physical quantities of capital accumulation. The change in inventory value is calculated from the difference of the value of inventories at the beginning and end of the time period. The change in inventory value can be broken down into component price and quantity effects.

Gross capital accumulation is balanced against capital consumption, sales of capital, and net capital growth. Capital consumption (depreciation) data are from the production income account. Limitations in the methods of depreciation estimation have some effects on this account. For example, if capital consumption is overestimated, the capital flows account could estimate net capital decline for the sector when net capital growth actually occurred.¹²⁶ As with gross sales in the production income account, sales of capital assets can be estimated gross or net of capital sales among subsectors in agriculture. The approach used here is net of these sales for simplicity in presentation, although eventual development of gross flows data may be desirable. Sales of capital assets to other sectors consist mainly of real estate sales to nonoperators. Purchases by establishments from other sectors are included on the gross capital accumulation side of the account. If information is available only for net transfers of real estate from or to the sector, net flows should be entered only on one side of the account.

The capital flows account is designed to explain changes to the balance sheet. Thus, if assets previously rented are purchased by farm establishments, the account shows capital formation although no change in the quantity of assets used in the sector has occurred. It is possible to compile an account designed to explain changes in the capital value series rather than the balance sheet. In this account, capital transfers to or from other sectors are the value of assets transferred to or from farm establishment uses, regardless of ownership. For example, purchases of land by establishments from nonoperator landlords would not

¹²⁶ See section 4.4.2.6 above.

affect the account since no change would have occurred in the amount of land used in the sector. It should be relatively easy to develop such an account from the capital flows account discussed above.

The capital flows account is related to the production income account and the other capital accounts discussed above. For example, own-account capital formation appears in both the production income and capital flows accounts. Also, the value of inventory change in the income account is the quantity change component of the change in the value of inventory in the capital flows account. The treatment of capital livestock and poultry as current production in the production income account implies similar treatment in the capital flows account for consistency. Changes to the value of livestock are shown as changes in inventory rather than as fixed asset changes.

The principal purpose of the capital flows account is the determination of capital growth or decline in the sector, and the structure of these capital changes. It enables changes in the balance sheet from year to year to be explained in terms of physical and revaluation components. Thus, it should be useful in the analysis of capacity growth and investment in the agricultural production sector.

5.5 OTHER CAPITAL ACCOUNTS

The capital accounts discussed above are basic accounts for any financial accounting system. If developed, additional accounting statements can be compiled for specific analytical purposes.¹²⁷ The capital

¹²⁷ See Richard W. Simunek, "The Relationship of The Farm Balance Sheet to Sector and National Income and Product"; John B. Penson, Jr., "USDA Capital and Financial Flow Accounting Procedures: An Analysis and Suggestions For Change"; David A. Lins, "Farm Sector Cash Flow

finance account measures the sources of financing capital accumulation. Capital accumulation must be financed from capital consumption allowances, real estate sales, capital borrowing, and savings from farm and off-farm financial sources. The capital finance account attempts to identify the importance of these financing sources over a period of time. Two different approaches to the estimation of this statement have been used in the United States.¹²⁸

The sources and uses of funds statement relates the accumulation and finance of both capital and noncapital asset values. The purpose of the account is to identify the sources and uses of all funds in the sector, whether in the form of cash or asset revaluation. Uses of funds include capital expenditures, changes in inventories and financial assets, real estate asset accumulation and proprietor withdrawals. The account may be useful in understanding: (1) the financing of sector activity from external and internal sources, (2) the financing of cash flows, (3) debt servicing in relation to gross income, and (4) debt requirements, based on real estate turnover rates, expenses, incomes, and the personal income and consumption of operators.¹²⁹ These accounts facilitate the

and Sources and Uses of Funds Accounts"; and discussions of these articles in Proceedings of Workshop on Farm Sector Financial Accounts, April 14-15, 1977, Agriculture Economic Report No. 412, USDA, Economics, Statistics, and Cooperatives Service, Washington, November, 1978. Also, see John B. Penson, Jr., David A. Lins and George D. Irwin, "Flow-of-Funds Social Accounts for the Farm Sector", American Journal of Agricultural Economics 53, No. 1, (February, 1971), pp. 1-7.

¹²⁸ John B. Penson, Jr. and David A. Lins, Agricultural Finance, pp. 305-7.

¹²⁹ See John R. Brake, "Farm Sector Cash Flow and Sources And Uses of Funds Accounts: Discussion", in Proceedings of Workshop on Farm Sector Financial Accounts, April 14-15, 1977, pp. 113-114.

analysis of the basic balance sheet and capital flows accounts. They can be developed as the data system in Canada expands to include regularly estimated capital accounts for the sector.

5.6 SUMMARY

The capital accounts discussed in this chapter are intended to complement the income accounts discussed in Chapter IV. The integrated data system is a comprehensive set of accounts for the sector facilitating the analysis of the economic situation of the sector. The balance sheet and capital value accounts show the asset, liability and equity position of the sector at specific points in time. The capital flows account explains the changes in the balance sheet, identifying quantity and valuation changes for establishment-owned assets in the sector. Accounts explaining the sources of financing for asset accumulation can be produced from the basic capital accounts described in this chapter. These accounts should be developed once the basic capital accounts are developed for Canada.

A common sectoring basis is used for all business-oriented accounts. Direct relationships exist between the institutionally-based farm operator income account and the establishment-based production income account, permitting valid analysis of the effects of sector income changes on farm operators' income. The common basis of estimation permits economic indicators to be constructed. For example, profitability indicators are ratios of estimates of returns and levels of investment which must be based on a common sectoring concept for valid results.

The proposed financial accounting system for the agricultural production sector parallels the Canadian System of National Accounts (CSNA) for the economy as a whole. Economic production of the sector is estimated and allocated to institutional groups. As the industrialization of the agricultural production sector continues, the economic welfare of the sector and its participants becomes less directly related. In order to permit valid sector analyses, separate accounts are needed reflecting the financial condition of the sector and the people involved in the sector. Capital stocks and flows are monitored to permit analysis of the origins of economic growth and the impacts of various programs on economic indicators. The common sectoring approach between the CSNA and the proposed system permits agricultural production sector accounts to be used with economic data for related "food systems" industries.

In 1974, the rationale of the proposed set of economic accounts for agriculture was expressed.

The establishment view of the agricultural industry can accommodate the concept of a family controlled proprietary business. But the family farm of 1974 is much less of a social institution than the family farm of 1940...The time has come to separate the view of farming as a business activity from that of farming as a way of life.¹³⁰

So long as the inconsistencies and other problems of the current accounting system exist, the system fails to fulfill its potential to serve decision-makers in the economy. The need for programs in the sector is more difficult to establish objectively and their impacts are analysed less effectively as a result of limitations in the accounting system. Additionally, the market coordination functions of the ac-

¹³⁰ Thomas A. Carlin and Charles R. Handy, "Concepts of the Agricultural Economy and Economic Accounting", American Journal of Agricultural Economics 56, No. 5, (December, 1974), p. 973.

counts, through their role in facilitating private sector estimation of the input and financing requirements of the sector, are performed less effectively.

The proposed accounting system is considerably larger than the existing data system. Some priorities for the development of the proposed accounting system are discussed in chapter VI, in the context of data availability and the relative importance of proposed changes in the data system.

Chapter VI

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER DEVELOPMENT

The primary purpose of this study was to propose an improved system of aggregate financial accounts for the agricultural production sector. These accounts are intended to resolve some of the accounting inconsistencies and analytical problems known to exist with the current data system and increase the usefulness of the accounts to decision-makers. The alternative set of accounts was explained and argued to fulfill the purposes of the data system more effectively than the current set of accounts. This chapter summarizes some of the principal arguments for developing the expanded data system. In addition, some priorities for future research and data collection activities in this area are discussed.

6.1 CONCLUSIONS

All data systems are developed to provide information for decision-making or problem-solving. Information is generated from data by analytical processes such as hypothesis-testing and interpretation to place data in the context of specific problems or decisions. The value of a data system depends on its ability to generate information relevant to decision-makers.

The general uses of the financial accounts for the agricultural production sector are the analysis of: (1) the economic welfare of farm sector participants, (2) rates of returns to resources in the sector,

(3) capacity, (4) productivity, (5) input demand, and (6) the financial situation of farm businesses. Additionally, the accounts form the basis of the agricultural production sector accounts in the aggregate Canadian System of National Accounts (CSNA) framework. Thus, they contribute to the fulfillment of the purposes of the CSNA, which include: (1) current economic analysis, (2) short-term forecasting, (3) government budget preparation, (4) medium-term projections, (5) economic growth analysis, (6) model-building, and (7) structural analysis, including the analysis of relationships among sectors in the economy.¹³¹ The data system is used for these purposes both in the analysis of issues particularly related to agriculture and, in the CSNA framework, the analysis of general economic issues.

The ability of the data system to fulfill these functions is limited by accounting inconsistencies and interpretation problems caused by changes in the structure of the sector. Heterogeneity in the sector decreases the utility of aggregate data and increases the importance of data by farm establishment size and product-type. Averages for the production sector as a whole are virtually meaningless where wide variations exist in the characteristics of farm establishments by size, type of product, and legal tenure. Increases in the capital intensity and use of leverage in the sector creates the need for balance sheets and other financial data on capital to allow policy-makers to monitor the need for, develop, and evaluate programs. The importance of nonfarm income sources in the economic welfare of many farm operator families and

¹³¹ Statistics Canada, National Income and Expenditure Accounts, Volume Three, A Guide to the National Income and Expenditure Accounts, Definitions-Concepts-Sources-Methods, Catalogue 13-549E, (Ottawa: Statistics Canada, 1975), pp. 29-32.

the importance of nonoperator factors of production in agricultural production increase the need for separate accounts monitoring the incomes of the production sector and farm operator families. Furthermore, accounting problems reduce the usefulness of existing data series by creating ambiguity and uncertainty in their interpretation. Some examples of accounting problems in the data system are: (1) the mix of sectoring concepts used in the accounts, (2) imprecise definition of sector boundaries with respect to production, (3) the treatment of wages to farm operator spouses and children, (4) the valuation of inventory changes, (5) the calculation of depreciation, and (6) the lack of valid linkages between data on the total incomes of farm taxfilers and the sector income account. Additionally, structural changes and a diverse set of policy demands create pressures for different types of data. For example, the analysis of the impacts of the sector on the rural economy requires data relating agricultural production to the rural economy.

Several major requirements for the improvement of the data system were identified in this study:

1. Subsector financial data by size and product-type of farm are required because of the increased degree of heterogeneity in the sector and the resulting usefulness of subsector data for analytical and policy applications. Sector and subsector accounts should be compiled on a similar basis to maximize the utility of the data system.
2. The sector definition needs to be specified more precisely to establish its relationships to other sectors of the economy and to provide a common frame of reference in the collection of finan-

cial data and the construction of accounts. The use of the establishment concept and the Standard Industrial Classification were proposed in this study as a means of defining the sector.

3. Accounting procedures need to be developed to resolve interpretation problems caused by changes in such areas as tax laws and the degree of vertical integration. Procedures used in the estimation of wage expenses, depreciation allowances, some farm cash receipts series, the value of inventory change, and other series can be improved.
4. Financial accounts need to be constructed for both the sector as a whole and farm operator families. Sector income accrues to many groups other than farm operator families, and farm operator families on average earn considerable income from nonfarm sources.
5. The realized net income series needs to be reevaluated. It is based on a mix of accrued and cash accounting approaches and is not a good measure of cash flow. The compilation of a cash flow account for the sector would require very little new data. Such an account could replace realized net income as a measure of cash income generated in the sector available to operators and proprietors for investment or withdrawal.
6. Balance sheet and capital flows accounts need to be developed to facilitate the analysis of rates of returns to factor services, the structure of assets and liabilities, net capital growth or decline, and changes in the equity and liability position of sector establishments.

6.2 RECOMMENDATIONS FOR FURTHER RESEARCH

The proposed data system implies a considerable amount of additional research and empirical estimation before regularly estimated reliable accounts are developed. This data system is intended to: (1) resolve accounting inconsistencies and interpretation problems known to exist in the current data system, (2) reflect structural changes in the sector that have affected the reliability of estimates, and (3) serve decision-makers more effectively by expanding the usefulness of the data system. Implementation of this system will require new data sources and methods of estimation for many series. Recommendations for further research are made with respect to: the implementation of the accounts, priorities for development, and specific accounting series.

6.2.1 Implementation

1. Statisticians and economic analysts are jointly responsible for the design and development of their data systems.¹³² Statisticians, analysts, and decision-makers should participate in the development of a consensus on the desired theoretical and operational concepts, and measurement procedures to be implemented. Concepts and procedures should be documented and analysed in the context of the purposes of the accounts. In many cases, data availability and costs may necessitate compromises in the methods, data sources and definitions used which may limit the applicability and usefulness of some accounts. It is imperative that

¹³² James T. Bonnen, "Assessment of the Current Agricultural Data Base: An Information System Approach", in A Survey of Agricultural Economics Literature, Volume 2, edited by L.R. Martin, (Minneapolis: University of Minnesota Press, 1977), p. 404.

data users are aware of the limits of the accounting methods and sources used.

2. Experimental accounts should be developed on the basis of the best available data sources with detailed documentation of the methods and sources used. Documentation is especially important where data gaps exist or imputations are necessary. These experimental or interim accounts would enable analysts to comment on their utility, and permit federal and provincial statisticians to examine critically the methods and sources used to estimate the accounts.
3. The dissemination of formatted accounts is the first stage of the analysis and interpretation function of the inquiry system. The manner of presentation of the accounts must be examined to ensure understanding and acceptance by users of the new data system. Some of the problems in the presentation of a new accounts framework to be resolved are: possible simultaneous publication of old and new accounting formats during a transition period, the amount of documentation to be made available, the development of historical time series on a new accounts basis, and mechanisms for obtaining suggestions and criticisms of the new accounts from data users.¹³³

¹³³ A summary of implementation issues in the U.S. when the revised USDA accounts were implemented is in George Hoffman, "Implementing the New USDA Farm Income Accounts", in Proceedings of the Seminar on Farm Income Statistics, edited by R.M.A. Loyns, D. Freshwater and G. Beelen, Occasional Publication 83-1, Department of Agricultural Economics and Farm Management, (Winnipeg, University of Manitoba, 1983).

6.2.2 Development of Accounts

1. Continued priority should be placed on the development of subsector accounts by product-type and size of farm. Subsector disaggregations should be taken into account in the development of methods for estimating new aggregate accounts.
2. The revised U.S. accounts introduced a cash flow summary format. This account has been found to be the most useful new account in the revised USDA format.¹³⁴ A cash flow statement for the sector in Canada should be a priority, especially since most of the requisite data required are already estimated.
3. Several related research areas were discussed in this study. Data requirements for food systems research need to be identified. Also, additional research is needed on the data required in the analysis of farmers' economic welfare. For example, data required to incorporate preferential tax laws, and different labour skill and time requirements need to be identified in comparing the economic welfare of different population groups. Additionally, data requirements on capital gains and wealth in comparative welfare analysis need to be identified further.
4. One of the principal thrusts of the data system discussed in this study is the construction of accounts on an establishment basis. Improvements in the coverage of the agricultural production sector in the CSNA should be possible since agricultural data would be constructed on the Standard Industrial Classification basis,

¹³⁴ George Hoffman, Economic Research Service, U.S. Department of Agriculture, Comment made in the Workshop on Methodology and Implementation, at the Seminar on Farm Income Statistics, at the University of Manitoba, October 15, 1982.

which is more compatible with the rest of the CSNA. The feasibility of the use of the establishment concept and the SIC needs to be explored in detail. Compromises in the definition of farm establishments may be necessary to use currently available data sources such as the Census of Agriculture, especially in the short-term.

5. Capital accounts should enable analysis of the sources of finance in the sector. As the capital accounts are developed, research into sources and uses of funds and capital finance statements will be warranted to maximize the information available on capital. In addition, research needs to be conducted into estimating the production income account treating capital livestock categories as capital rather than current production. This would increase the validity of the production income account by accounting for capital in the sector according to accounting principles.

6.2.3 Specific Accounting Series

Many of the changes to current definitions and methods of estimation may be empirically insignificant in most time periods. Some accounting inconsistencies have an effect on the interpretation of the data series only over a number of years. For example, the implications of increasing farm incorporation on the meaning of net farm income are likely to be significant only over a period of years. The priorities placed on the development of new data series and the improvement in methods of estimating existing series should depend on the extent to which they can be expected to increase the utility of the system. Some areas of poten-

tial importance, discussed in this study, are summarized in this section.

1. The procedures used to estimate depreciation need detailed review. Currently, the methods used do not match the stated goal of measuring depreciation as straight-line capacity depreciation. More accurate methods of estimating these expenses are needed, including research to update the rates of depreciation for farm assets in modern agricultural production.
2. The development of subsector financial information creates the need for data on interfarm product sales in the aggregate account for compatibility reasons. Other important new series with potentially significant effects on the income account are input inventories and own-account capital formation.
3. In order to develop the sector income account as discussed, the incomes of factors of production must be identified in more detail. Data by institutional group claiming sector income are important to the development of valid linkages between the sector production income account and the income account for farm operator families.
4. The total income of farm operators account needs to be developed. The farm taxfiler data base and other sources should be examined to provide data on the desired basis for this account.
5. Several new data series are needed if the capital accounts discussed in this study are to be developed. While some data gaps may exist, good approximations of these accounts should be feasible with relatively few new data collection programs. Farm debt

data by length of term are important to permit liquidity and solvency indicators to be estimated from sector balance sheets. The major new data requirements of the capital flows account are data on the physical accumulation of capital in the sector to permit the analysis of real capital changes in the sector.

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