THE UNIVERSITY OF MANITOBA

MARKET REGULATION OF AGRICULTURAL PRODUCTS IN CANADA: THE CASE OF POULTRY MEATS

by

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ABSTRACT

Marketing board regulation of agricultural products is becoming increasingly common in Canada. In the case of poultry meats, producer marketing boards were implemented only a decade ago and have expanded greatly since then. The study was initiated to provide information on the effects of alternative regulatory strategies on improving and/or stabilizing producer prices and incomes for the five categories of poultry meats.

In the cases of chickens and broiler turkeys, the analysis indicated that a substantial degree of stability can be introduced into the industry by setting the monthly prices or volumes at the average for the year. For hen and tom turkeys the analysis indicated that a quarterly price model or an orderly marketing of quantity at pre-determined levels introduced a degree of stability into the industry.

If market regulation by the producer boards were co-ordinated for the purpose of reducing inventory, the analysis indicated that reductions of five percent for broiler chicken and broiler turkey, and ten percent for hen and tom turkeys yielded the largest initial increase in total revenue and price. The inventory depletion could be achieved by curtailment of marketings or by attempting to

expand the present market for poultry meats.

The market development analysis indicated that if demand were increased by five percent, for all classes of poultry meats, substantial increases in total revenue could be expected. Price was predicted to increase from ten to thirty percent, if the quantities marketed were regulated at the 1971 and 1972 levels. However, the elastic nature of the demand curves implied that, if quantity had not been regulated, prices would not have increased as fast as the quantity marketed would have increased, if demand had been increased by five percent.

The market regulation analysis was applied using a volume and a price strategy to increase and/or stabilize producer total revenue. The volume strategy regulated the maximum monthly quantity at predetermined levels throughout the year, whereas the price strategy fixed the minimum price at predetermined levels throughout the year. The volume strategy appeared to be the better alternative because the various producer boards were trying to regulate price, and also influence inventory levels, (which in turn also influenced price). However, the volume strategy indicated that short-term revenue would be foregone, but the advantage of output stability would be greater than with a pricing strategy. Moreover, the fluctuating price under a volume strategy could be stabilized under a price pooling system. The price pooling system has the advantage of paying equal prices for equal quality products. There would

be problems at the national level of instituting a system but the study suggests only that a pooling system could be used.

Finally the analysis indicated that the role of producer marketing boards as an organization in creating stability and cohesiveness in the poultry industry could benefit all poultry producers. The analysis was at the national level and assumed that the various boards acted in a co-ordinated manner to regulate competition among themselves as well as regulate the market via the supply management mechanism described in the thesis.

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TO

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CHAPTER I

INTRODUCTION

HISTORICAL BACKGROUND

The Canadian poultry industry has experienced vast changes in production and marketing technology, during the last twenty years. These changes have had an impact upon every phase of the industry from producer to consumer. During the 1950's, new improved breeding stock, better disease controls, and scientifically formulated rations, were developed and adopted rapidly across the industry in North America.[1] However, the production and marketing technology did not happen haphazardly. It was assisted by a degree of planned co-ordination within the industry. As Leckie pointed out, the advancement in technology was possible through the efforts of the five major input sectors of the industry being co-ordinated.[2] It should be emphasized that vertical integration and contract farming were prevalent ways of the industry growth during the 1950's and that the Canadian poultry industry was readily adaptable

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[1] G. J. Moutney, Poultry Products Technology; Westport, Connecticut, The AVI Publishing Co. Inc., 1965.

[2] H. K. Leckie, "Whither Integration" in Canadian Journal of Agricultural Economics, Workshop Report, 1959 pp 53-65.

for integration purposes and did so rapidly.[3] During the 1960's twelve producer marketing boards were formed and, as of December 31, 1971, there were thirteen producer marketing boards operative for poultry meats in Canada. Seven of these were for broiler chickens, five were for turkeys and one covered both commodities.[4] These producer marketing boards have been in existence for differing numbers of years, ranging from one year in the instance of the Federation des Prodecteurs de Volailles du Quebec to twelve years in the instance of the British Columbia Broiler Marketing Board.

The relative importance of producer marketing boards as a mechanism for market regulation has increased substantially over the last decade in the poultry industry. In 1961, the British Columbia Broiler Marketing Board pioneered this form of market regulation in poultry meats and controlled 4% of the Canadian producer receipts for broiler chickens. By 1969, there were seven boards[5] accounting for 51% of all broiler chicken receipts.

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[3]J. T. Hill, "Structure and Concentration in the Canadian Poultry Meat Industry," Canadian Farm Economics Volume 1, Number 2, 1966. Also, see J. T. Hill, "Vertical Integration of the Poultry Meat Industry," Canadian Farm Economics, Volume 1, Number 3, August, 1966.

[4]See Appendix I for a list of existing producer marketing boards for poultry.

[5]British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia and New Brunswick.

Turkeys came under control later in 1966 and 1967 in some provinces and accounted for 16% of the receipts paid to turkey producers. By 1969 four boards[6] controlled 24%.[7]

In 1970, the Canadian poultry industry experienced what were considered to be unacceptably low producer prices due to various marketing problems. The problem in part was created by a marked increase in placements of broiler chickens across Canada. In 1970, national production increased by about 54 million pounds, led by an increase of 23.7 million pounds in Quebec (Table 1). Naturally, production increases of these magnitudes were accompanied by a number of problems. Producer boards claim that they were forced to increase their production and also cut their prices in order to maintain their home markets.[8] Prices in Quebec (Montreal) in 1970, for example, were the lowest in Canada -- 17.2 cents per pound, as compared to the Ontario (Toronto) price of 19.2 cents per pound and the Canadian national average price of 19.3 cents per pound, (Table 2). During 1970 inventories were also building up to what was considered to be unacceptably high levels and it proved

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[6]British Columbia, Alberta, Saskatchewan and Manitoba.

[7]K. E. Cann, Marketing Boards' 1969, Canada Department of Agriculture, Ottawa, February, 1971.

[8]cf. 1970 Annual Report, Manitoba Broiler Chicken Producers' Marketing Board, E.E. Kitchen, 'Secretary-Manager's Report.'

to be increasingly costly to hold these large inventories. Thus, during 1970 various provinces adopted import orders designed to curb the entry of broiler chickens, eggs and turkeys from other provinces.[9]

In 1971, placements were reduced by 10 to 20 percent in some provinces and more production was brought under control with the formation of the joint poultry board in Quebec and the Federation des Prodecteurs de Volailles du Quebec had about 1800 producers. Also, the passage of the National Farm Products Marketing Council Act (Bill C-176) on December 31, 1971 added a new dimension to poultry marketing in Canada.

Bill C-176 contained one very important section dealing with the allocation of regional quotas (Section 24).[10] Section 24 created a great deal of controversy and could have been detrimental if the various boards had decided to manoeuver for a larger share of the national quota, due to the five year averaging mechanism for allocation. However, there was little evidence in placements of broiler chicks or poults to June, 1972 that production had increased abnormally in the various provinces (Table 3 and 4).

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[9] See Appendix II

[10] The House of Commons of Canada, Bill C-176 "Farm Products Marketing Agencies Act," Third Session, Twenty eighth parliament, 19-20 Elizabeth II, 1970-71 as passed 30th December, 1971.

TABLE 1

Change in Production of Broiler Chicken
From 1969 to 1970 by Province

Province	Production -000 lbs.-	Percentage of total change
British Columbia	3,567	6.6
Alberta	4,276	8.0
Saskatchewan	2,394	4.4
Manitoba	1,598	3.0
Ontario	15,294	28.5
Quebec	23,737	44.3
New Brunswick	1,343	2.5
Nova Scotia	1,393	2.5
Canada	53,602	100.0

Source: Canada Department of Agriculture, Poultry Market Review Annual Report 1970, Information Canada, Ottawa.

The Need for Research and Objectives of this Study

In Canada, there has been a limited amount of quantitative research conducted that assumed a market regulation setting for poultry meats. Several studies of provincial markets have been conducted that have assumed

TABLE 2

Monthly Average Prices to Producers of Live No. 1 Broiler Chicken at Selected Markets, 1970 and 1971[a]

Month	Canadian Weighted Average Price[b] 1970	1971	Vancouver 1970	1971	Edmonton 1970	1971	Winnipeg 1970	1971	Toronto 1970	1971	Montreal 1970	1971
	(Cents per pound)											
January	18.9	18.3	20.5	21.0	20.0	19.5	19.0	19.0	18.5	20.0	17.2	16.0
February	19.8	18.3	21.0	21.0	20.5	19.9	19.0	19.0	20.0	20.0	18.0	16.0
March	20.1	18.6	21.6	21.4	20.8	20.0	19.4	19.0	20.0	20.0	18.5	16.4
April	19.9	18.9	20.9	22.0	20.5	20.1	19.2	19.0	19.8	20.0	18.5	17.0
May	19.5	19.6	20.5	22.0	20.0	20.9	18.5	19.2	19.2	20.9	18.2	17.5
June	19.4	20.1	20.5	22.0	20.0	21.0	18.5	20.0	19.0	21.2	18.0	18.4
July	19.3	20.7	20.5	22.4	20.0	21.0	18.5	19.8	19.0	21.8	18.0	19.3
August	18.9	20.8	20.5	22.6	20.0	22.0	18.5	19.9	18.4	21.8	17.4	19.4
September	18.6	20.9	20.1	22.6	19.5	22.0	18.0	20.8	18.4	21.6	16.2	19.6
October	18.7	20.6	20.5	22.5	19.5	22.0	18.0	20.8	19.0	20.8	15.5	19.8
November	18.9	20.3	21.0	22.5	19.5	22.0	19.0	20.8	19.2	20.0	15.5	19.9
December	19.2	20.4	21.0	22.5	19.5	22.0	19.0	20.8	19.9	20.0	15.6	20.0
Year	19.3	19.8	20.7	22.0	20.0	21.0	18.7	19.8	19.2	20.7	17.2	18.3

Source:

[a]Canada Department of Agriculture, Poultry Market Review, Fourth Quarter 1971, Ottawa, Information Canada, 1972.

[b]B. M. Lee, "Economic Analysis of Factors Influencing Demand and Price in the Canadian Poultry Meat Industry". Unpublished Masters Thesis, University of Manitoba, forthcoming.

perfect competition.[11] Likewise, the relative importance of the poultry industry in the total agricultural economy warrants a study to provide information on alternative means for improving and/or stabilizing producer returns within a given framework of demand. The objectives of this study are to show the effects of alternative levels of production, and distribution throughout the year and alternative price levels on producer total revenue for the five categories of poultry meats. The other objective of this study is to investigate the organizational role of the various provincial boards and the contribution of these boards to the further development of the leadership role they might play in the poultry meats industry. The study also makes use of simple economic tools of orderly marketing and supply control to indicate how returns to producers of the five categories of poultry meats may be improved or stabilized. The economic theory and its application is outlined in Chaper III following and is applied in the context of supply Management (orderly

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[11] cf. C. B. Matthews, "An Econometric Model for Ontario Turkey Prices," Unpublished Masters Thesis, The Department of Agricultural Economics, The University of Guelph, 1968, and Y. Huang, "A Spatial and Seasonal Analysis of Turkey Markets in Canada," Unpublished Masters Thesis, The Department of Agricultural Economics, The University of Guelph, 1966. Also see: R.R. Huranen, et al., Vertical Integration and Concentration in the Alberta Broiler Industry, Agricultural Economics and Rural Sociology Research Bulletin 8. The University of Alberta, August, 1970.

TABLE 3

Placement of Broiler Chicks

January 1 to June 3, 1971 and 1972[a]
Comparisons

	1971	1972	Change In Year*	Change In Total 1971	Change In Total 1972
	----000----		-------per cent ----		
British Columbia	7844	8961	+14.2	8.88	9.59
Alberta	5763	6493	+12.7	6.52	6.95
Saskatchewan	1973	2297	+16.4	2.23	2.46
Manitoba	3632	4161	+14.6	4.11	4.45
Ontario	32710	33110	+ 1.2	37.06	35.46
Quebec	30657	32405	+ 5.7	34.73	34.71
New Brunswick	22052	2207	+ 7.6	2.32	2.36
Nova Scotia	3119	3232	+ 3.6	3.53	3.46
Prince Edward Island	89	95	+ 6.7	.10	.10
Newfoundland	420	395	+ 6.0	.47	.42
Total	88258	93357	+ 5.8	100.0	100.0

Source: [a]Canada Department of Agriculture, Poultry Market Report: Weekly Report No. 23, June 16, 1972, Information Canada, Ottawa, 1972.

* Week ending June 3, 1972.

TABLE 4

Placement of Poults[a]
January 1, to June 3, 1972.
Comparisons

	Broiler Weight					Heavy Weight				
	Year To Date*		Change In Year to Date*	Change in Total		Year To Date*		Change in Year To Date*	Change in Total	
	1971	1972		1971	1972	1971	1972		1971	1972
	----000------		-----per cent--------			-----000-----		-------per cent------		
British Columbia	425	383	-10.96	9.73	9.41	557	381	-39.2	8.49	6.44
Alberta	214	234	+ 8.54	4.90	5.58	972	852	-12.3	14.82	14.42
Saskatchewan	107	79	-35.44	2.45	1.88	508	502	- 1.2	7.74	8.49
Manitoba	142	156	+ 8.97	3.25	3.72	929	907	- 2.4	14.17	15.35
Ontario	1505	1564	+ 3.87	34.48	37.32	2363	2215	- 6.3	36.04	37.49
Quebec	1826	1537	-18.80	41.84	36.68	1216	1034	-15.0	18.54	37.49
New Brunswick	26	33	+21.21	.59	.78	1	6	---	.01	.10
Nova Scotia	90	81	-10.0	2.06	1.93	8	11	+37.5	.12	.18
Total	4364	4190	- 4.15	100.0	100.0	6556	5908	- 9.9	100.0	100.0

Source: [a]Canada Department of Agriculture, Poultry Market Report: Weekly Report No. 23, June 16, 1972, Information Canada, Ottawa, 1972.

* January 1, 1972 to June 3, 1972.

marketing and supply control administered under a centralized agency) in Chaper IV following.

The scope of this study is national and deals with the market regulation of the five categories of poultry meats -- broiler chicken, roaster chicken, broiler turkey, hen turkey and tom turkey. The study deals with the supply management of the five categories based on the given monthly demand equation derived by Lee.[12] The research presented in this thesis is limited to the producer level and its basic objective is to illustrate alternative ways in which producer total revenue might be increased and/or stabilized.

Some Definitions

The following list of terms are used in the study and should be interpreted as follows:

Broiler Chicken - any class of chicken under six months of age, and under four pounds eviscerated weight, not raised for egg production.

Roaster Chicken - any class of chicken with an eviscerated weight of four pounds and over, not raised for egg production.

Broiler Turkey - any class of turkey under 10 pounds eviscerated weight, not raised for egg production.

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[12] B. M. Lee "Economic Analysis of Factors Influencing Demand and Price in the Canadian Poultry Meats Industry" Unpublished Masters Thesis, University of Manitoba, forthcoming.

Hen Turkey - any class of turkey over 10 pounds and under 16 pounds evicerated weight, not raised for egg production.

Tom Turkey - any class of turkey with evicerated weight of 16 pounds and over, not produced for egg production.

Market Conduct - the firm's or agency's policy (policies) toward the moves by rivals in the market.

Market Performance - the firm's or industry's contribution relative to its potential in promoting producer welfare.

Market Structure - the organizational characteristics of the market that may influence the nature of competition.

Producer Marketing Board - a compulsory agency sanctioned by governmental authority, controlled by elected producers to perform specific marketing operations in the interests of the producers of the regulated product concerned.

Orderly Marketing - the process of matching the monthly flow of poultry with demand specifications in the time, place, volume (quantity), and quality dimensions of a market.

Supply Control - the practice of regulating aggregate supply of a particular size of chicken or any class of turkey for the purpose of raising average monthly price above a price level which would prevail in the absence of controls.

Supply Management - the centralized control over quantity and/or price of the regulated product of specific quality from a specified group of producers to a particular market or markets in a given time period.

CHAPTER II

THE ORGANIZATIONAL AND LEGAL ASPECTS OF PRODUCER MARKETING BOARDS FOR CANADIAN POULTRY MEATS

The Nature of Producer Marketing Boards for Poultry Meats

The producer boards for poultry are compulsory agencies sanctioned by governmental authority to regulate poultry meats in the best interest of poultry producers.[1] Basically, the purpose of poultry producer marketing boards for broiler chickens and turkeys are to promote and regulate the marketing of chickens and turkeys, respectively, and to fix, from time to time, the fair or minimum acceptable price at which chickens or turkeys are purchased by processors, and to co-operate with other boards and committees set up in other provinces for the same purposes. The striking feature of countervailing power wielded by producers in the form of boards is their exemption from prosecution under the Combines Investigation Act. The antitrust exemption is intended to assist producers in attaining a stronger bargaining position in negotiating higher returns for poultry meats. Bill C-176 provides explicit exemption from anti-combines laws for those commodities which are operating within a national marketing

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[1] See Appendix III for Provincial Plans.

plan.[2] In effect the Combines Investigation Act is designed to preserve competition, whereas marketing board legislation is designed to regulate competition.[3]

Wood[4], discussed three broad approaches toward achieving satisfactory results of the basic goals stated above.

The three broad categories were as follows:

1. Reduction of costs of marketing per unit of product of individual producers;
2. Increasing (decreasing) sales prices of product through enhanced demand and manipulation of the quantity sold under existing demand conditions; and
3. Pooling receipts for specified periods and paying the producers a uniform price within the period.

The enabling legislation provided the power to enforce these three kinds of regulation in attaining the ultimate goal of increased producer returns. A producer

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[2]See Bill C-176, Section 23 Subclass 3, and R.M.A. Loyns, "A Comparison of Legislative Aspects of Agricultural Market Regulation in Canada and the U.S." Canadian Journal of Agricultural Economics, Volume 19, No. 1, July, 1971 pp 35-46.

[3]E.C. Hope, "Farmer's Marketing Schemes as a Medium of Economic Power" Canadian Journal of Agricultural Economics Volume 111, No. 1, 1955. pp 62-66.

[4]A. W. Wood, "The Economics of Producer Marketing Boards," a paper given to the Inter-District meeting of The Manitoba Farmers Union Hog Committee Meeting, October 21-25, 1963 (Mimeograph).

board might choose to combine one or more of these approaches to achieve its ultimate goal. Without limiting the generality of the above purposes the various boards have objectives to:

1. maintain a fair and stabilized price for the regulated product;
2. provide a uniformly high quality of the regulated product for the market;
3. develop and maintain the orderly marketing of the regulated product;
4. encourage a continuous supply of the regulated product for the trade;
5. gather, compile and distribute statistical information related to the production and marketing of the regulated product;
6. maintain adequate advertising and promotion of the regulated product;
7. co-operate with other boards and commissions having similar purposes, which may be established in other Canadian provinces.[5]

The general approach to improving the economic position of producers is to influence factors which affect producer prices. The categories of marketing board provisions available for this purpose have been summarized

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[5]See Appendix III, Provincial Plans Outlining Goals and Objectives of Each Board.

by Loyns[6] as:

1. regulation of the total volume of production, and its distribution among individual producers;
2. timing of product flow to market;
3. regulation of product quality;
4. negotiation of minimum producer prices;
5. physical acquisition or control of the product including handling, processing, storing, selling, and distribution;
6. pooling of receipts across producers or time periods, and establishing producer payments from such pools;
7. market development activities, including pro-product promotion and research;
8. assigning and collecting levies from the regulated product in order to finance the program; and
9. co-operation with other provinces in activities related to marketing the regulated product.

Specific references to the methods used in this study are found in Chapter III dealing with economic theory and market regulation. The organizational characteristics

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[6]R.M.A. Loyns, "National Marketing Boards: A Review of Their Problems and Potentials" Department of Agricultural Economics, The University of Manitoba, February, 1971, (Mimeograph)

of the boards are dealt with in the next section.

Organizational Characteristics of Boards

There are important changes in the functional organization of the industry due to the adoption of producer marketing boards. There is a new decision making unit dealing with the organizational and administrative aspects of an important segment of the marketing system. In the case of administration, three new functional bodies are provided for, namely:

1. The provincial marketing board;
2. The producer marketing board; and
3. The advisory committee.

The administrative organization (producer marketing board) set up to operate a market scheme can be viewed as a separate structure partly parallel to the existing marketing situation. This view of countervailing power has its focus on the collective activities made possible by the antitrust exemptions through the enabling legislation.[7] However, it is necessary to consider the new organizational functions which are added as an operating unit in the marketing system and which absorb part of the marketing margin or create additional costs to be added into the marketing margin in much the same way as other functional units in the process.

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[7]See Appendix IV for the Enabling Legislation for each poultry board, and see Richard Gosse, The Law on Competition in Canada, Toronto: Carswell Co., 1962.

The producer board[8] is made up of poultry producers, elected by producers and they form the board of directors under supervision of the provincial marketing board. The board of directors, usually employs a manager to handle the day-to-day operations of the producer marketing board. The duties of the manager depend upon how active the board is involved in regulating the market in a particular province.

The functions performed by the board are usually of a dual nature. From the administrative side there is a price negotiating function that deals with the pricing mechanism to establish producer prices. The quota aspects are another functional entity of the administration body and they relate to quota allocation, placement timing and delivery timing that are compatible with the pricing decisions. Moreover, there are other duties related to advertising programs,[9] information collection and dissemination as well as other day-to-day operations. Figure 1 shows the administrative characteristics of producer marketing boards within a province.

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[8]See Appendix I for the list of producer boards.

[9]Advertising and promotion programs are discussed at length by: Sidney Hoos, "The Advertising and Promotion of Farm Products - Some Theoretical Issues," Journal of Farm Economics, Vol. 41, No. 2, May, 1959, pp 349-363 and Marc Nerlove and Fredrick V. Waugh, "Advertising Without Supply Control: Some Implications of a Study of the Advertising of Oranges," Journal of Farm Economics, Vol. 43, No. 4, Part 1, November, 1961, pp 813-837.

Perhaps the most important change in the marketing system had to do with the organizational aspects of producer marketing boards. It could be inferred that the advocates of producer marketing boards had a dual purpose objective: they wanted to encourage self-help action among the poultry producers, and they wanted to give these producers a control mechanism that would otherwise be unavailable to them.

Little attention had been devoted to the effectiveness of producer marketing boards in developing the cohesiveness and organization which was envisioned as an objective of the various enabling legislations. Wood looked at these aspects in a recent study in the United States with respect to federal marketing orders. He concluded that organizational inertia may have been more important in justifying an order's (board's) existence than the demonstration of any financial benefits.[10] Historically, most market analysis had been concerned with an evaluation of the effectiveness of boards producing a positive change in price and income. The analytical results have been somewhat inconclusive. Bennett pointed this out quite well in his research findings for a market control program for peaches:

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[10]W. W. Wood Jr., "Federal Marketing Orders and Commodity Group Organization," unpublished Ph. D. Thesis, University of California, Berkeley, 1964.

> "... the explanation of price is subject not only to the forces which have objective values, but to the interpretation individuals put on these prices . . . . interpretations of results from examining market behavior under control must be done with an understanding that the psychological interpretations of objective conditions by enterpreneurs might well have been quite different without control."[11]

Thus, there appears to be a distinction made between controlled and uncontrolled market behavior. Prior to the introduction of producer boards the market behavior of producers followed those outlined by economic theory under the concepts of perfect competition. Now the boards can operate in an imperfect competition setting and try to develop their organizational momentum to the advantage of their registered producers.

Warner argued that a major impulse toward organization is self-expression, whether political, social, or otherwise. The other major impulse toward organization is security, particularly economic.[12] The ultimate success

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[11] John T. Bennet, "An Economic Analysis of Market-Control Programs for California Clingstone Peaches," unpublished Ph. D. Dissertation, University of California, Berkeley, 1958, p. 159. (underlined by myself for emphasis).

[12] W. L. Warner, American Life, Chicago, The University of Chicago Press, 1961, p 11.

of a group, therefore, depends upon its ability to satisfy its members' needs for self-expression and security. Thus, the producer boards' administrative body, (board of directors) helps establish an atmosphere of understanding and active participation by its members. Through this strong group action the organizational momentum might be built up to develop a more secure market position. From a secure market position the board might manoeuver for a larger return for its producers or other desirable goals.

For example, producer boards could exert a political force upon the public decision makers. Producer board influences were felt with the passage of Bill C-176. Latham would have described this victory as follows:

> "What may be called public policy is actually the equilibrium reached in the group struggle at any given moment, and it represents a balance which the contending factions or groups constantly strive to weigh in their favor . . . The legislative referees the group struggle, ratifies the victories of the successful coalition, and records the terms of the surrenders, compromises, and conquests in the form of statutes."[13]

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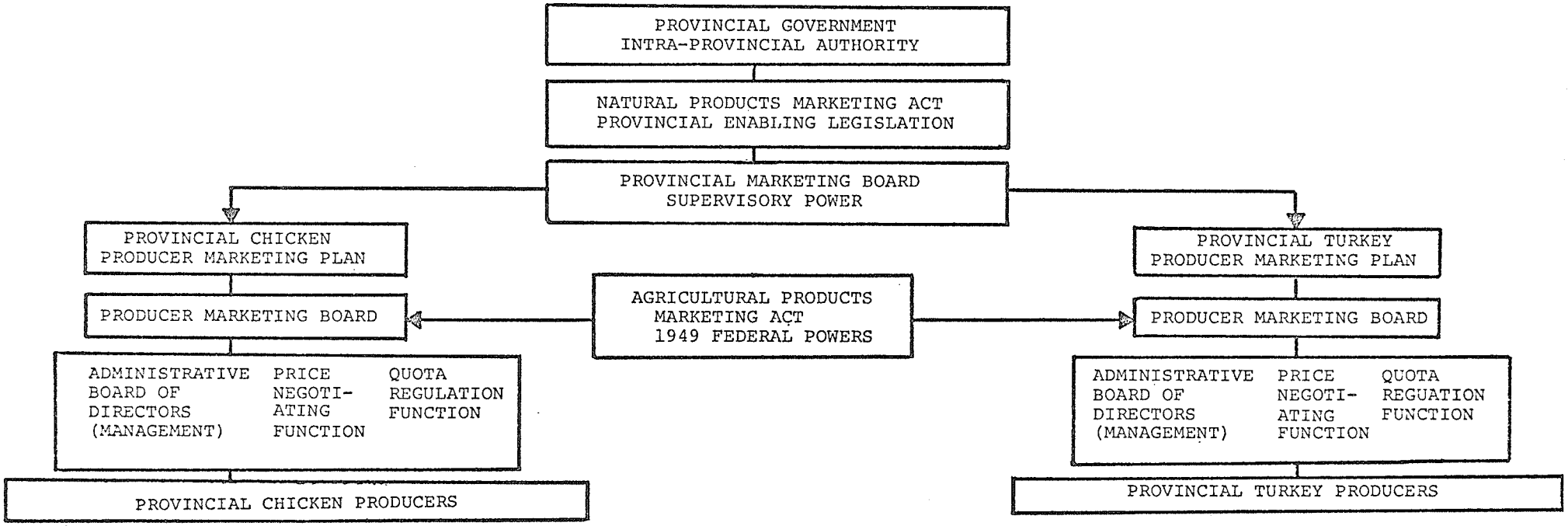
[13]Earl Latham, "The Group Basis of Politics: Notes for a Theory," in H. Eulau, S.J. Elderveld and M. Janowitz (editors), Political Behavior, New York, The Free Press of Glencoe, 1956, p. 239.

Figure 1

Administrative Characteristics of Producer Marketing Boards for Poultry Meats



Moreover, the two national organizations of poultry producers, the Canadian Broiler Council and the Canadian Turkey Federation played an important group action in the passage of Bill C-176. One of the objectives of these national organizations was to promote harmony in the industry at the national level and manoeuver for a desirable position with respect to other national agricultural industries.

The continued use of producer marketing boards as an organizational entity tends to strengthen the argument that they are a useful and needed aspect of regulated marketing for poultry meats. This continued use may conceivably be derived from several sources.

1. One explanation may be that poultry producers are satisfied that they have received price and income benefits even though such results have not been demonstrated analytically.
2. Another source of continuance may be the recognition of other benefits which may accrue from the organization provided by the producer board.
3. The producer members continue to view the use of regulatory provisions optimistically, and hope that future benefits might be realized.
4. Finally, price and income enhancement may actually have occurred, but a means of objectively demonstrating the results may not yet be

available or utilized.

The presence of a formal organizational structure augments the impression that individual producers do support this type of vehicle as a means to their economic security. Thus, the producer marketing boards are a full-fledged additional economic institution and an auxiliary link in the trade chain, although they are usually considered as lying outside the commercial channels of trade because they do not take part directly in the processes of exchange. However, it is apparent that through the functions they perform, the producer marketing boards for poultry do affect the exchange of chickens and turkeys. The decision making unit is financed internally and provides a valuable service to its members. As indicated above there are a number of significant contributions that can be made through the leadership role undertaken from the organizational side of the various producer boards or of a national agency. One of the important contributions is related to government relations. A strong producer organization could impress federal and provincial officials of the importance and worth of their commodities. The organization could stress economic issues such as income levels of producers, stability of the industry, jobs in the processing and input sectors of the industry as well as relating them to other agricultural industries and commerce in general as to the value of the output and the incomes realized by the producers.

Other contributions that a strong leadership organization could make, deal with intra-industry co-operation and a bringing together for a better understanding of each others problems and research needs. For example, there is a lack of information in some areas of the poultry industry. The Canada Department of Agriculture publishes the Poultry Market Review but gets some of its data from Statistics Canada. The various boards are in a position to supply most of the needed data and are in a position to collect extra data for research. Certain data, such as volume of interprovincial movements, were discontinued in 1965, but are vital in any allocation on a comparative advantage basis for new or additional quotas under the new National Agencies Marketing Act.[14] A board could act as a clearing house and extension service for data requirements and improve the accuracy of data collection. Likewise, a co-ordinated effort and significant contribution could be made in increasing the public acceptance of the commodities handled by board members. There is a need for the liaison role to represent the producer's views in public discussions and decision making to be played by the various boards or agencies. This role is similar to the legislative role but more encompassing.

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[14] See: Section 24, Bill C-176, op. cit.

The organizational aspects and functions of the various boards were made possible through provincial enabling legislation. The next section deals with this subject in some length as well as the various enforcement powers applicable to the various boards as set out via the provincial plans.

Legal Implications and Powers of Enforcement

Producer marketing boards in general, and including those for broiler chickens and turkeys, are legally sanctioned entities under federal and provincial enabling legislation. The division of federal-provincial jurisdiction is quite clear with respect to powers of enforcement. The British North American Act under Section 92, Class 2, gives the federal government "The regulation of trade and commerce", in inter-provincial and export matters. The federal powers under Section 91 are exclusive in nature and are limited only by express powers granted to provinces. Provincial powers stem from Section 92, Classes 13 and 16, wherein the provinces are granted jurisdiction over property and civil rights in the province, and generally over all matters of a local or private nature.[15]

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[15] A. Scarth, Q.C., "Constitutional Aspects of Provincial and Federal Approaches to Market Regulation" in Market Regulation in Canadian Agriculture, The Department of Agricultural Economics, The University of Manitoba, Occasional Series No. 3, May, 1972, pp. 32-40.

Producer marketing boards are provincial in nature and the provincial governments initiate and empower the boards[16] under the provincial enabling legislation.[17] The authority established under the various provincial Natural (Agricultural) Products Marketing Acts deals specifically with intra-provincial market regulation. Some overlap of power does occur, and the Federal Agricultural Products Marketing Act 1949 (as amended 1957), empowers the provincial marketing board to regulate inter-provincial and foreign export trade and permits tariff collection on this movement. The new national marketing board legislation will however, permit regulation of interprovincial and export shipments of broiler and turkeys by a national marketing agency.

The provincial poultry boards have stated in their respective plans[18] the objectives and purposes of the plans specific to that province. It should be emphasized that the plans cannot have more power granted than is possible under the enabling legislation. The plans are the legal basis for market regulation by the producer marketing boards in their respective provinces and are

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[16] See Appendix I for list of Boards.

[17] See Appendix IV for list of Enabling Legislation.

[18] See Appendix III for list of Provincial Plans.

enforceable only to participants in the plan in that particular province of jurisdiction. Chapter III outlines the economic theory that the various boards could use to attain the goals specified by the various plans.

CHAPTER III

THE ECONOMICS OF MARKET REGULATION

INTRODUCTION

Most market structures lie somewhere between perfect competition and monopoly. Imperfect competition in the form of government sanctioned monopolies and corporate oligopolies is characteristic of modern industrial organization. Fisher, Galbraith, and Kotler described the immense capacity developed by corporate enterprise to manipulate its business environment, especially demand, by competition control and advertising.[1] It is apparent that Canadian agriculture is also moving in that direction with the assistance of provincial and federal legislation permitting the establishment of agricultural producer marketing boards. There is evidence of an increasing shift in Canadian agriculture, including the poultry industry, from a supply oriented to demand oriented basis of policy formulation. The emphasis now is being placed on meeting market demands at

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[1] J. Fisher, The Plot to Make You Buy, New York: McGraw-Hill Book Company, 1968, J. K. Galbraith, The New Industrial State, New York: The New American Library Inc. 1967, P. Kotler, Marketing Management, Englewood Cliffs, New Jersey: Prentice Hall Inc. 1967

a reasonable profit for producers.[2]

Relationship Between Final and Derived Demand

The given demand functions that face the various producer boards are derived demand functions for the five categories of poultry meats. In final product markets, repeated testing has consistently confirmed that for a broad class of demand phenomena the quantity of a commodity Q which any consumer i will purchase depends primarily on the price of the commodity, the prices of commodities which are substitutes or complements in consumption, income, and tastes and preferences. The final demand function for an individual consumer, i, can be expressed as follows:

$$Qd_i = f(P_q, X_1, X_2, \ldots X_j)$$

where:

Qd_i = the quantity of a commodity Q demanded by an individual consumer i per unit for time;

f = the functional relationship between dependent and independent variables given constant tastes and preferences;

P_q = the price of commodity Q;

X_1 = the prices of commodities which are substitutes or complements in consumption;

X_2 = the level of individual consumer income;

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[2] P. Kotler, op. cit., p. 12.

X_j = other identifiable variables such as custom, tradition and institutional factors which may affect the price of commodity Q demanded.

Equilibrium analysis in the Q commodity market necessitates that the price of commodity Q demanded be a function of its own quantity demanded with all other variables held constant. The aggregate demand function can be represented as:

$$P_q = f(Qd_i \mid X_1, X_2, \ldots, X_j)$$

The aggregate demand for commodity, Q, the demand of all consumers participating in the commodity market at a particular price level -- is the summation of quantities demanded by all consumers. The aggregate demand function represents total quantity demanded, Qd, at various price levels, P_q, other things being equal, for n consumers. Aggregate demand curves are typically negatively sloped, meaning quantity demanded varies inversely with price, other things being equal.[3]

For poultry meats, aggregate consumer demand represents final or retail demand, Dr, for products processed from live poultry: fresh birds, frozen whole and cut up parts, and pre-cooked. The demand for poultry at the farm level, Df, as raw material input is derived from final

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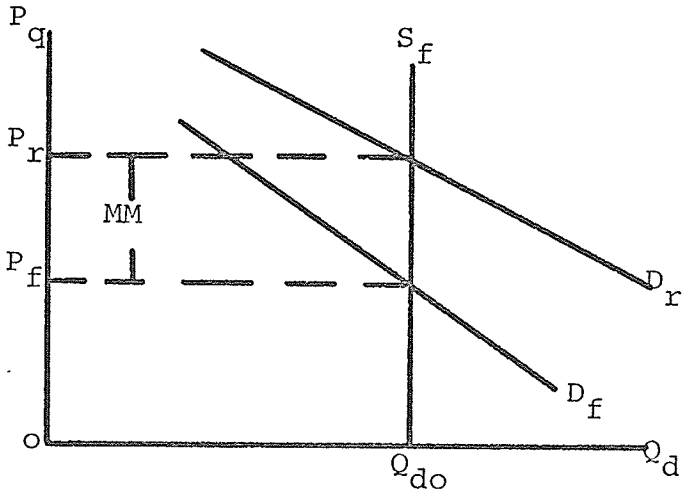
[3]C.E. Ferguson, Microeconomic Theory, Homewood Illinois: Richard D. Irwin Inc., 1966, especially chapters 1 to 5.

demand. The marketing margin, MM, is the spread between the price the consumer pays, P_r, and the price the producer receives, P_f, at any aggregate output level, Q_{do}. The marketing margin includes the costs of activities such as handling, storage, transportation, processing, wholesaling, retailing and marketing board operation; specifically, $P_f = P_r - MM$.

Marketing costs may be 'specific' -- fixed dollar value markup -- or 'ad valorum' -- fixed percentage markup. If marketing costs are all ad valorum, the price elasticity of demand at retail and farm are the same at each output level; if marketing costs are specific, demand elasticity at the farm level is less than at the retail level.[4] The typical retail-farm demand relationship for

Figure 2

The Relationship Between Final and Derived Demand



[4] G. S. Shepherd, Agricultural Price Analysis, Sixth Edition, Ames, Iowa: Iowa State University Press 1968, pp. 62-63.

poultry showing the derived demand curve to be less elastic, is illustrated in figure 2.

Under a market regulation setting, the industry demand curve for a particular poultry meat is downward sloping to the right, but the demand curve confronting an individual producer is perfectly elastic at the level of equilibrium price in the industry to a point where his marketing quota intersects the horizontal demand curve. In other words, the marketing quota system allocates derived demand among producers on a regulated basis. If total revenue could be improved or stabilized then every producer would benefit to some extent from market regulation. It is the purpose of the next section to illustrate how the techniques of orderly marketing, supply control and supply management can be used to stabilize or increase total producer revenue. It is assumed that the economic theory presented here sufficiently describes and simplifies the phenomena prevailing in the Canadian poultry industry to provide reliable information about future market regulation of the industry. Figures 3 through 6 illustrate relationships between monthly aggregate demand-supply-price interaction and commodity monthly price trends among the various categories of producer level derived demands for chicken meat and turkey meat.

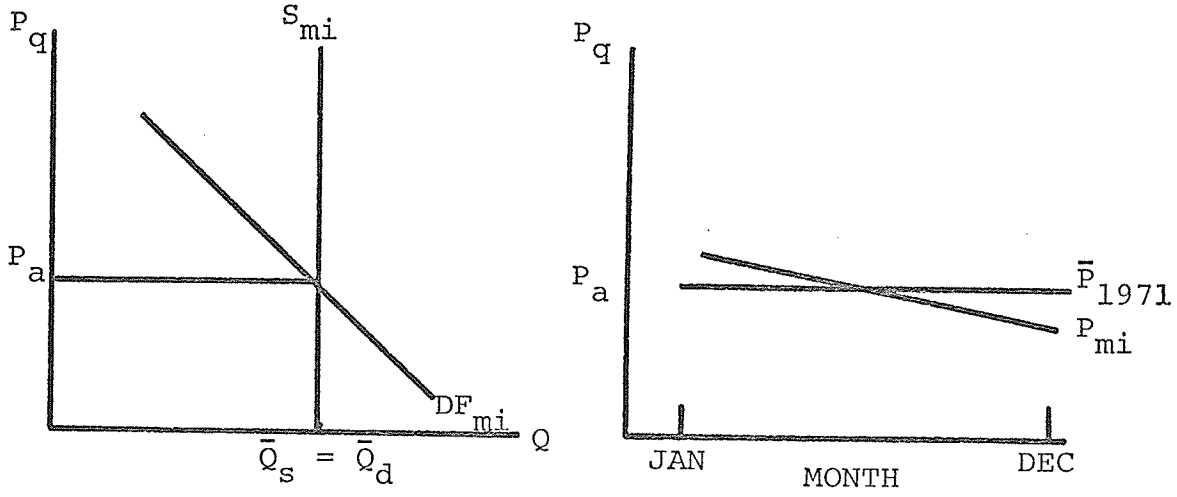
MARKET REGULATION UNDER PRODUCER BOARDS

Situation 1: Orderly Marketing

Orderly Marketing is defined in the present study as the process of matching the flow of poultry meats with monthly demand specifications.[5] Orderly marketing is assumed to be implemented by the producer marketing boards-group action via a marketing quota mechanism. The underlying supposition is that the board has better market information on which to base commodity flow decisions and the power to achieve it, than producers acting independently.

Figure 3

Price-Quantity Relationships: Orderly Marketing



[5] D. Oldenstadt and D. Call, "Group Action in Agricultural Marketing" in Agricultural Market Analysis, V. L. Sorenson (ed.), Graduate School of Business Administration, Michigan State University, 1964, pp. 190-204.

The objective of controlling the quantity in any month is to take advantage of the differences in monthly elasticities of demand for the commodity regulated.

The economic characteristics of situation 1 are portrayed in Figure 3. Monthly supply, SM_i, is regulated to conform to a monthly average, and any deviations are planned in response to deviations in derived demand, DF_i. The theoretical impact is the avoidance of a supply-demand imbalance which leads to unpredictable price movements -- and thereby the attainment of an increased average weighted price, P_i, for the year. The monthly price, PM_i, would tend to be the highest possible under market clearing activity. Excessive income transfers to middlemen via depressed prices due to excess supply would tend to be minimized and reduce the marketing margin, MM. Moreover, in any month quantity demanded equals quantity supplied ($Q_{sm} = Q_{dm}$) at price, P_a. Orderly marketing serves as a mechanism to improve producer prices, and the incomes of producers could be stabilized by developing and implementing a pooled pricing system. The organizational role of the producer boards enables this type of mechanism to be implemented easily. There are various types of pooling systems[6]; the system proposed in this study is very

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[6]S. H. Sosnick, "Optional Co-operative Pools for California Avocados", Hillgardia, Volume 35, No. 4, Sept. 1963, pp. 47-84.

simple.

Pooled pricing is the practice of accummulating the receipts of all producers in a province, or nationally, by the board and making an initial payment, P_i, upon delivery of the commodity based on some standardized unit of bird. The boards do not necessarily have to take possession of the birds but merely act as a clearing house. When the pool is closed a final payment, $P_{reg}-P_i$, could be made reflecting the surplus from the marketing operation. The Manitoba Turkey Producers' Marketing Board followed a pooling system during 1971 and achieved successful results.

Figure 4

Price-Quantity Relationships: Orderly Marketing With Pooled Pricing

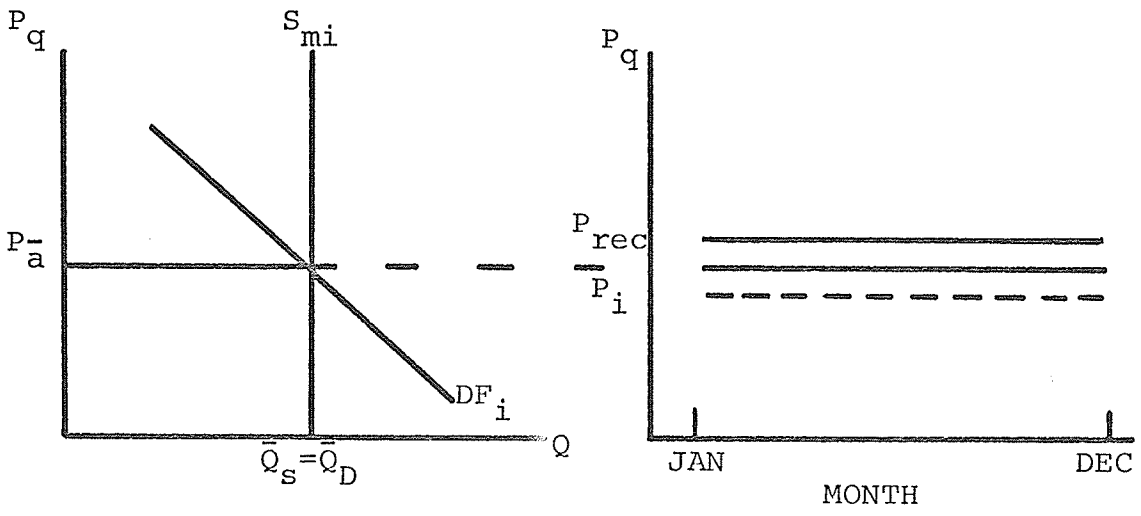

Figure 4 illustrates the economic characteristics of the pooled pricing mechanism under orderly marketing. The monthly price pattern is eliminated at the producer level. The initial price, P_i, is paid on all commodity delivered. The average price, P_{reg}, is paid for the total year and is higher than the actual price, P_a, without orderly marketing. The final payment, $P_{reg}-P_i$, is paid upon the closing of the pool to all producers on the basis of their total quantity marketed for the year. A degree of stability through pooled pricing could be introduced into the industry and returns could be paid to producers according to what they deliver, not the particular time of delivery.

Situation 2: Supply Control

Supply control is defined in this study as the practice of controlling aggregate supply of a particular poultry meat for the purpose of raising yearly price above an equilibrium level.[7] The effectiveness of supply control in raising aggregate income levels depends upon the price elasticity of demand of the commodity. If price increases and demand is inelastic, total revenue increases; if demand is elastic, total revenue decreases.

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[7] W. W. Cochrane, "Some Further Reflections on Supply Control", Journal of Farm Economics, Volume 41, No. 3, 1959, pp. 697-717.

Figure 5

Price-Quantity Relationships: Supply Control

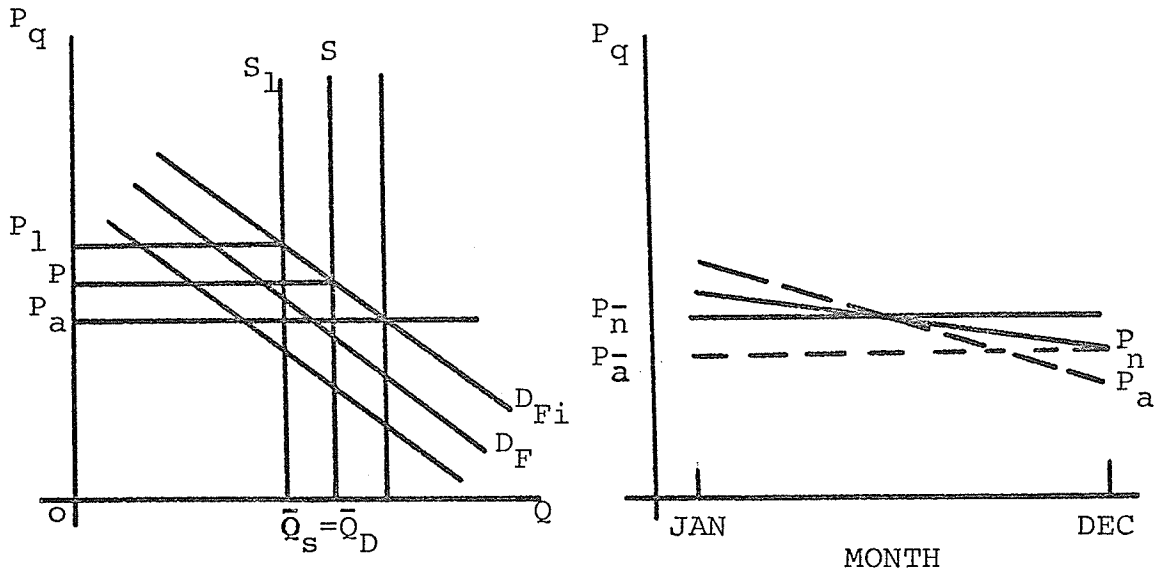


Figure 5 illustrates the concept of supply control. It is assumed that the various boards can practice supply control through their marketing quota mechanism. Under board supervision quotas can be allocated to restrict output. If output is restricted from S to S_1, then price increases from P to P_1 for the given monthly demand, DF_i. At the price of P_1, Q_s = Qd and the market is cleared. The average monthly weighted price, Pn, is raised above the actual weighted price, Pa, through output control, but the possibility of an accentuated monthly price pattern exists. Note that Pa and Pn show trends to price movements and exact prices are not plotted. The supply control mechanism

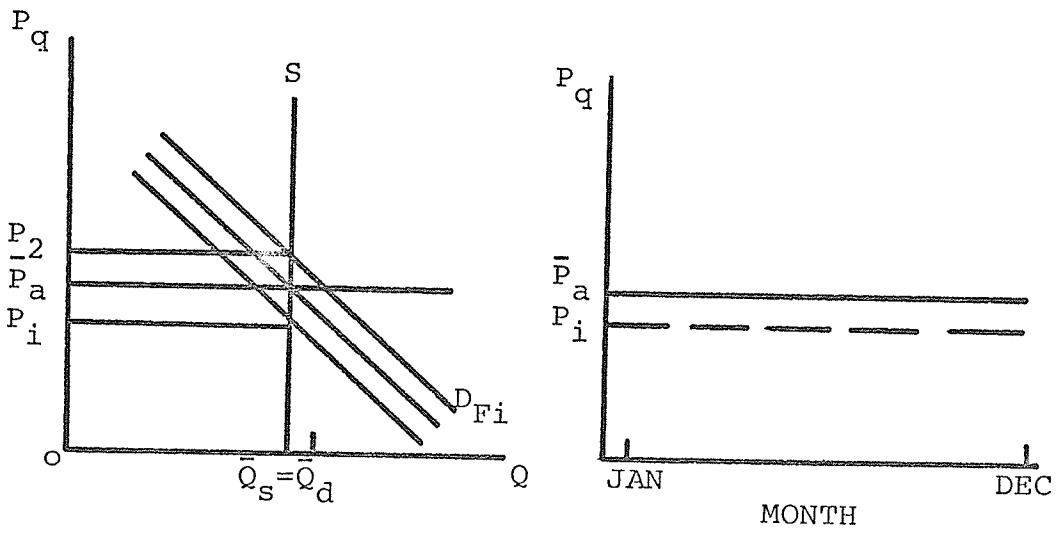
serves to increase producer prices. If stability were desired, a pooled pricing mechanism could be implemented by the boards. The pooled pricing system could be similar to that for orderly marketing, and variations in the method of pooling prices are not developed in this study.[8]

Situation 3: Supply Management

Supply management is defined as the centralized control over quantity and/or price of one or more classes of turkeys or chickens from a specified group of producers to a particular market or markets in a given period. The two primary price objectives of supply management are: 1) to minimize seasonal price fluctuations; and 2) to raise

Figure 6

Price-Quantity Relationships: Supply Management



[8]See S. H. Sosnick, op. cit. pp. 47 to 60 for alternative pooling criterias.

the level of average seasonal prices.[9]

Figure 6 represents the economic impacts of situation 3 with pooled pricing. Supply is assumed to be controlled by the tacit agreement of producer boards. The rate of flow to market is controlled by the marketing quota mechanism. If the supply is fixed at a constant level, S, then the monthly price fluctuates according to the demand specifications of, D_{Fi}. The monthly price fluctuations can be eliminated at the producer level by instituting a pooling system. The initial payment, P_i, is paid throughout the year and after the pool is closed a final payment, $P_n - P_i$, is made to each producer. Alternatively, another method of supply management could be followed. The price could be kept constant at a certain level and the quantity marketed could be allowed to fluctuate according to the monthly demand specifications of D_{Fi}. The price constant and quantity constant methods of supply management were used for broiler chickens, roaster chickens and broiler turkeys in this study. With reference to broiler chickens, Darley found this technique to be very successful as an alternative means of stabilizing the broiler markets in the United States.[10]

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[9] D. L. Macfarlane, et. al. Canadian Agriculture in the Seventies: Report of the Federal Task Force on Agriculture, Ottawa: The Queen's Printer, December, 1969, pp. 310-315

[10] R. D. Darley, "Monthly Price Estimating Models for Broilers," Unpublished Ph. D. Thesis, Purdue University, 1961.

In this study, supply management for hen turkeys and tom turkeys was regulated according to the orderly marketing and supply control concepts on a monthly basis. The quantity or price was regulated on a predetermined monthly basis to accommodate the seasonality of production of these birds. Likewise, these heavier bird types are not generally grown in sheltered buildings but ranged over the summer for fall market. Supply management implies the transmittal of projected future market information to producers in advance of placements because without such information, production adjustment tends to lag, thus creating additional inventory problems. One of the basic objectives of supply management as applied to poultry meats was to avoid large storage stocks of poultry meats. The next section summarizes the theory of inventory holding.

Implications of Inventory Holding

In most cases there is a time lag between production and consumption, and the creation of time utility in bridging this gap is called storage and is a productive activity that can be accomplished only at a cost in terms of resources employed.[11] In dealing with inventories of poultry meats there are a number of important implications

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[11] R. G. Bressler Jr. and R.A. King, Markets, Prices and Interregional Trade, New York: J. Wiley and Sons Inc. 1970, Chapter 5.

that have the effect of depressing producer prices.

As mentioned above inventories bridge the gap between production and consumption, but they also serve as a means of control over price. The processor-wholesale level in the poultry meats industry generally carries the bulk of the storage stocks. They hold these stocks for a number of reasons, and they are as follows:

1. As a buffer between unexpected increases in demand.
2. As a safety factor to insure that customer demands are met without delay.
3. For speculative purposes in order to have a degree of price setting power over the producers. If producers try to force the prices of poultry meats up the processor-wholesaler level will stop purchases and will deplete some of its inventory until producers lower their prices. Speculation with storage stocks will continue as long as the difference between future and present prices exceeds storage costs, since this will represent potential excess profits.[12]

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[12] J. F. Magee, "Guides to Inventory Policy 1; Functions and Lot Sizes: Harvard Business Review, Volume 34, No. 1, January-February, 1956, pp. 49-60. Also see: M. J. Brenan, "A Model of Seasonal Inventories", in Econometrica, Volume 27, 1956, pp. 228-244.

The decision to hold seasonal inventories is partly speculative and partly planned at the processor-wholesaler level. However, there could be risk involved and this risk might be passed along to the producers by way of depressed prices.[13] Through co-ordinated group action the various boards can counter the processor-wholesaler level inventory policies by regulating supply to market. This would entail a supply control and orderly marketing procedure as outlined in the previous sections. If the boards are successful in reducing storage stocks then they will be able to increase producer prices (equal to storage costs). Likewise, unnecessarily large inventories create income problems for producers. During 1970 increased production served to depress prices and a large portion of this increased production could only be put into inventory stocks if the price were discounted to take into consideration the added storage costs due to the purchase of added space.[14]

The task of inventory planning and scheduling of placements and production could be carried out by the group action of the various boards. The boards must balance conflicting objectives such as those of minimum acceptable prices versus costs of production, minimum investment

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[13] G. Tolley and C. Harrell "Management of Meat Inventories" Journal of Farm Economics, Volume 36, No. 2, 1955, pp. 252-269.

[14] See: Manitoba Chicken Broilers Producers' Marketing Board Presentation to the Standing Committee on Agriculture, Ottawa, March 12, 1971, also see: B.M. Lee, op.cit. Chapter IV.

expenditures to distribute or carry their own inventory and giving maximum service to customers. In this section a conceptual framework of the analytical approach that might be taken to develop an optimal inventory size is proposed. Through a co-ordinated effort of the various boards a plan for marketing over time, the volume of output, distribution of output, location of production and size of inventories could be controlled by the boards, in order to increase the prices of poultry meats and increase the market efficiency of the system. From the outset one must remember that poultry meats are perishible and have a limited storage life. The optimum inventory level should probably serve as a safety stock, and keep the marketing channel operating smoothly throughout the year.

There are costs associated with inventory stocks. Among them are costs related to rental of cold storage space and ice for chilling poultry meats. This is cash actually paid out or opportunities for profit foregone. Costs of storage are generally based on a weight and volume basis, in-and out-of storage handling, temperature and humidity control, as well as special stacking and container usage.[15] Likewise, there might be the alternative choice of capital investment in cold storage facilities owned by the boards.

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[15]See Bressler and King, op. cit.

The big question is - - are poultry meats a valuable enough product to warrant purchase of cold storage facilities by boards? The answer is probably no, if the production rate could be maintained closer to the consumption rate. However, rental of storage space has several advantages in that there is no fixed capital involved, only short-term variable costs that might be offset by increased prices later in the year.

Magee[16] and others have suggested that in order to determine the levels of inventory, the decision making body might answer the following questions.

1. Where is the cash coming from - inside (producer) financed or outside financing (government or banks)?
2. What else could be done with the funds, and what could they earn elsewhere?
3. How long will it take to recover the investment or will it be recovered at all?
4. What is the storage life of the commodity and how fast can it be replaced?
5. What percentage of return does the board want for its investment or side benefits of countervailing power over wholesaler-processor level?

An evaluation of the worth of customer service, or the loss suffered through poor service, is also an important

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[16] J. F. Magee, op. cit.

part of the problem of arriving at a reasonable inventory policy. It should be remembered that interregional movements of poultry meats are possible, if the wholesaler needs a commodity and cannot obtain it locally at a reasonable price. To some extent the boards have tried to regulate interregional movements by import orders - but these have been withdrawn.[17]

Usually businessmen buy raw materials in sizeable quantities to reduce costs connected with purchasing. Thus, they obtain a degree of control over price and also attempt to minimize handling and transportation costs by bulk shipping. A modified Stollsteimer Model[18] could be developed to determine the optimal inventory levels. Magee[19] has found this approach helpful in controlling stocks made up of low value items used regularly in sizeable quantities. The graphic solution is presented in figure 7.

The graph illustrates the conceptual framework to discover X, the optimal inventory level in storage given the inventory costs and transfer costs. However, no analysis was possible due to the lack of data on costs related to storage and other needed variables. This

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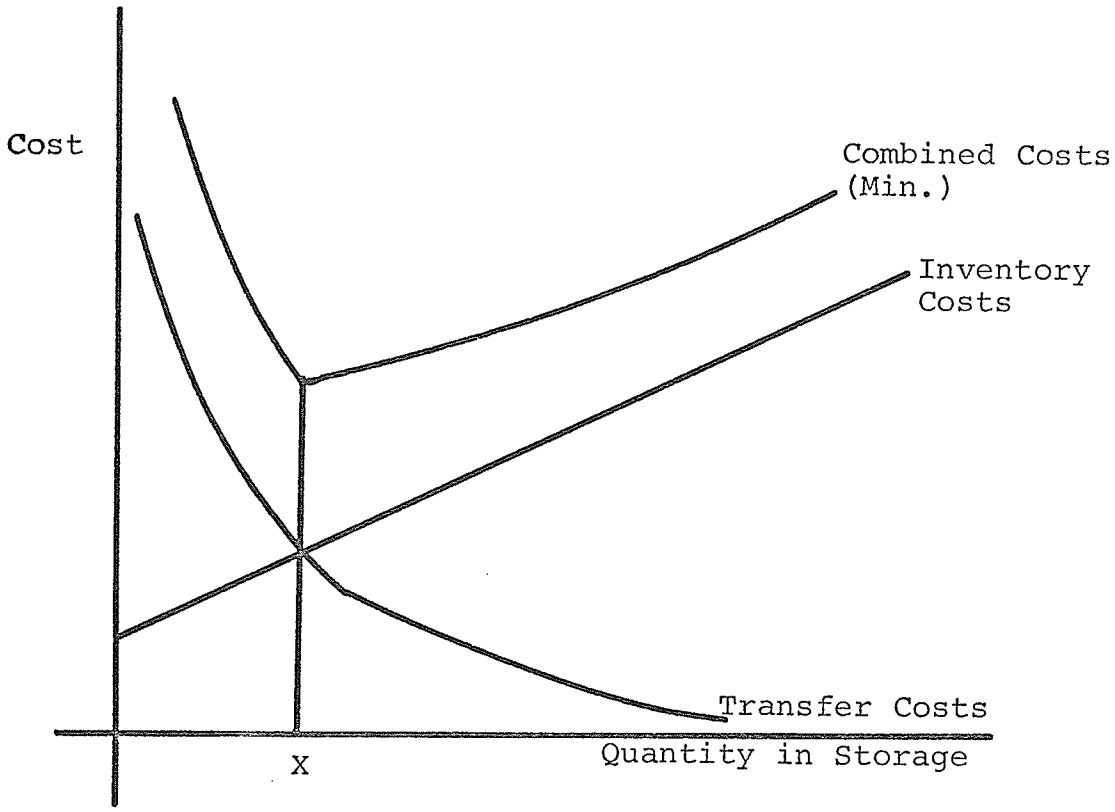
[17] See Appendix I for list of import orders during "Chicken and Egg War 1970-1971".

[18] J. F. Stollsteimer, "A Working Model for Plant Numbers and Locations" in Journal of Farm Economics, Volume 45, Number 3, August, 1963, pp. 631-645.

[19] J. F. Magee, op. cit. pp. 55-60.

Figure 7

Optimal Inventory Level Model



would be an excellent area for further research. The analysis in Chapter V indicates that organizational contributions with direct economic benefits could be possible through inventory levels being reduced, other things being equal. The inventory levels could be reduced through the co-ordinated effort of the various boards to limit increases in output wherever possible. If the boards were successful then higher producer prices could have been expected, and the additional income could have been passed along to the producers of the poultry meat.

DISTRIBUTION OF INCREASED TOTAL REVENUE

The study makes no conclusions about individual profit levels due to the lack of production cost data. However, some producers might experience profits and some might experience losses. Those that continually experience losses would eventually go out of production. The individual distribution of increased total revenue could be based on each individual producers' marketing quota for the five categories of poultry meat. In order that potential economic gains are not capitalized into the purchase of quota rights, the quotas could be controlled by the boards. As present, some boards allow quota sales and others do not. Veeman[20] recently discussed quota allocations and provided a lucid description of alternative methods of allocation.

The following chapter deals with the application of these market regulation techniques to the five poultry meats deriving results under various regulatory conditions. The demand inputs used are those derived by Lee.[21]

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[20] See: M. Veeman, "Alternative Techniques of Quota Regulation by Marketing Board Action," in Market Regulation in Canadian Agriculture, Occasional Series, No. 3, The University of Manitoba, May, 1972, pp. 60-80.

[21] B. M. Lee, op. cit., Chapter 3 and 4.

CHAPTER IV

MARKET REGULATION ANALYSIS FOR CANADIAN POULTRY MEATS

METHOD OF ANALYSIS

One of the basic objectives of this study was to provide information on alternative ways to improve and/or stabilize producer prices, and ultimately total revenue, within a given framework of demand for the five categories of poultry meats. Using the technique of supply management to regulate markets, the following method of analysis was used to regulate broiler chickens, roaster chickens and broiler turkeys. The first option that the various boards could have invoked through a co-ordinated group action could be one of volume regulation at a constant level throughout the year, and allowing the price to adjust to clear the market, other things being equal. The quantity slaughtered could have been stabilized but the price would have fluctuated within the year. However, a simple price pooling mechanism could have been introduced to stabilize producer prices. The alternative option that the boards could have chosen was to regulate the price at a constant level throughout the year allowing the quantity to adjust to clear the market, other things being equal. Theoretically there could have been twelve possible monthly levels from which to choose the base month. The month that approximated

the yearly average quantity slaughtered was chosen for illustrative purposes here.

The graphical illustrations used in this study were adopted from a study by Darley[1]; they illustrate the changing levels of demand relative to the base month. Figure 8, for example, illustrates the implications of what could be expected to happen to price (quantity) when the quantity (price) is held constant at the base month throughout the year. The vertical axis of the graph represents the fixed level of quantity at the base month and cuts the monthly demand equations to yield the market clearing prices. These prices were then converted to percentage differences from the base month to indicate the degree of fluctuation on a percentage basis. Similarly the horizontal axis represents the price level being held constant and cuts the monthly demand equation at the market clearing quantities. The quantities were converted to percentages to illustrate the degree of fluctuation of quantity marketed on a percentage basis. Figures 8 through 16 illustrates the price-quantity relationships within a given framework of demand under supply management regulation for broiler chickens, roaster chickens and broiler turkeys.

In the cases of hen turkeys and tom turkeys the supply management model was modified to allow the levels

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[1]R. D. Darley, op. cit.

of price or quantity to vary on a monthly basis within a predetermined range in order to improve and/or stabilize prices for the year. The quantity was regulated on the basis that during the first half of the year the quantity slaughtered should be reduced and during the second half it should be increased except for December which also should be reduced to curtail year end inventories. The rational of this approach was twofold. First hen and tom turkeys take a longer period to produce than broiler turkeys and production practices have to be geared around the biological production pattern for these birds. Secondly, the heavier turkeys are used for the festive celebrations of Thanksgiving and Christmas which falls in the second half of the year, and the December slaughter was reduced to help reduce year end stocks. The next section summarizes the given framework of demand for the five categories of poultry meats.

GIVEN FRAMEWORK OF DEMAND

Given the Two Stage Least Squares (TSLS) monthly demand equations for the five categories of poultry meats, for the period 1963 to 1970, estimated by Lee[2], the technique of supply management was applied to stabilize and/or increase producer total revenue. The equations are given below along with the statistical summary of the coefficients and statistical tests.

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[2] B. M. Lee, op. cit., Chapter 4.

TSLS Monthly Demand for Broiler Chicken

$$PBRF_t = \hat{b}_o + \sum_{i=1}^{11} \hat{b}_i S_{t,i} + \hat{b}_{12} PHF_t + \hat{b}_{13} PBRR_t + \hat{b}_{14} T_t + \hat{b}_{15} PHTF_t + \hat{b}_{16} INVBR_t + \hat{b}_{17} PLBR_t + \hat{b}_{18} QBRS_t \quad (1)$$

where: i = 1,2, ..., 11 represents the months February to December;

t = 1, 2, ..., 96 represents the 96 months during January 1963 to December, 1970;

$PBRF_t$ = deflated weighted price of broiler chicken to producers; (all deflations are by the monthly Consumer Price Index)

S_t = 11 dummy variable accounting for monthly price variations not resulting from variations in other explanatory variable;

PHF_t = deflated price of hogs (Index 100) to producers;

$PBRR_t$ = deflated price of broiler chicken to consumers;

T_t = time trend where 1963 = 1, ..., 1970 = 8;

$PHTF_t$ = deflated weighted price of hen turkeys to producers;

$INVBR_t$ = estimated Inventory of broiler chicken in cold storage;

$PLBR_t$ = estimated landed price of U.S. broiler chicken;

$QBRS_t$ = per capita quantity slaughtered of broiler chicken;

The TSLS estimates of the parameters did not conflict with the theoretical preconceptions in regard to sign, except the landed price variable. Most of the variables were significant at the ten percent level or better. However, the PHTF and PLBR variables were significant at the forty percent level and indicated that their statistical significance was questionable. The Durbin-Watson test was untenable due to the fact that test statistics are not derived for more than six independent variables.[3] The prediction efficiency of Equation 1 was tested using Theil's U-Coefficient. The U-Coefficient was calculated using the following formula:

$$U = \sqrt{\frac{\Sigma (P_t - A_t)^2}{n}} \Big/ \sqrt{\frac{\Sigma (A_t)^2}{n}} + \sqrt{\frac{\Sigma (P_t)^2}{n}}$$

where: P_t = predicted values

A_t = actual values

n = number of observations

If the U-Coefficient equals zero, the forecasts are perfect. When U equals unity, there is a complete lack of relationship between the predicted and actual values.[4]

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[3] See: J. M. Dowling and F.R. Glabe (eds.) Readings in Econometric Theory, Boulder Colorado: Colorado Associate University Press, 1970 pp. 89-91 and 104.

[4] For more discussion of accuracy test in forecasting see: H. Theil, Applied Economic Forecasting, Amsterdam; North-Holland Publishing Company, 1966: and H. Theil, Economic Forecasts and Policy, 2nd ed. Amsterdam: North Holland Publishing Company, 1961.

The U-Coefficient (0.013) indicated that the equation may be used to predict price changes with a reasonable degree of confidence. Table 5 presents the statistical summary of the coefficients and statistical tests for Equation 1.

TSLS Monthly Demand for Roaster Chicken

$$PRCF_t = \hat{b}_o + \sum_{i=1}^{11} \hat{b}_i S_{t,i} + \hat{b}_{12} PHF_t + \hat{b}_{13} PBRR_t + \hat{b}_{14} T_t + \hat{b}_{15} PHTF_t + \hat{b}_{16} INVRC_t + \hat{b}_{17} PLRC_t + \hat{b}_{18} QRCS_t \quad (2)$$

where: i = 1, 2, ..., 11 represents the months February to December;

t = 1, 2, ..., 96 represents the months during January 1963 to December, 1970;

$PRCF_t$ = deflated weighted price of roaster chickens to producer;

S_t = 11 dummy variables accounting for monthly price variations not resulting from variations in other explanatory variables;

PHF_t = deflated price of Index 100 hogs to producers;

$PBRR_t$ = deflated price of broiler chickens to consumer;

T_t = time trend where 1963 = 1, ..., 1970 = 8;

$PHTF_t$ = estimated deflated weighted price of hen turkeys to producer;

$INVRC_t$ = estimated inventory of roaster chickens in cold storage;

Table 5

Empirical Results of the Time-Series Analysis for Broiler Chicken Prices 1963-1970.[a]

Independent Variable	Unit	Regression Coefficient	Standard Error of Regression Coefficients	t-Values	
Constant	¢/lb	7.49197	4.72390	1.58594	**
February	¢/lb	0.22203	0.28311	0.7842	
March	¢/lb	0.86935	0.34250	2.5382	***
April	¢/lb	0.78415	0.28462	2.7551	***
May	¢/lb	1.35478	0.29569	4.5817	***
June	¢/lb	1.21450	0.30523	3.9790	***
July	¢/lb	1.80320	0.34144	5.2811	***
August	¢/lb	1.68079	0.34059	4.9349	***
September	¢/lb	1.40967	0.32136	4.3865	***
October	¢/lb	0.66463	0.28341	2.3451	***
November	¢/lb	0.99994	0.27497	3.6365	***
December	¢/lb	0.52816	0.28173	1.8747	***
PHF	$/cwt	0.06362	0.03605	1.7646	***
PBRR	¢/lb	0.39164	0.03743	10.4631	***
T	Year	0.20259	0.14612	1.3865	**
PHTF	¢/lb	-0.09120	0.10977	0.8308	*
INVBR	000 lb.	-0.00004	0.00003	1.3542	**
PLBR	¢/lb	-0.09720	0.10969	0.8862	*
QBRS	lbs.p.c.	-2.82127	0.58870	4.7924	***

Multiple R^2 = .9164
Standard Error of Estimate = 0.48718
Mean of Dependent Variable ¢/lb. = 17.27
Durbin-Watson Statistic = 1.37530+
Theil's U-Coefficient = 0.01293

* Significantly different from zero at the 40 percent probability level.
** Significantly different from zero at the 20 percent probability level.
*** Significantly different from zero at the 5 percent probability level.
\+ Inconclusive serial correlation test.

a) Source: B. M. Lee, op. cit.

Table 6

Empirical Results of The Time-Series Analysis of Roaster Chicken Prices 1963-1970.[a]

Independent Variable	Unit	Regression Coefficient	Standard Error or Regression Coefficients	t-Values
Constant	¢/lb	10.53445	4.25075	2.47 ***
February	¢/lb	0.24032	0.35032	0.68
March	¢/lb	0.37638	0.35173	1.07 *
April	¢/lb	0.38490	0.34870	1.10 *
May	¢/lb	0.56662	0.39154	1.44 **
June	¢/lb	0.20442	0.42942	0.47
July	¢/lb	0.21724	0.41919	0.51
August	¢/lb	-0.38264	0.42371	0.90
September	¢/lb	-0.30677	0.42348	0.72
October	¢/lb	-0.29797	0.37809	0.78
November	¢/lb	0.16229	0.37388	0.43
December	¢/lb	0.30180	0.37207	0.81 *
PHF	$/cwt	0.06700	0.03707	1.80 **
PBRR	¢/lb	0.37756	0.05100	7.40 ***
T	Year	-0.66851	0.13523	4.94 ***
PHTF	¢/lb	-0.20516	0.13487	1.52 **
INVRC	'000 lb	-0.000005	0.00006	0.07
PLRC	¢/lb	-0.01938	0.05106	0.37
QRCS	lbs.p.c.	-3.22510	2.52409	1.26 **

Multiple R^2 = .935
Standard Error of Estimate = 0.6737
Mean of Dependent Variable ¢/lb = 20.29
Durbin-Watson Statistic = 0.71262+
Theil's U-Coefficient = 0.01563

* Significantly different from zero at the 40 percent probability level.
** Significantly different from zero at the 20 percent probability level.
*** Significantly different from zero at the 5 percent probability level.
\+ Inconclusive Durbin-Watson test.

a) Source: B. M. Lee, op. cit.

$PLRC_t$ = estimated landed price of U.S. roaster chickens;

$QRCS_t$ = per capita quantity slaughtered of roaster chickens;

The TSLS estimates of the parameters did not conflict with the theoretical preconception in regard to sign, except the trend variable. The prediction efficiency of Equation 2 was tested and the U-Coefficient (0.016) indicated that the equation may be used to predict price changes with a reasonable degree of confidence. The monthly regression coefficients for the months of June, July, August, September, October, November and December were insignificant and were treated as being zero. The regression coefficients for the landed price and inventory of roaster chicken were not significant but were included as being economically important. Table 6 summarizes the statistical results for the given roaster chicken monthly demand equation.

TSLS Monthly Demand for Broiler Turkey

$$PBTF_t = \hat{b}_o + \sum_{i=1}^{11} \hat{b}_i S_{t,i} + \hat{b}_{12} PHF_t + \hat{b}_{13} PBRR_t + \hat{b}_{14} T_t + \hat{b}_{15} PHTF_t + \hat{b}_{16} INVBT_t + \hat{b}_{17} PLBT_t + \hat{b}_{18} QBTS_t \quad (3)$$

where: i = 1, 2, ..., 11 represents the months February to December;

t = 1, 2, ..., 96 represents the 96 months during January, 1963 to December, 1970;

$PBTF_t$ = deflated weighted price of broiler turkey to producer;

S_t = 11 dummy variables accounting for monthly price variations not resulting from variations in other explanatory variables;

PHF_t = deflated price of hogs (Index 100) to producers;

$PHTR_t$ = deflated retail price of hen turkeys;

T_t = trend variable, 1963 = 1, ..., 1970 = 8;

$PBRF_t$ = estimated deflated weighted price of broiler chicken to producers;

$INVBT_t$ = estimated inventory of broiler turkey in cold storage;

$PLBT_t$ = estimated landed price of U.S. broiler turkey;

$QBTS_t$ = per capita quantity slaughtered of broiler turkey;

The TSLS estimates of the parameters for equation 3 did not conflict with the theoretical preconceptions in regard to sign, except the landed price variable. The regression coefficients for the months of August and December were insignificant and were treated as being equal to zero. The regression coefficients for PHF and T were also insignificant but were included as being economically important. Table 7 summarizes the statistical results of Equation 3 for broiler turkeys.

Table 7

Empirical Results of the Time-Series Analysis for Broiler Turkeys 1963-70.[a]

Independent Variable	Unit	Regression Coefficient	Standard Error of Regression Coefficients	t-Values
Constant	¢/lb	9.88761	3.66626	2.6969 ***
February	¢/lb	-0.38251	0.28434	1.3452 **
March	¢/lb	-0.31700	0.33575	0.9442 *
April	¢/lb	-0.52388	0.35771	1.4646 **
May	¢/lb	-0.99374	0.41432	2.3985 ***
June	¢/lb	-0.84623	0.42513	1.9905 ***
July	¢/lb	-0.42283	0.35026	1.2072 **
August	¢/lb	-0.08112	0.29660	0.2735
September	¢/lb	0.36804	0.28870	1.2748 **
October	¢/lb	0.42482	0.33926	1.2522 **
November	¢/lb	0.86541	0.33388	2.5920 ***
December	¢/lb	0.03631	0.40943	0.0887
PHF	$/cwt	0.01038	0.02625	0.3955
PHTR	¢/lb	0.25079	0.05080	4.9362 ***
T	Year	0.12330	0.15978	0.7717
PBRF	¢/lb	0.35526	0.10905	3.2577 ***
INVBT	000 lbs	-0.00063	0.00018	3.4165 ***
PLHT	¢/lb	-0.07287	0.04549	1.6003 **
QBTS	lbs.p.c.	-4.15431	2.01293	2.0638 ***

Multiple R^2 = .948
Standard Error of Estimate = 0.557
Mean of Dependent Variable ¢/lb. = 21.08
Durbin-Watson Statistic = 1.06668+
Theil's U-Coefficient = 0.01189

* Significant at the 40% probability level;
** Significant at the 20% probability level;
*** Significant at the 5% probability level;
\+ Inconclusive serial correlation test.

a) Source: B. M. Lee, op. cit., Chapter IV.

TSLS Monthly Demand for Hen Turkey

Note: that equation is in logarithmic form.

$$PHTF_t = \hat{b}_o S_t \sum_{i=1}^{11} \hat{b}_i \; PHF_t^{\hat{b}_{12}} PHTR_t^{\hat{b}_{13}} T_t^{\hat{b}_{14}} PBRF_t^{\hat{b}_{15}} INVHT_t^{\hat{b}_{16}} PLHT_t^{\hat{b}_{17}} QHTS_t^{\hat{b}_{18}} \quad (4)$$

where: i = 1, 2, ..., 11 represents the months February to December;

t = 1, ..., 96 represents the 96 months during January 1963 to December, 1970;

$PHTF_t$ = deflated weighted price of hen turkey to producers;

S_t = 11 dummy variables accounting for monthly price variation not resulting from variations in other explanatory variables;

PHF_t = deflated price of hogs (Index 100) to producers;

$PHTR_t$ = price of hen turkey to consumers;

T_t = time trend where 1963 = 1, ..., 1970 = 8;

$PBRF_t$ = estimated deflated weighted price of broiler chicken to producers;

$INVHT_t$ = estimated inventory of hen turkey in cold storage;

$PLHT_t$ = estimated landed price of U.S. hen turkey;

$QHTS_t$ = per capita quantity slaughtered of hen turkey;

Table 8

Empirical Results of the Time-Series Analysis for Hen Turkey Prices 1963-1970.[a]

Independent Variable	Unit	Regression Coefficient	Standard Error of Regression Coefficients	t-Values
Constant	¢/lb	0.5358	0.2818	1.9011 **
February	¢/lb	-0.0116	0.0075	1.5483 **
March	¢/lb	-0.0240	0.0079	3.0372 ***
April	¢/lb	-0.0246	0.0100	2.4435 ***
May	¢/lb	-0.0162	0.0126	1.2824 **
June	¢/lb	-0.0183	0.0138	1.3232 **
July	¢/lb	0.0051	0.0153	0.3375
August	¢/lb	0.0348	0.0183	1.8989 **
September	¢/lb	0.0665	0.0209	3.1782 ***
October	¢/lb	0.0826	0.0218	3.7798 ***
November	¢/lb	0.0883	0.0227	3.8820 ***
December	¢/lb	0.0430	0.0163	2.6342 ***
PHF	$/cwt	0.0810	0.0441	1.8366 **
PHTR	¢/lb	0.4077	0.0992	4.1076 ***
T	Year	-0.0094	0.0159	0.5902
PBRF	¢/lb	0.1387	0.1044	1.3820 **
INVHT	000 lbs	-0.0999	0.0379	2.6350 ***
PLHT	¢/lb	0.1296	0.0667	1.9424 ***
QHTS	lbs.p.c.	-0.0377	0.0168	2.2358 ***

Multiple R^2 = .8971
Standard Error of Estimate = 0.0146
Mean of Dependent Variable ¢/lb = 1.34839
Durbin-Watson Statistic = 1.16837+
Theil's U-Coefficient = 0.00583

** Significantly different from zero at the 20 percent probability level.

*** Significantly different from zero at the 5 percent probability level.

\+ Inconclusive serial correlation test.

a) Source: B. M. Lee, op. cit.

The TSLS estimates of the parameters did not conflict with the theoretical preconception in regard to sign. The July monthly regression coefficient was not significant and was treated as being zero. The trend variable regression coefficient was not significant but was included as being economically important. The prediction efficiency of Equation 4 was tested using Theil's U-Coefficient (0.006) and indicated that the equation may be used to predict changes with a reasonable degree of confidence. Table 8 summarizes the statistical results for the given monthly hen turkey equation which is in logarithmic form.

TSLS Monthly Demand for Tom Turkey

Note: that the equation is in logarithmic form.

$$PTTF_t = \hat{b}_o S_t \sum_{i=1}^{11} \hat{b}_i \; \hat{b}_{12} PHF_t \; \hat{b}_{13} PHTR_t \; \hat{b}_{14} T_t \; \hat{b}_{15} PBRF_t \; \hat{b}_{16} INVTT_t \; \hat{b}_{17} PLTT_t \; \hat{b}_{18} QTTS_t \qquad (5)$$

where: i = 1, 2, ..., 11 represents the months February to December;

t = 1, ..., 96 represents the 96 months during January to December, 1970;

$PTTF_t$ = deflated weighted price of tom turkey to producer;

S_t = dummy variables accounting for monthly price variation not resulting from variations in other explanatory variables;

PHF_t = deflated price of hogs (Index 100) to producers;

$PHTR_t$ = deflated price of hen turkey to consumers;

T_t = time trend 1963 = 1, ..., 1970 = 8;

$PBRF_t$ = estimated deflated weighted price of broiler chicken to producers;

$INVTT_t$ = estimated inventory of tom turkey in cold storage;

$PLTT_t$ = estimated landed price of U.S. tom turkeys;

$QTTS_t$ = per capita quantity slaughtered of tom turkeys;

The TSLS estimates of the parameters did not conflict with the theoretical preconceptions in regard to sign, except the PHF and PLTT variables. Most of the regression coefficients were acceptable at the twenty percent level or better. However, the regression coefficients for August and December were not significantly different from zero and were treated as being equal to zero. The prediction efficiency of Equation 5 was tested using Theil's U-Coefficient (0.0008) and indicated that the log equation may be used to predict price changes with a reasonable degree of confidence (Table 9).

Implications of Demand and Total Revenue for Market Regulation

Basic economic theory indicates that short run total revenue is maximized when the marginal revenue equals zero and that demand is unit elastic. If the demand is unit elastic the price flexibility is equal to one. If the price flexibility coefficient is greater than one, demand is

Table 9

Empirical Results of the Time-Series Analysis for Tom Turkey Prices[a] 1963-1970

Independent Variable	Unit	Regression Coefficient	Standard Error of Regression Coefficient	t-Values
Constant	¢/lb	-0.5104	0.3582	1.4248 **
February	¢/lb	-0.0175	0.0116	1.5061 **
March	¢/lb	-0.0390	0.0131	2.9821 ***
April	¢/lb	-0.0435	0.0129	3.3606 ***
May	¢/lb	-0.0388	0.0126	3.0742 ***
June	¢/lb	-0.0257	0.0134	1.9220 ***
July	¢/lb	-0.0214	0.0144	1.4802 **
August	¢/lb	-0.0121	0.0148	0.8157
September	¢/lb	0.0331	0.0157	2.0995 ***
October	¢/lb	0.0587	0.0177	3.3079 ***
November	¢/lb	0.0495	0.0188	2.6217 ***
December	¢/lb	0.0089	0.0136	0.6520
PHF	$/cwt	-0.1548	0.0562	2.7522 ***
PHTR	¢/lb	0.8091	0.1363	5.9341 ***
T	Year	0.1112	0.0210	5.2904 ***
PBRF	¢/lb	0.4404	0.1694	2.5990 ***
INVTT	'000 lbs	-0.1029	0.0210	4.8992 ***
PLTT	¢/lb	0.3431	0.0912	3.7603 ***
QTTS	lbs.p.c.	-0.0468	0.0153	3.0539 ***

Multiple R^2 = .8640 **
Standard Error of Estimate = 0.0199
Mean Dependent Variable ¢/lb = 1.33378
Durbin-Watson Statistics = 1.17377+
Theil's U-Coefficient = 0.00788

** Significantly different from zero at the 20 percent probability level.

*** Significantly different from zero at the 5 percent probability level.

\+ Inconclusive serial correlation test.

a) Source: B. M. Lee, op. cit.

inelastic, and if less than one demand is elastic. In other words, if the price flexibility is less than one, total revenue can be increased by increasing output and reducing the price. However, when the market is imperfect, economic theory implies that producers operate where marginal revenue equals marginal cost in order to maximize profits rather than total revenue.[5]

Under market regulation, the basic objective of producer marketing boards is to stabilize and/or increase price. Since the producer boards regulate the quantity marketed in order to improve the price and revenue position, one could assume that maximum total revenue is unattainable but that increased total revenue might be possible. This would imply that we are operating in the elastic portion of the demand curve. In the case of poultry meats Lee obtained the following price flexibility results (Table 10).

The low magnitude of the price flexibility coefficients indicated that the quantity marketed if unregulated would have been highly responsive to a one percent change in price. Or, in other words, a one percent change in quantity of broiler chickens slaughtered would have been associated with an 0.26 percent opposite change in

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[5] R. H. Leftwich, The Price System and Resource Allocation, (Third Edition), New York: Holt, Rinehart and Winston, 1966, Chapters 3, 9, 10, 11 and 12. Also see: R.J. Foote, Analytical Tools for Studying Demand and Price Structures, U.S. D.A. Handbook 146, 1958, pp. 103-109.

broiler chicken prices. Similarly, a one percent change in quantity of roaster chickens slaughtered would have been associated with a 0.03 percent opposite change in roaster chicken prices. In the cases of broiler turkeys, hen turkeys, and tom turkeys, a one percent change in the quantity slaughtered would have been associated with a 0.04, 0.03 and 0.04 percent opposite change in price, respectively.

Table 10

Price Flexibility Coefficients for Poultry Meats 1963-1970 Estimates[a]

Commodity	Price Flexibility Coefficient	Elastic Demand
Broiler Chicken	-0.267	Yes
Roaster Chicken	-0.033	Yes
Broiler Turkey	-0.047	Yes
Hen Turkey	-0.037	Yes
Tom Turkey	-0.046	Yes

a) Source: B. M. Lee, op. cit.

It should be pointed out that the price flexibility coefficients were quite small due to the fact that the demand equations estimated by Lee did not account for the influence of marketing boards in the period of analysis. The emphasis of the analysis was on monthly demand specification using dummy variable analysis for the months rather than the influence of marketing board policy. This resulted in the estimated regression coefficient for the quantity slaughtered

being biased downward. Since the regression coefficient was biased downward the price flexibility was also biased downward since the price flexibility (λ) equals the slope (b) times the average monthly quantity ($\bar{q}$) divided by average monthly price ($\bar{P}$). If the boards had been operating to stabilize and/or increase price, our estimating model should have included another variable to account for the marketing board influence, ie.,

$$P_t^* = f(q_t, X_1, \ldots X_j, MB)$$

Since Lee did not account for the marketing board influence on price stabilization, then:

$$P_t = f(q_t, X_1, \ldots X_j)$$

was estimated as $P_t = a_o + b_1 q_t$ instead of $P_t^* = a_o^* + b_2 q_t$. If the boards had been successful in stabilizing price, by definition $b_2 > b_1$. Therefore:

$$\lambda_1 = b_1 \frac{\bar{q}}{\bar{p}}$$

and $$\lambda_2 = b_2 \frac{\bar{q}}{\bar{p}^*}$$

then: $\lambda_2 > \lambda_1$ since $\bar{p}^* = \bar{p}$

On the other hand, the low price flexibility coefficients could have been an indication of the degree of instability that would have prevailed in the industry without market regulation.

SUPPLY MANAGEMENT OF POULTRY MEATS

Case 1: Broiler Chicken

In 1971, the actual national weighted average price of broiler chickens to producers deflated by the Consumer Price Index was 14.87 (19.85) cents per pound basis live number one birds.[6] The price fluctuated between 14.01 (18.72) and 15.51 (20.74) cents per pound to yield a total revenue of 79.2 (105.7) million dollars. The per capita monthly demand fluctuated between 1.82 and 2.17 pounds per capita and the total per capita demand for the year was 24.53 pounds per capita.

Using the supply management technique in order to stabilize and/or increase total revenue, the boards could have used at least the following options. The boards could have fixed the monthly deflated weighted price at a pre-determined level and allowed the quantity to adjust to the monthly demand specifications of Equation 1, in order to clear the market. Alternatively, slaughter could have been fixed at a pre-determined per capita monthly level and allowed the weighted average price to adjust to clear the market.

If the quantity slaughtered had been held constant at the June level of 2.04 pounds per capita throughout the 12 months, other things being equal, the monthly prices

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[6] In all succeeding discussions involving deflated prices the current values for prices and total revenue are shown in parenthesis. They can be calculated using Appendix V.

would have been adjusted to the appropriate monthly levels according to the demand specifications of Equation 1 and giving the results in Table 11. When the fixed quantity was greater than the actual quantity demanded the price declined according to the demand specifications. Likewise, when the fixed quantity was less than the actual quantity demanded the price increased. The price fluctuated between 13.54 (18.01) and 16.96 (22.56) cents per pound when the quantity slaughtered was fixed at 2.04 pounds per capita per month. The estimated total revenue when quantity slaughtered was held constant was 81.5 (108.9) million dollars. The total per capita demand associated with this strategy was 24.50 pounds and indicated that demand would have been decreased for the year.

If the price had been held constant at the June level of 15.15 (20.25) cents per pound throughout the year, other things being equal, then the monthly quantities slaughtered would have been expected to adjust to the appropriate monthly levels specified by Equation 1. When the fixed price was greater than the actual price, the quantity demanded decreased according to the demand specifications. Likewise, when the fixed price was less than the actual price, the quantity slaughtered increased. The quantity slaughtered fluctuated between 1.47 and 2.68 pounds per capita when the price per pound was fixed at 15.15 cents per pound per month, and the estimated total revenue was 83.1 (111.1) million dollars. The total per capita slaughter

associated with the June price constant strategy was 24.50 pounds and indicated that when the price increases the quantity demanded declined for the year. Figure 8 illustrates the price-quantity relationships for 1971.

Figure 8

Supply Management Price-Quantity Relationships For Broiler Chicken 1971

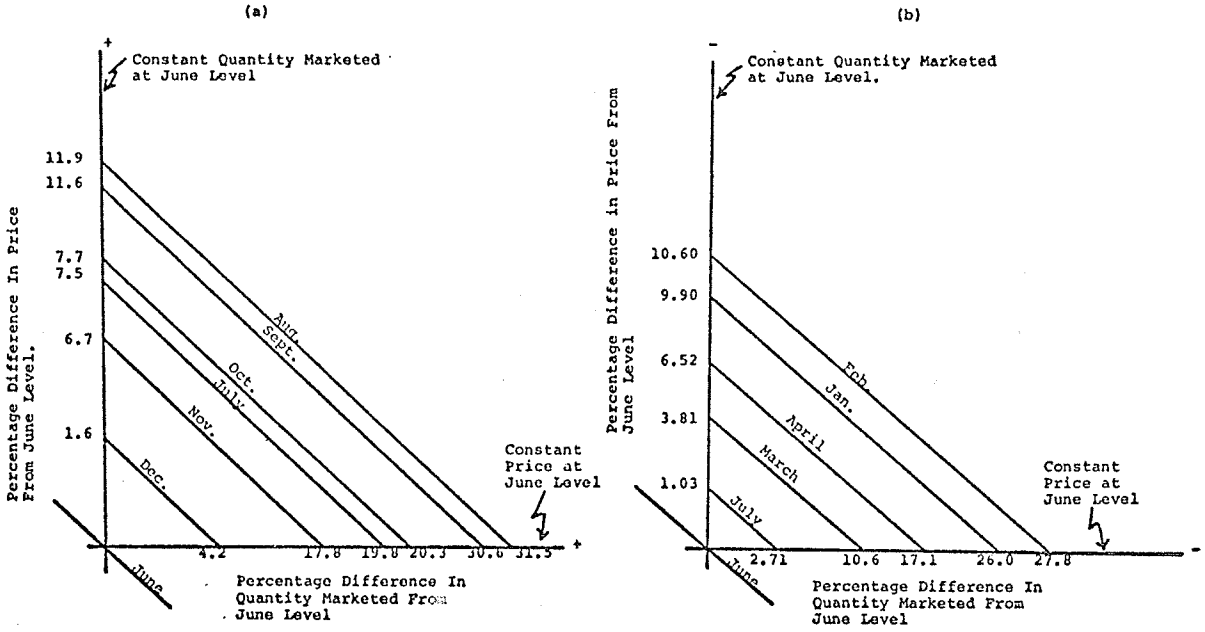

Figure 8(a) shows that in August, for example, an estimated 31.53 percent more broiler chicken could have been marketed than in June at the June price of 15.15 cents per pound. Or if the quantity marketed in August had remained constant at the June level of 2.04 pounds per capita, price could have been an estimated 11.98 percent higher. Similarly, for example, if prices had been stabilized (note the horizontal line in Figure 8 (a) and 8(b), an estimated 19.8 percent more broilers could have been marketed in July, than in June. If the objective of the boards had been to stabilize the amount of broilers (note the vertical line in figure 8(a) and 8(b), broiler prices would have averaged

Table 11

Supply Management Results for Broiler Chicken 1971[a]

	Actual Price	Estimated Price	Actual Quantity	Estimated Quantity[c]	Actual Total Revenue	Estimated Total Revenue[b]	Estimated Total Revenue[c]
	¢/lb.		p.c.		$000		
January	14.15	13.65	1.9755	1.5101	5983	5966	4897
February	14.01	13.54	1.8251	1.4725	5487	5934	4787
March	14.19	14.57	2.1587	1.8369	6590	6401	5987
April	14.34	14.16	2.0115	1.6913	6222	6237	5527
May	14.76	14.90	2.0227	1.9552	6456	6581	6405
June	15.15	14.99	2.0419	1.9865	6706	6637	6524
July	15.45	16.29	2.1749	2.4468	7303	7230	8057
August	15.42	16.96	2.1586	2.6856	7253	7549	8866
September	15.51	16.91	2.0320	2.6669	6885	7544	8826
October	15.30	16.32	2.0566	2.4576	6891	7299	8154
November	15.03	16.18	2.1338	2.4070	7009	7254	8007
December	14.96	15.29	1.9502	2.1278	6421	6918	7095
Year	14.87	15.33	24.5314	24.5028	79211	81556	83137

[a]Deflated values, 1961 = 100

[b]With quantity held constant at June level of 2.04 lb./capita.

[c]With price held constant at June level of 15.15 ¢/lb.

about 7.5 percent higher in July. Likewise, in December, 4.2 percent more broilers could have been marketed at the stabilized June price level or the price would have increased 1.6 percent had the quantity been stabilized at the June level.

Figure 8(b) shows that in the months of February, January, April, March, and July the percentage change in price from the June level decreased (when the quantity marketed was stabilized) by 27.88, 26.04, 17.17, 10.63, and 2.71 percent respectively. Alternatively, when the price was stabilized at the June level the quantities marketed decreased by 10.60, 9.90, 6.52, 3.81 and 1.03 percent respectively.

The total revenue increased by about 4.9 percent when the price level was stabilized at the June level of 15.15 cents per pound. Alternative stabilization by quantity being held constant at the June level of 2.04 pounds per capita resulted in a 2.8 percent increase in total revenue for broiler chickens. It would appear that price stabilization would yield more total revenue and could also have an effect on reducing inventory stocks if the price were stabilized at a higher level. The inventory implications are summarized in Chapter five following.

Forecasting Method for 1972 Situations

One way of evaluating the theory and method of estimation in the broiler chicken econometric model is to compare forecasts outside the sample period, from which the structural parameters have been estimated with subsequently observed values of the same variables. The closeness with which the predicted values approximate the actual values give a general indication only of whether the model is acceptable or unacceptable in predicting these values. Forecasting the predictand requires having the values of all the variables on the right hand of the equation. The values of the endogenous variables in the system will be influenced by the value of the predictand and thus cannot be known before the forecast is made. They must also be forecast at the same time. A solution for this problem is to obtain the estimated structural equations and then solve the resulting equations to obtain each endogenous variable as a function of exogenous variables only. In other words, this implies the use of the reduced form of the structural equations to forecast the values of the jointly dependent variable.[7] The U-Coefficients for the structural equations used in forecasting indicate that an acceptable degree of confidence can be placed on the forecasted values. Appendix VI summarizes U-Coefficients of

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[7]See H. Theil, op. cit.

the structural coefficients of the endogenous variables used in forecasting the TSLS variables, and Appendix 7 gives the forecasted values.

Forecasting the 1972 situation for broiler chickens was carried out using the above mentioned forecasting technique. The Canadian average deflated price was forecasted to be 15.29 (20.90) cents per pound with the monthly prices fluctuating between 14.57 (19.93) and 15.75 (21.54) cents per pound. Per capita slaughter was forecasted to be 24.4 pounds and the monthly per capita quantity slaughtered fluctuated between 1.84 and 2.17 pounds per capita. The total revenue was forecasted to be 85.4 (116.9) million dollars (Table 12).

When applying the technique outlined above for supply management, the quantity slaughtered was held constant at the November level of 2.08 pounds per capita,[8] the price fluctuated between 14.34 (19.82) and 15.86 (21.92) cents per pound. The quantity demanded for 1972 increased from 24.44 to 25.02 and the estimated total revenue was 88.5 (121.1) million dollars, an increase of 3.6 percent. Whenever the fixed quantity slaughtered of 2.08 pounds per capita was greater than the forecasted quantity slaughtered, a decrease in price was noted. Likewise, whenever the

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[8]The month of November was chosen because it approximated the average for the year.

fixed quantity slaughtered of 2.08 pounds per capita was less than the forecasted quantity demanded, an increase in price occured.

Alternatively, when the price was held constant at the November level of 15.04 (20.58) cents per pound, the per capita quantity demanded ranged from 1.83 to 2.44 pounds per capita and the total quantity demanded was 25.7 pounds per capita. The estimated total revenue was 87.0 (119.1) million dollars, an increase of 1.8 percent.

Alternatively with the current monetary problem between Canada and the United States, the wholesalers and/or retailers might import broiler chicken from the United States. At present, the Canadian dollar is at a premium to the U.S. meaning that the landed price of broilers is lower, causing a downward pressure of Canadian broiler prices in order to keep out imports. At the present time, it would appear that Canadian and U.S. prices are competitive and for 1972 we might expect the forecast weighted price of 15.29 cents per pound.[9] Likewise, with a restricted output any upward shift in the quantity demanded might have to be met from inventory or imports from the United States. The wholesaler-retailer level would deplete some of their inventory until it reached the safety level and

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[9]See Appendix VII

Table 12

Supply Management Results for Broiler Chickens
1972 Forecasted[a]

	(Forecasted) Price	Estimated Price[b]	(Forecasted) Quantity	Estimated Quantity[c]	(Forecasted) Total Revenue	Estimated Total Revenue[b]	Estimated Total Revenue[c]
	¢/lb		lbs. p.c.		$000		
January	14.57	14.34	2.0050	1.8375	6471	6626	6123
February	15.21	14.53	1.8460	1.9056	6257	6755	6388
March	14.90	15.15	2.1761	2.1246	7267	7084	7164
April	15.22	15.12	2.0208	2.1132	6935	7111	7168
May	15.75	15.66	2.0253	2.3048	7234	7409	7864
June	15.54	15.49	2.0378	2.2447	7226	7372	7704
July	15.75	16.05	2.1634	2.4427	7818	7682	8433
August	15.66	15.86	2.1402	2.3740	7736	7633	8243
September	15.73	15.64	2.0082	2.2967	7334	7572	8021
October	14.91	14.82	2.0260	2.0075	7051	7218	7051
November	15.04	15.13	2.0855	2.1157	7367	7409	7473
December	15.04	14.62	1.9090	1.9365	6780	7202	6879
Year	15.29	15.21	24.4438	25.7036	85481	87077	88517

[a] deflated Values, 1961 = 100

[b] with quantity held constant at November level of 2.08 lbs./capita.

[c] with price held constant at November level of 15.04 ¢/lb.

then start importing from the United States.[10] The level of inventory was down from the 1971 levels due to the restrictive policy of the various boards and the fact that domestic disappearance is up by 4 percent.[11] Figure 9 illustrates the forecasted price quantity relationship for 1972.

Figure 9(a) shows that in July, for example, an estimated 17.12 percent more broiler chicken could have been marketed in November at the November price of 15.04 cents per pound. Or, if the quantity marketed in July had remained constant at the November level of 2.08 pounds per capita the price would have been 6.69 percent higher. Likewise, if the prices had been stabilized for the month of June at the November level 7.6 percent more broilers could have been marketed in June. Alternatively, if quantity stabilization had been implemented the price could have been estimated 2.9 percent higher than in November.

Figure 9(b) shows that for the months of January, February, October and December a decrease in the price could have been expected of 11.89, 8.62, 3.74 and 7.15 respectively, if the quantity marketed had been stabilized at the November level. Or, if the price had been stabilized at the November level the quantity marketed could have

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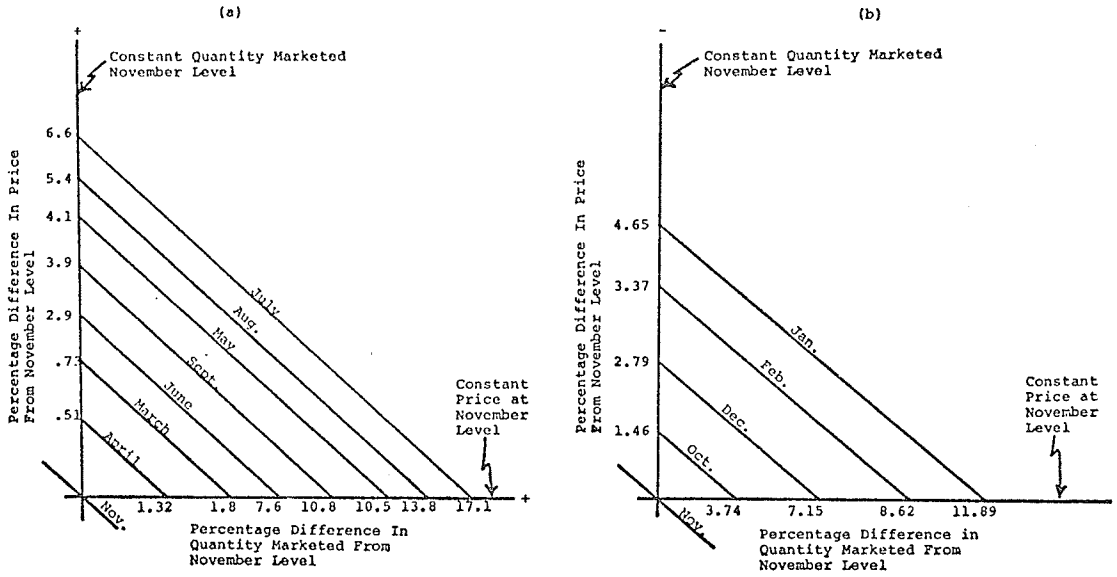
[10] Canada Department of Agriculture, Poultry Market Report: Weekly Report No. 29, July 28, 1972, Ottawa, Information Canada, 1972.

[11] Ibid

been expected to decrease by 4.65, 3.37, 1.46 and 2.79 percent respectively from the November level.

Figure 9

Supply Management Price-Quantity Relationships For Broiler Chicken 1972 Forecasts



Stabilization by Price Pooling

If price and quantity stabilization had been a major goal of the various producer boards, it could have been accomplished through the combined use of the price pooling mechanism and the constant volume strategy. The pooled pricing system could have eliminated price fluctuations on payments to producers because each producer could have been paid the same price for an equal quality product within a region[12] and the volume strategy would

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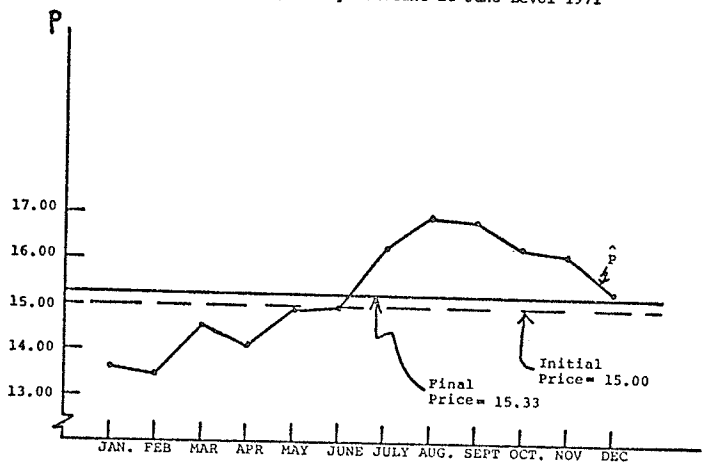
[12] R.M.A. Loyns, "Discriminatory Pricing and Quota Regulation Under Marketing Boards," The University of Manitoba, Department of Agricultural Economics (Mimeograph), 1971, p. 4.

have stabilized the quantity marketed.

For example, in 1971 the weighted deflated price of broiler chickens was 15.33 cents per pound and fluctuated from a February low of 13.54 to an August high of 16.96 when the quantity was held constant at the June level. If the price paid to producers had been pooled the stability of price and quantity would have been possible. Figure 10 illustrates the situation of price pooled and not pooled when the quantity is stabilized at the June level.

Figure 10

Pooled Pricing Under Supply Management
With Quantity Constant at June Level 1971



The initial price of 15.00 cents per pound could have been paid to all producers upon delivery of broiler chickens for slaughter, and when the pool closed at the end of the year the final payment of 0.33 cents per pound could have been paid to all producers. A problem of regional price differentials would have to be overcome due to

the fact that our data was on the national level. The pooling option was included to show that price and quantity could have been stabilized together but no attempt has been made to analyze a pooling system on the provincial basis in this study.

Case 2: Roaster Chicken

In 1971, the actual deflated weighted price of roaster chicken to producers was 15.57 (20.80) cents per pound and the per capita quantity slaughtered was 2.5 pounds. The total revenue to producers was 8.4 (11.2) million dollars. The effect of alternative supply management policies were applied as outlined and the following results were obtained.

By allowing the monthly quantity slaughtered to flow to market at a fixed rate of 0.215 pounds per capita the total revenue increased from 8.44 (11.2) to 9.05 (12.1) million dollars. The price fluctuated between 15.32 (20.33) and 16.94 (22.48) cents per pound during the year and the yearly weighted price was estimated to be 16.09 (21.48) cents per pound. Alternatively, if the price had been held constant, other things being equal, the quantity demanded fluctuated between -0.03 and 0.47 pounds per capita and generated an estimated total revenue of 8.9 (11.7) million dollars, (Table 13). It should be noted that for January, February and April the quantity demanded at the stabilized price of 16.12 cents per pound was negative, indicating that there was no demand due to the price being too high for

Table 13

Supply Management Results for Roaster Chicken 1971

	Actual Price[a]	Estimated Price[b]	Actual Quantity	Estimated Quantity[c]	Actual Total Revenue	Estimated Total Revenue	Estimated Total Revenue[d]
	¢/lb		lbs.p.c.		$000		
January	13.69	15.32	0.2207	(-0.0320)[d]	646	707	0
February	13.86	15.32	0.2319	(-0.0287)[d]	689	710	0
March	14.11	15.69	0.2247	0.0842	682	728	292
April	14.29	15.41	0.1871	(-0.0023)[d]	577	717	0
May	16.12	15.94	0.2158	0.1603	752	744	558
June	16.23	15.63	0.1668	0.0665	587	731	232
July	16.67	16.27	0.1770	0.2631	641	763	921
August	16.64	16.44	0.1679	0.3166	608	773	1112
September	16.63	16.88	0.2228	0.4522	809	796	1592
October	16.67	16.94	0.2010	0.4722	734	801	1667
November	16.20	16.66	0.2343	0.4859	833	789	1365
December	16.20	16.50	0.2485	0.3361	896	784	1192
Year	15.57	16.09	2.4991	2.6371[d]	8449	9049	8931[d]

[a]Deflated values, 1961 = 100

[b]With quantity held constant at May level of 0.21 lbs./capita.

[c]With price held constant at May level of 16.12 ¢/lb.

[d]Negative values were treated as being zero.

those months.[13] Figure 11(a) and (b) illustrate the results for the price-quantity relationships.

Figure 11

Supply Management Price-Quantity Relationships For Roaster Chicken 1971

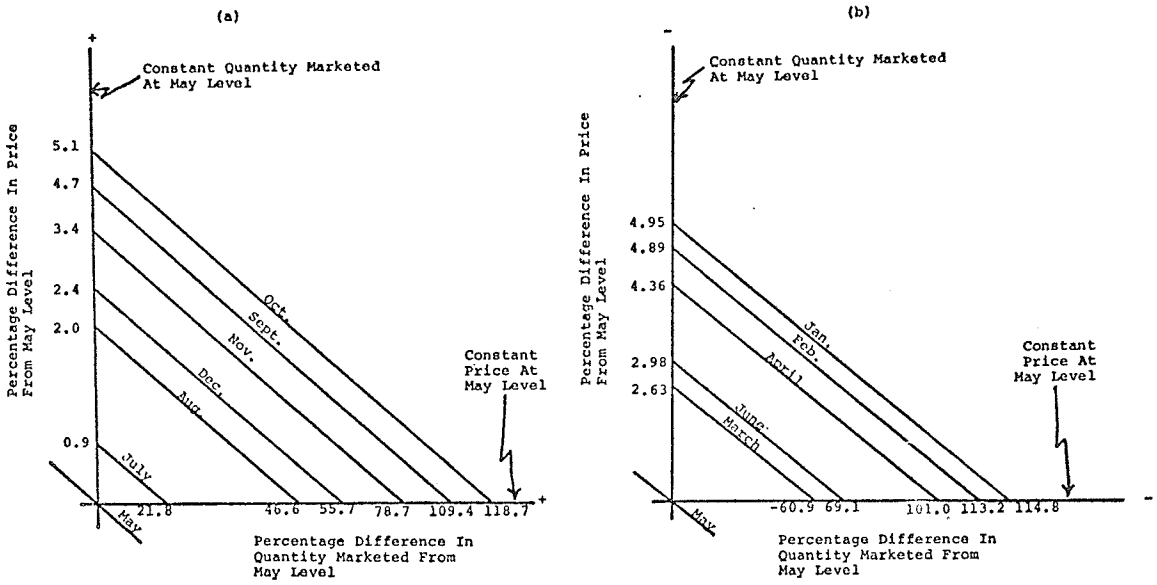


Figure 11(a) shows that in October, for example, an estimated 118.75 percent more roaster chickens could have been marketed than in June at the stabilized price of 16.12 cents per pound. Or, if the quantity marketed in October had remained stable at the June level, the price could have been an estimated 5.12 percent higher. Alternatively, Figure 11(b) shows that in March, for example, a decrease of 60.9 percent in quantity marketed could have been expected at the stabilized price level. On the other hand, if the quantity had been stabilized at the May level a 2.63 percent decrease in price could have been expected. The smaller range of variation in roaster chicken prices

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[13] The negative quantity demanded indicated the price was too high and that any wholesale needs would have to be met from inventory holdings or imports.

than in roaster marketings was the result of the implied elastic demand for roasters.

Roaster Chicken 1972 Forecasts

In 1972, the Canadian weighted average price for roaster chicken to producers live number 1 birds was forecasted to be 15.22 (20.82) cents per pound and ranged from a November low to 15.09 (20.59) cents per pound to a May high of 15.68 (21.24) cents per pound. The quantity marketed was forecasted to be 2.49 pounds per capita and generated a forecasted total revenue of 8.7 (11.9) million dollars.[14] If the quantity marketed had been regulated at the November level of 0.23 pounds per capita the estimated weighted average price was 15.09 cents per pound and the total yearly quantity marketed could have been 2.81 pounds per capita. The total revenue generated when the quantity marketed was held constant, was 9.7 (13.2) million dollars or a net increase of 1.1 percent. The monthly prices fluctuated from low of 14.61 (20.19) to a high of 15.62 (21.59) cents per pound.

If the price had been regulated at the November level of 15.09 cents per pound, other things being equal, the quantity demanded could have fluctuated between an August low of 0.08 pounds per capita to a May high of 0.39

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[14]Forecasted values for Equation 2 exogenous and endogenous variables are in Appendix VII.

pounds per capita, and the total quantity demanded could have been 2.83 pounds per capita. This suggests that if the price had been lowered from 15.22 to 15.09 cents per pound the yearly quantity demanded would have increased for 1972. The total revenue generated when the price was held constant at 15.09 cents per pound was 9.7 (13.2) million dollars or a net increase of 1.1 percent. Table 14 summarizes the 1972 roaster chicken supply management results and Figure 12 illustrates price-quantity relationships.

Figure 12

Supply Management Price-Quantity Relationships
1972 Forecasts for Roaster Chicken

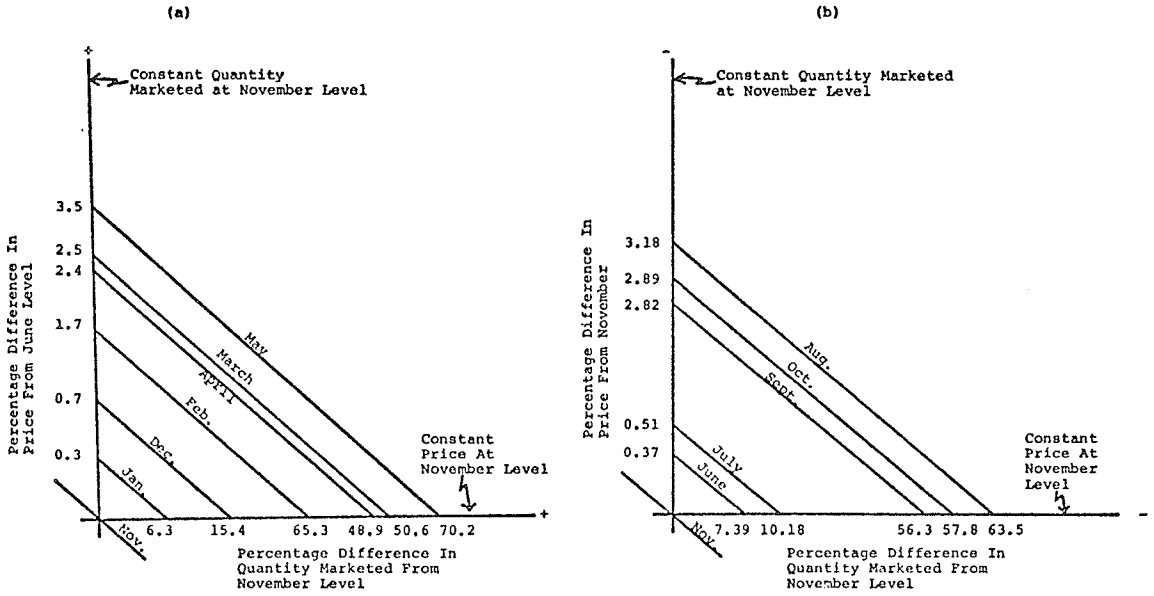

Figure 12(a) shows that in May, for example, an estimated 70.2 percent more roaster chicken could have been marketed than in November, at the November price of 15.09 cents per pound. Or, if quantity marketed in May had remained constant at the November level of 0.23 pounds per capita, the price could have been an estimated 3.51 percent

Table 14

Supply Management Forecasts 1972 Roaster Chicken Results[a]

	Forecasted Price	Estimated Price[b]	Forecasted Quantity	Estimated Quantity[c]	Forecasted Total Revenue	Estimated Total Revenue	Estimated Total Revenue
	----------¢/lb-------		-------lbs. p.c.----		----------$000----------		
January	15.18	15.13	0.2207	0.2492	742	785	832
February	15.36	15.35	0.2319	0.3172	794	801	1066
March	15.50	15.47	0.2247	0.3531	780	812	1194
April	15.61	15.46	0.1871	0.3492	658	816	1188
May	15.68	15.62	0.2158	0.3990	767	830	1365
June	15.45	15.03	0.1668	0.2170	588	803	747
July	15.41	15.01	0.1770	0.2105	626	807	728
August	14.82	14.61	0.1679	0.0853	574	790	297
September	14.70	14.66	0.2228	0.1024	760	797	358
October	14.76	14.65	0.2010	0.0988	692	801	347
November	15.09	14.92	0.2343	0.1846	830	821	654
December	15.16	15.20	0.2485	0.2705	889	841	963
Year	15.22	15.09	2.4991	2.8368	8705	9712	9745

[a]deflated values, 1961 = 100.

[b]with quantity held constant at November level of 0.23 lbs./capita.

[c]with price held constant at November level of 15.09 ¢/lb.

higher. Similarly, Figure 12(b) shows that in the month of September 56.32 percent less roasters could have been marketed at the stabilized price level or that the price would decrease by 2.82 percent if the quantity had been stabilized at the November level. It would have appeared that either method of regulation could have generated the same increase in total revenue in the case of roaster chickens.

Case 3: Broiler Turkey

In 1971, the Canadian weighted average price of broiler turkey was 16.52 (22.05) cents per pound. The price fluctuated from a November low of 15.93 (21.21) cents per pound to a January high of 17.73 (23.64) cents per pound. The total per capita quantity marketed was 3.67 pounds and fluctuated from a January low of 0.21 pounds per capita to a March high of 0.41 pounds per capita. The actual total revenue generated for 1971 was 13.2 (17.5) million dollars.

Applying the same analytical technique to broiler turkey for 1971 the following results were obtained. If the quantity marketed had been held constant at the May level of 0.30 pounds per capita, other things being equal, the price could have fluctuated between an August low of 14.82 (19.67) cents per pound and a December high of 18.50 (24.55) cents per pound. The weighted average price was estimated to be 17.03 (22.71) cents per pound, and the quantity marketed could have decreased from 3.67 to 3.62

pounds per capita. The estimated total revenue generated when quantity was stabilized could have been 13.4 (17.8) million dollars. (Table 15)

On the other hand, if the price had been stabilized at the May level of 16.52 (21.98) cents per pound, other things being equal, the quantity demanded could have fluctuated between an August low of -0.10 and a December high of 0.78 pounds per capita. The total quantity demanded would have been 5.1 pounds per capita and could have generated an estimated producer total revenue of 18.3 (24.3) million dollars. Figure 13 illustrates the price-quantity relationship under supply management regulation for 1971 broiler turkey results. It should be noted that for the months of July and August the quantity demanded was negative indicating that the stabilized price in those months was too high. The price could have been lowered for those months or the quantity slaughtered could have been put into cold storage for later consumption.

Figue 13

Supply Management: Price Quantity Relationships for 1971 Broiler Turkey

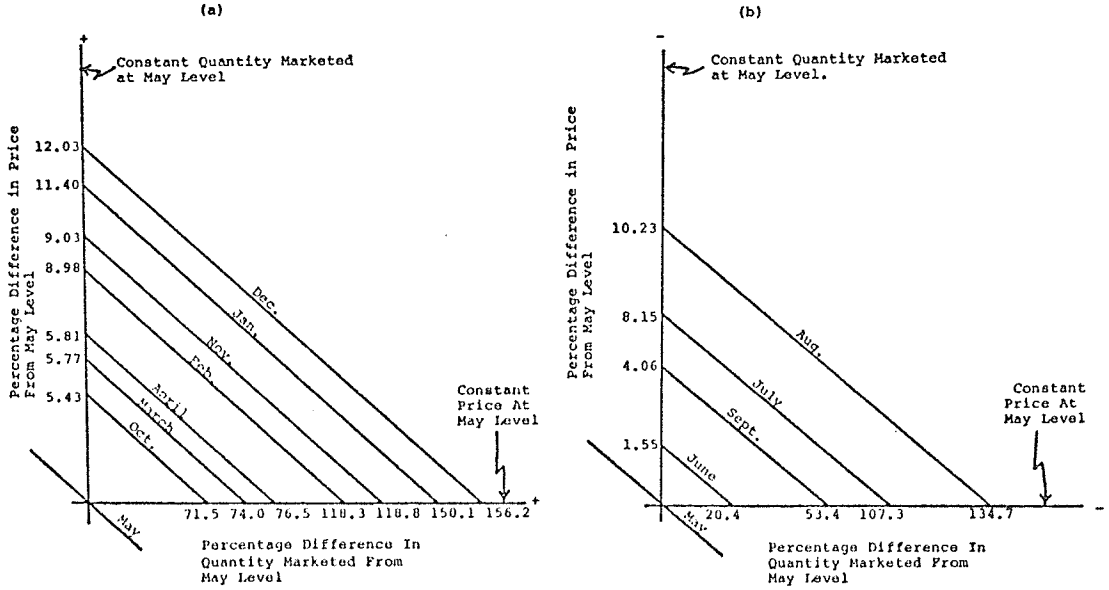

Table 15

Supply Management Results for Broiler Turkey 1971

	Actual Price[a]	Estimated Price[b]	Actual Quantity	Estimated Quantity[c]	Actual Total Revenue	Estimated Total Revenue[b]	Estimated Total Revenue[c]
	¢/lb		lbs. p.c.		$000		
January	17.73	18.40	0.2192	0.7557	832	1190	2672
February	16.21	18.00	0.2606	0.6594	906	1167	2337
March	16.12	17.47	0.4199	0.5318	1456	1135	1890
April	16.37	17.48	0.3446	0.5333	1216	1139	1900
May	16.52	16.97	0.3021	0.3021	1079	1109	1470
June	16.57	16.26	0.2731	0.2404	981	1065	860
July	16.90	15.17	0.2767	(-0.0221)[d]	1016	996	0
August	16.87	14.82	0.2926	(-0.1050)[d]	1075	976	0
September	16.57	15.84	0.2571	0.1405	930	1046	507
October	16.25	17.41	0.2992	0.5182	1065	1152	1875
November	15.93	18.01	0.3269	0.6613	1143	1194	2398
December	16.69	18.50	0.3978	0.7805	1461	1230	2838
Year	16.52	17.03	3.6702	5.1232[d]	13166	13404	18747[d]

[a]Deflated values, 1961 = 100.

[b]With quantity held constant at May level of 0.30 lbs./capita.

[c]With price held constant at May level of 16.52 ¢/lb.

[d]Negative values were treated as zero.

Figure 13(a), shows that in the months of December, January, November, February, April, March and October, the quantity demanded was expected to increase by 158.3, 150.1, 118.8, 118.2, 76.5, and 71.5 percent, respectively, at the stabilized price level. Or, if the quantity marketed had been stabilized at the May level the price could have been expected to rise in December, January, November, February, April, March, and October by 12.0, 11.4, 9.0, 8.9, 5.8, 5.7 and 5.4 percent respectively. Likewise, the quantity demanded could have been expected to decline in August, July, September and June by 134.7, 107.3, 53.4 and 20.4 percent respectively if the price had been stabilized at the May level. The low variation in price compared to quantity demanded can be accounted for by the implied elastic nature of Equation 3 derived by Lee. The results indicated that more total revenue could have been attained through price stabilization. As the results implied the higher price level could have caused a decrease in the per capita quantity demanded for the year and any shift in the demand equation would have to be met from inventory stocks or from imports.

Broiler Turkey 1972 Forecasts

The 1972 situation for broiler turkey was forecasted using time trend analysis of the exogenous variables and also using the reduced form method of forecast the endogenous variables in Equation 3 to obtain the forecasted prices for 1972 broiler turkey based on the assumption that the

quantity slaughtered was reduced by ten percent from the 1971 level.[15]

The 1972 weighted average price was forecasted to be 16.43(22.58) cents per pound (basis number one live) and fluctuated from a May low of 15.83 (21.56) cents per pound to a January high of 17.40 (23.48) cents per pound and generated a forecasted total revenue of 12.1 (16.5) million dollars. The per capita quantity marketed fluctuated from a January low of 0.18 pounds to a March high of 0.34 pounds and the total per capita quantity was estimated at 3.21 pounds. (Table 16)

If the quantity marketed had been stabilized at the December level of 0.33 pounds per capita, other things being equal, the weighted average price could have been 16.18 (22.13) cents per pound and could have generated an estimated total revenue of 14.8 (20.0) million dollars. The quantity marketed would have been 4.00 pounds per capita. Alternatively if the price had been stabilized at the December level then the quantity demanded could have been 4.83 pounds per capita and could have generated a total revenue of 17.5 (24.1) million dollars. Figure 14 illustrates the effects of price and quantity stabilization for the 1972 situation.

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[15]The values of the exogenous and endogenous variables for broiler turkey are summarized in Appendix VII

Table 16

Supply Management for Broiler Turkey
1972 Forecasted Results

	Forecasted Prices[a]	Estimated Prices[b]	Forecasted Quantity	Estimated Quantity[c]	Forecasted Total Revenue	Estimated Total Revenue[b]	Estimated Total Revenue[c]
	¢/lb.		lbs.p.c.		$'000		
January	17.40	16.77	0.1801	0.5435	694	1239	1913
February	16.81	16.30	0.2134	0.4325	799	1213	1532
March	16.26	16.29	0.3426	0.4294	1248	1219	1530
April	16.23	16.01	0.2803	0.3607	1025	1205	1292
May	15.83	15.46	0.2449	0.2287	879	1170	824
June	16.00	15.53	0.2206	0.2453	805	1182	889
July	16.28	15.87	0.2359	0.3283	881	1216	1197
August	16.40	16.22	0.2902	0.4111	1098	1249	1508
September	16.84	16.51	0.2541	0.4808	993	1279	1774
October	16.65	16.48	0.2948	0.4756	1145	1285	1765
November	16.90	16.85	0.3210	0.5627	1273	1320	2100
December	15.90	15.90	0.3338	0.3335	1253	1253	1254
Year	16.43	16.18	3.2121	4.8340	12098	14835	17588

[a]Deflated values, 1961 = 100.

[b]With quantity held constant at December level of 0.33 lbs./capita.

[c]With price held constant at December level of 15.90 ¢/lb.

Figue 14

Supply Management: Price-Quantity Relationships
For 1972 Broiler Turkey

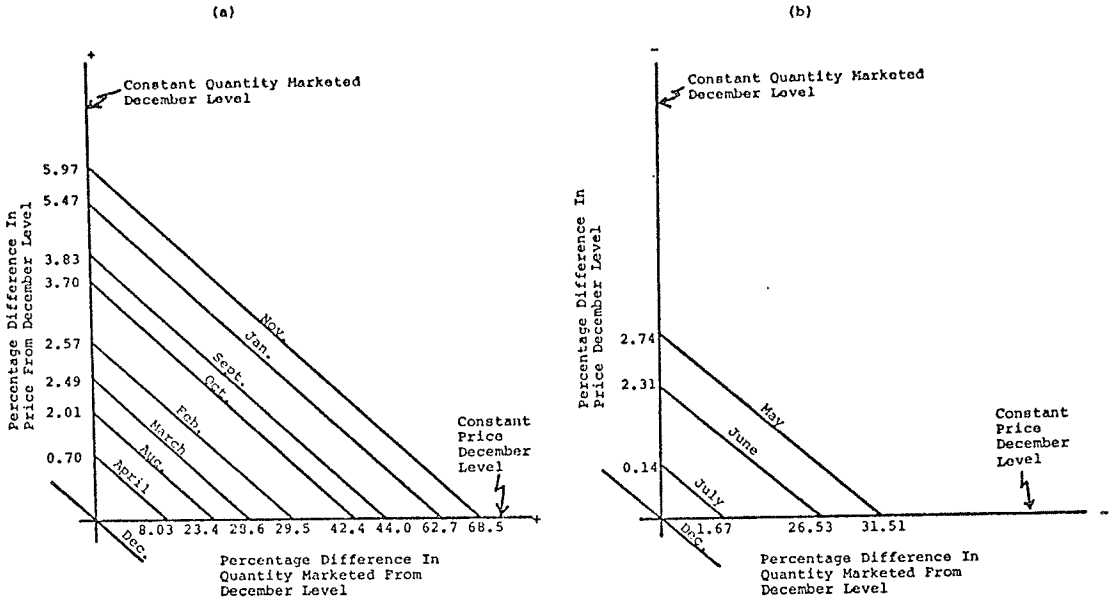


Figure 14(a) shows that in the months of January, February, March, April, August, September, October, and November an estimated 62.79, 29.55, 28.61, 8.03, 23.14, 44.01, 42.44 and 68.54 percent more broiler turkey could have been marketed than in December, if the price had been stabilized at the December level of 15.90 cents per pound. Or, if the quantity marketed had remained constant at the December level the price could have been 5.47, 2.57, 2.49, 0.70, 2.01, 3.83, 3.70 and 5.97 percent higher respectively.

Figure 14(b) shows that for the months of May, June and July the quantity marketed could have been decreased by 31.51, 26.53, and 1.67 percent from the December level, if the price had been stabilized at 15.90 cents per pound. Or, that if the quantity marketed had been stabilized at the 0.33 pounds per capita level, the price could have been

decreased by 2.74, 2.31 and 0.14 percent for May, June and July, respectively.

Case 4: Hen Turkey

The technique of regulating the monthly rate of flow and the monthly price level at predetermined levels was applied to hen turkey meats. It was assumed that the action could have been implemented by the co-ordinated effort of the various turkey boards. The boards could have used the mechanism of marketing quotas to adjust the monthly rate of flow to market within the year, other things being equal, to obtain monthly prices as specified by equation 4. Given specific monthly prices the board could have estimated the monthly quantity demanded, and adjusted quotas to control marketings within the year.

In 1971 the actual quantity marketed was 1.89 pounds per capita and fluctuated from a March low of 0.02 pounds per capita to a September high of 0.37 pounds per capita. About 85 percent of all hen turkeys slaughtered occurred in the second half of the year and indicated a strong demand or seasonality in production at that time of year. The price fluctuated between 17.80 (23.88) and 20.20 (27.66) and averaged 18.70 (25.17) for the year. The actual producer total revenue generated was 7.7 (10.4) million dollars.

Based on the information that hen turkey demand was elastic (Table 10) and that during the period of August to November demand was more elastic (85 percent of hen turkeys slaughtered occurred in this time period), the rate of flow

to market was adjusted within the year as follows. For the periods of January to July the quantity slaughtered was decreased by five percent, August to November slaughter was increased by five percent and for December slaughter was decreased by five percent. The strategy of the decreased periods was to increase price and decrease marketings and in the increased period to increase quantity demanded due to the lower prices that could have prevailed if the quantity marketed had been increased. The regulated quantity for the year was estimated to be 1.98 pounds per capita and the weighted average price was estimated to be 18.69 (25.16) cents per pound, (Table 17). The producer total revenue generated was estimated to be 8.1 (10.9) million dollars, an increase of about 4 percent.

Alternatively, if the monthly price levels had been regulated at predetermined levels as follows: the months of January to June were increased by 0.38 (0.50) cents per pound and from July to December decreased by 0.38 (0.50) cents per pound, and the weighted average price was estimated to be 18.62 (25.09) cents per pound and the estimated quantity demanded was 2.27 pounds per capita. Producer total revenue was estimated to be 9.2 (12.4) million dollars, an increase of twenty percent.

Figure 15(a) illustrates the price quantity relationship for hen turkey demand. Given the monthly demand equation, D_i, the price could have been, P, if the quantity marketed had been regulated, S, for that month. If the

Table 17

Supply Management Hen Turkey Meats 1971[a]

	Actual Price	Estimated Price[a] Regulated Quantity[b]	Regulated Price	Actual Quantity	Regulated Quantity	Estimated Quantity With Regulated Price	Actual Total Revenue	Estimated Total Revenue Regulated Quantity[b]	Estimated Total Revenue Regulated Price
	¢/lb.			lbs. p.c.			$000		
January	19.22	19.23	19.52	0.0377	0.0359	0.0243	155	147	101
February	18.44	18.82	18.82	0.0519	0.0493	0.0289	205	195	117
March	17.97	17.98	18.17	0.0296	0.0281	0.0279	114	108	145
April	17.88	17.89	17.89	0.0447	0.0425	0.0421	172	164	162
May	18.08	18.09	18.25	0.0480	0.0456	0.0360	187	178	142
June	17.87	17.88	17.96	0.0674	0.0640	0.0562	261	248	218
July	17.80	17.60	17.46	0.1751	0.1663	0.2033	677	636	772
August	17.87	17.88	17.79	0.3258	0.3584	0.4044	1269	1396	1568
September	18.49	18.50	18.43	0.3738	0.4112	0.4489	1510	1662	1808
October	19.10	19.11	18.93	0.3471	0.3818	0.4866	1452	1598	2108
November	19.64	19.65	19.44	0.2084	0.2292	0.3032	899	989	1295
December	20.20	20.30	20.57	0.1834	0.1742	0.1461	819	779	915
Year	18.70	18.69	18.62	1.8933	1.9869	2.2783	7727	8105	9266

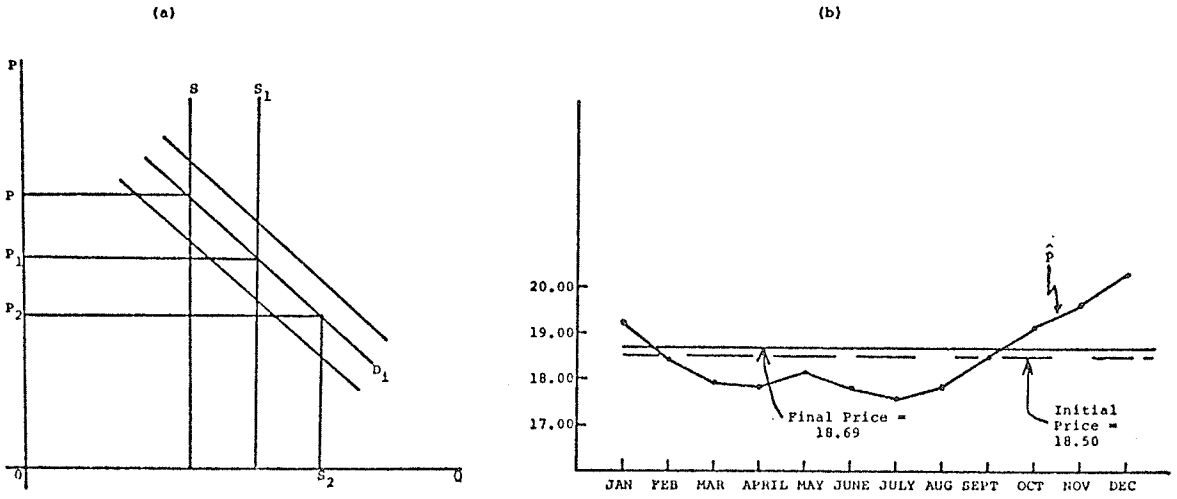
[a]Deflated Values

[b]As specified in Column 5.

quantity marketed had been increased to, S_1, then the price level would have decreased to, P_1, and total revenue could have increased (assuming an elastic demand). Alternatively, if the price level had been regulated at, P_2, then the quantity demanded would have been S_2. Obviously, if price stability had been one of the objectives of the boards, a price pooling system could have been developed to smooth the fluctuating price pattern generated by the regulation of the rate of flow strategy described above. Figure 15(b) shows the estimated price fluctuations could have been stabilized by a pooling mechanism. The initial price could have been set at 18.50 cents per pound and could have been paid to all producers and the final payment would have been paid once the pool had closed. In this case the final payment would have been 0.19 cents per pound payable to all producers according to the gross weight they marketed for the year.

Figure 15

Supply Management: Pooled Pricing
1971 Hen Turkey Results



Hen Turkey 1972 Forecasts

The 1972 situation for hen turkey was forecasted using time trend extrapolation for all exogenous variables and estimating the endogenous variables by using the reduced form forecasting technique.[16] The 1972 deflated average price was forecasted to be 20.68 (28.43) cents per pound and fluctuated from a June low of 18.75 (25.62) cents per pound to a November high of 22.61 (31.26) cents per pound. The forecasted quantity marketed fluctuated from a March low of 0.02 to a September high of 0.33 pounds per capita. The total per capita quantity marketed was forecasted to be 1.66 pounds (12 percent less than 1971). Producer total revenue generated was forecasted to be 7.9 (10.9) million dollars (Table 18).

Based on the assumption that the demand for hen turkey was elastic (Table 10) and that 85 percent of the quantity slaughtered occurs between August and November the quantity was regulated as follows: from January to July the quantity slaughtered was reduced by five percent, from August to November the quantity slaughtered was increased by five percent and December the quantity slaughtered was decreased by five percent; with the objective being to improve total revenue.

Alternatively the price could have been regulated

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[16] See: H. Theil, op. cit., for a detailed explanation of forecasting procedures and Appendix VII for Forecasted values for hen turkey meats.

Table 18

Supply Management Forecasts: Hen Turkey Meat 1972

Month	Forecasted Price[a]	Estimated Price Regulated Quantity[b]	Regulated Price	Forecasted Quantity	Regulated Quantity	Estimated Quantity Regulated Price	Forecated Total Revenue	Estimated Total Revenue Regulated Quantity	Estimated Total Revenue Regulated Price
	¢/lb		lbs. p.c.				$000		
January	18.88	20.43	18.50	0.0328	0.0318	0.4369	137	141	1790
February	19.34	19.49	18.50	0.0450	0.0427	0.1710	193	185	705
March	19.20	19.25	18.50	0.0255	0.0243	0.0697	110	104	289
April	18.97	19.00	18.50	0.0385	0.0366	0.0751	164	157	313
May	19.19	19.22	18.50	0.0412	0.0391	0.1089	179	170	457
June	18.76	18.79	18.50	0.0576	0.0548	0.0836	246	234	353
July	18.86	18.89	18.75	0.1493	0.1418	0.1748	646	615	752
August	19.89	19.86	19.75	0.2922	0.3069	0.3566	1341	1406	1625
September	21.45	21.12	21.15	0.3342	0.3510	0.3393	1641	1720	1665
October	21.97	21.94	21.75	0.3093	0.3248	0.4114	1587	1664	2088
November	22.61	22.58	22.50	0.1852	0.1944	0.2146	983	1031	1133
December	20.45	20.49	20.25	0.1539	0.1462	0.2011	743	707	961
Year	20.68	20.74	20.01	1.6654	1.6942	2.6436	7976	8140	12135

[a] Deflated Values

[b] As specified in Column 5.

at pre-determined monthly levels for hen turkey meats. The strategy for pricing was to regulate the period from January to July at a price level of 18.50 to reflect the firm prices anticipated during the first part of 1972. From August to December the prices were decreased by the deflated value of one quarter of a cent, the reason being to take advantage of that demand was more elastic from August to November.

If the quantity marketed had been regulated at the pre-determined levels (Table 18, Column 5), the weighted price could have been 20.74 (28.52) cents per pound with a total quantity marketed of 1.69 pounds per capita. The estimated total revenue to producers could have reached 8.1 (11.1) million dollars (a 2.5 percent increase from the forecasted value). Alternatively, if the monthly price level had been predetermined as in Table 18, Column 3, the weighted average price could have been 20.01 (27.41) cents per pound and the quantity demanded could have increased to 2.64 pounds per capita, other things being equal. The estimated total revenue to producers could have been 12.1 (16.6) million dollars.

One explanation why the producer boards have opted to reduce marketings to maintain and/or improve price was the fear of depressed prices due to high inventory levels experienced in 1970 and 1971. Placements of hen poults

was down by eleven percent for 1972.[17] Likewise, it should be noted that U.S. turkey production was up six percent and undoubtedly will create downward pressure on the price level in Canada for hen turkeys.

Case 5: Tom Turkey

Within the given framework of demand derived by Lee for tom turkey meat the monthly rate of flow was regulated at pre-determined levels, or alternatively the monthly price levels were regulated, to increase and/or stabilize producer total revenue. It was assumed that these strategies could have been implemented through the co-ordinated efforts of the various turkey boards. The mechanism of marketing quotas could have been used to regulate the monthly rate of flow as well as to regulate the quantity marketed for the year.

The pricing and marketing strategies were implemented on the basis that demand for tom turkey was elastic (Table 10) and that it was more elastic in the period of August to December since about 75 percent of all tom turkeys slaughtered occurred in that period. The rate of flow was adjusted by a ten percent increase during August to November to increase total revenue in that period and reduced by ten percent from December to July to increase total revenue in that period. The pricing strategy employed for the

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[17] Canada Department of Agriculture, Summer Outlook June 1972, Ottawa: Information Canada, p. 47.

period January to July was to reduce the price level by one cent because of the implied elastic demand for that period and from August to December the price was not altered in order to have a degree of control over quantity demanded, and also to insure a price increase in that period if demand shifted to the right.

In 1971, the actual quantity marketed by tom turkey producers was 3.94 pounds per capita at an average weighted price of 17.83 (23.98) cents per pound.[18] Actual producer total revenue was estimated to be 15.3 (20.6) million dollars (Table 19). Applying the quantity regulation strategy the per capita quantity marketed could have been 4.00 pounds per capita. The weighted average price was predicted to be 17.81 cents per pound with a predicted producer total revenue of 15.5 (20.8) million dollars. Alternatively if the price had been regulated to yield a weighted average of 17.53 (23.45) cents per pound, the total quantity demanded could have been 5.63 pounds per capita. Producer total revenue could have been 21.5 (28.7) million dollars. It would appear that by regulating the monthly price levels the total revenue could have been expected to increase more than by using the quantity regulation method. However, one

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[18]Current values are in parenthesis and were calculated by multiplying the deflated values by the appropriate monthly C.P.I. (Appendix V).

explanation opting for the rate of flow method might have been to prevent inventory build up by the processor-wholesaler level in the industry.

In the case of tom turkey, stability of the price level could have been achieved by the formation of a pool. The organizational ability to develop a pool could have been achieved through the group action of the turkey boards. There could be problems associated with pooling mechanisms but the purpose of this section was to illustrate that pools can stabilize price.

Figure 16 (a)
Tom Turkey Price Stabilization 1971
With Quantity Regulated

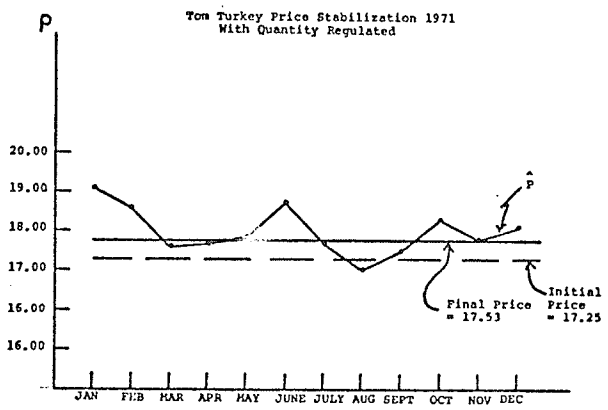

Figure 16(b)
Tom Turkey Price Stabilization 1971

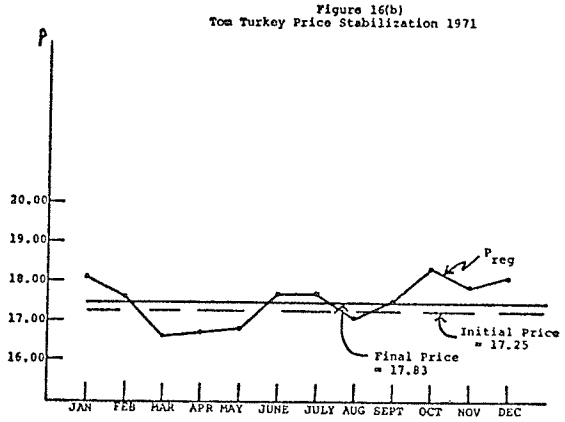

Figure 16(a) illustrates price stabilization when quantity marketed was regulated. The predicted price pattern fluctuated (Table 19) and the average price was predicted to be 17.81 cents per pound. The producer board could have instituted an initial payment of 17.25 cents per pound payable to all producers for tom turkeys.

Table 19

Supply Management of Tom Turkey Meats 1971

	Actual Price	Estimated Price Quantity Regulated[b]	Regulated Price	Actual Quantity	Regulated Quantity	Estimated Quantity Price Regulated	Actual Total Revenue	Estimated Total Revenue Quantity Regulated	Estimated Total Revenue Price Regulated
	¢/lb.			lbs. p.c.			$000		
January	19.02	19.07	18.02	0.1047	0.9949	0.3364	426	406	1297
February	18.62	18.66	17.62	0.0785	0.0746	0.2563	313	298	969
March	17.60	17.65	16.60	0.0097	0.0947	0.3523	377	360	1258
April	17.70	17.74	16.69	0.1114	0.1058	0.3942	425	405	1419
May	17.81	17.84	16.80	0.1252	0.1189	0.4335	482	459	1575
June	18.71	18.76	17.71	0.1792	0.1702	0.5842	727	692	2243
July	17.71	17.76	17.71	0.3270	0.3107	0.3304	1259	1199	1272
August	17.05	17.02	17.04	0.5454	0.5727	0.5582	2026	2124	2072
September	17.54	17.50	17.54	0.7813	0.8203	0.7900	2993	3137	3027
October	18.29	18.25	18.28	0.6810	0.7151	0.6931	2728	2858	2775
November	17.87	17.82	17.87	0.6159	0.6467	0.6162	2416	2531	2417
December	18.07	18.11	18.07	0.2942	0.2794	0.2942	1170	1114	1170
Year	17.83	17.81	17.53	3.9440	4.0091	5.6396	15347	15588	21499

[a]Deflated Values.

[b]At the rate of flow of Column 5.

The final payment would have been 0.56 cents per pound upon closure of the pool (assuming no operating expenses). Similarly, Figure 16(b) illustrates the price stabilization if the price had been regulated (Table 19) and resulted in a weighted average price of 17.53 cents per pound, and the final payment would have been 0.28 cents per pound.

Tom Turkey Forecasts 1972

The 1972 situation for tom turkey was forecasted using the method of time trend analysis for the exogenous variables and forecasting the endogenous variables by the reduced form method.[19] It should be noted that the quantity marketed was regulated at the level of 3.69 pounds per capita due to the tacit agreement of the producer boards to cut back on heavy turkeys by ten percent.[20] Producer total revenue was forecast to be 14.9 (20.6) million dollars and the weighted average price was forecast to be 17.51 (24.08) cents per pound (Table 20).

If the various boards had considered that the period from December to July was less elastic than the period from August to November, then they could have regulated the marketings as follows: from December to July a five percent reduction (to increase price in that period) and from August

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[19] Appendix VII summarizes the forecasted variables used for the tom turkey demand equation.

[20] See Table 4, Placement of Heavy Poult.

Table 20

Supply Management for Tom Turkey
1972 Forecast Results[a]

Month	Forecasted Price	Estimated Price Quantity Regulated[b]	Regulated Price	Forecasted Quantity	Regulated Quantity	Estimated Quantity Price Regulated	Forecasted Total Revenue	Estimated Total Revenue Quantity Regulated	Estimated Total Revenue Price Regulated
	¢/lb			lbs. p.c.			$000		
January	18.77	18.83	18.51	0.0810	0.0769	0.1099	336	320	450
February	18.19	18.25	17.93	0.0605	0.0575	0.0830	245	233	331
March	17.04	17.09	16.78	0.0766	0.0728	0.1072	292	278	403
April	16.70	16.75	16.45	0.0853	0.0810	0.1207	321	306	447
May	16.52	16.57	16.26	0.1232	0.1170	0.1738	461	440	641
June	16.78	16.82	16.52	0.1533	0.1456	0.2129	587	559	803
July	16.40	16.45	16.15	0.2788	0.2649	0.3877	1049	999	1437
August	16.16	16.10	15.90	0.5408	0.5949	0.7724	2018	2211	2836
September	17.56	17.49	17.30	0.7721	0.8493	1.0665	3148	3449	4285
October	18.66	18.59	18.40	0.6709	0.7380	0.9100	2924	3202	3911
November	18.27	18.20	18.01	0.6048	0.6653	0.8251	2595	2843	3490
December	17.27	17.32	17.01	0.2468	0.2345	0.3418	1007	959	1373
Year	17.51	17.49	17.24	3.6946	3.8981	5.1115	14989	15804	20412

[a]Deflated Values, 1961 = 100.

[b]As specified in Column 5.

to November to increase marketings by ten percent because economic theory implied that total revenue would increase more in this period. The reason for the quantity reduction in the first period was to exert pressure on the wholesaler-processor level to reduce inventory holdings. The total per capita quantity marketed could have been 3.89 pounds and the estimated total revenue could have been 15.8 (21.7) million dollars (an increase of about six percent). The weighted average price was predicted to be 17.49 (24.05) cents per pound, (Table 20).

Alternatively, the producer boards could have regulated the minimum price at the monthly levels indicated in Column 3 of Table 20, to increase total revenue in that period because demand for tom turkey was elastic (Table 10). The weighted average price was predicted to be 17.24 (23.70) cents per pound and the predicted producer total revenue was 20.4 (28.0) million dollars. With the price level being decreased the quantity demanded was predicted to be 5.11 pounds per capita.

Summary of Supply Management Analysis

The analysis of the five categories of poultry meat was undertaken to develop information for stabilizing and/or improving producer revenues to be used by the various boards. If a pricing and/or volume strategy could have been ordinated then producers could have been able to regulate the market to their advantage.

The stabilization of price at a constant level was used for broiler chickens, roaster chickens and broiler turkeys and the results appear to be reasonable. However, with stable prices the quantity demanded would be expected to fluctuate. Alternatively, with stable quantities the prices would be expected to fluctuate but a price pooling system could be introduced to stabilize price. For the three cases just mentioned stability was introduced successfully by either method and the average price increased along with total revenue. However, there was one exception, in the case of broiler turkey the average price decreased indicating that the volume stabilization method shoud be used, if the average price was to be increased and also have total revenue increase.

The general recommendations that can be drawn from the quantitative analysis are that a greater degree of stability could be introduced into the poultry industry for broiler chickens, roaster chickens, and broiler turkeys by either the pricing mechanism or a constant rate of flow mechanism, and also improve the average price level. It would appear that the total revenue could be increased by a larger amount by employing the volume stabilization option of supply management, although in the case of roaster chickens it would appear that the price mechanism increases total revenue more than the volume mechanism. (Table 21).

Table 21

Summary of Supply Management Analysis 1971

Objective / Commodity	Stability		Percentage Change Average Price		Percentage Change Total Revenue	
	Price Held Constant	Quantity Held Constant	Price Level Held Constant	Quantity Level Held Constant	Price Held Constant	Quantity Held Constant
Broiler Chicken	Yes	Yes	+ 1.9	+ 3.1	+ 2.9	+ 4.9
Roaster Chicken	Yes	Yes	+ 3.3	+ 3.5	+ 7.1	+ 3.1
Broiler Turkey	Yes	Yes	0.0	+ 3.1	+ 1.8	+38.9
	Monthly Price Regulation	Stability Under Orderly Marketing		Stability Under Orderly Marketing		
Hen Turkey	*	**	- 0.4	0.0	+ 4.9	+19.9
Tom Turkey	*	**	- 1.6	- 0.1	+ 1.5	+40.0

* stability of price is possible for Hen and Tom Turkeys with the use of the price pooling mechanism.

** stability of quantity at constant levels is infeasible due to the fact that 85 percent of these turkeys are marketed in the period August to December therefore orderly marketing was used to introduce a degree of stability.

Likewise, for hen turkeys and tom turkeys a degree of stabilization could be introduced through the technique of orderly marketing for quantity regulation and the price could be stabilized through a price pooling system. The average price decreased under both options but the total revenues increased. The reason for the average prices declining is explained by the elastic demand during the August - December period. The regulation of quantity appears to be the better alternative to improve total revenue from hen turkey and tom turkey meats.

The next chapter deals with the implications of inventory reduction and the potential gains to producers. Likewise, the analysis examines what would happen to price and total revenue if the demand curves were to shift to the right for the five categories of poultry meats and relates the findings to the potential benefits of a market development program for poultry meats.

CHAPTER V

INVENTORY AND MARKET DEVELOPMENT IMPLICATIONS UNDER SUPPLY MANAGEMENT

INVENTORY IMPLICATIONS

Generally, there is a time gap between production and consumption making it necessary to have some product inventory to provide adequate customer service and also to keep the marketing channels open.[1] Some product inventory is generally held at the processor-wholesaler level and at the retail level. The inventory is also held to act as a buffer against higher prices being negotiated by the producer boards.

If the price level to producers were felt to be too high the wholesalers would generally react by curtailing the purchase of live poultry for slaughter and fill their orders from cold storage, in order to create downward pressure on the price of live poultry. In turn, they would be willing to purchase live poultry for slaughter but only at a reduced price level. Ultimately, if the live birds have been produced, the producers might have to sell the birds at depressed prices if they were competing against one another. If on the other hand, inventory levels were

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[1] J. F. Magee, op. cit.

low, the wholesalers might still be able to purchase the birds at low prices due to the fact that individual producers would find it difficult to hold the birds for longer periods of time.

However, producer boards have the organizational power to regulate output marketed and to negotiate minimum prices on behalf of their members. They could control inventory by trying to negotiate for higher prices and also reinforce this pricing policy by reducing marketings to achieve a higher price. If price were forced upward, the processor-wholesaler might curtail purchases and fill orders from inventory. On the other hand, if the processor-wholesalers felt that output was being curtailed and they might not get enough product, they would raise the price to insure a flow of product was forthcoming.

Case 1: Broiler Chicken

The inverse relationship between price and inventory derived by Lee's analysis,[2] indicated that price could have been expected to increase if the inventory level had been decreased. To demonstrate that producer price and income could have been increased through inventory reduction, the 1971 inventory level was reduced by five percent. The Canadian average weighted price was predicted to be 15.49

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[2]B. M. Lee, op. cit.

(20.67) per pound or an increase of 4.3 percent. Total revenue was predicted to increase from 79.2 (105.7) to 82.6 (109.6) million dollars, other things being equal, (Table 22).

Table 22

Broiler Chicken Prices and Revenue[a]
With a Five Percent Inventory Reduction
1971

Month	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue
	¢/lb		$000	
January	13.83	13.88	5851	5869
February	14.01	14.23	5487	5576
March	14.19	14.34	6590	6662
April	14.34	14.38	6222	6242
May	14.76	15.12	6456	6615
June	15.15	15.17	6706	6718
July	15.45	16.11	7303	7619
August	15.42	16.85	7253	7926
September	15.51	17.17	6885	7623
October	15.30	16.51	6891	7436
November	15.03	16.19	7009	7550
December	14.96	15.96	6421	6851
Year	14.87	15.49	79211	82687

[a]deflated values, 1961 = 100;
[b]with inventory reduced five percent.

With the increased prices due to inventory reduction producers might be inclined to increase their output, however, the marketing boards could exercise control of output through marketing quotas. Any increase in output marketed must come about by quota increases or temporary permits issued to producers. The producer boards entered

into an agreement to limit the 1972 output to an increase of five percent even though per capita consumption was expected to increase by more than five percent. It was hoped that the per capita consumption could be met from slaughter and inventory movements. If the boards were successful then the 1972 prices could be expected to be higher than the 1971 prices. The Canadian weighted price for 1972 was forecasted to be 15.29 cents per pound, an increase from the 1971 price level of 14.87 cents per pound.

If the inventory forecasts for 1972 were five percent lower, then the forecasted price would have been 15.51 (21.22) cents per pound, and the total revenue would have been 86.8 (118.7) million dollars rather than 85.4 (116.9) million dollars (Table 23). As the analysis indicates there could have been a gain in producer total revenue if the boards had been successful in controlling inventory.

Case 2: Roaster Chicken

Potential gains through inventory reduction were indicated by the inverse relationship between price and inventory in Equation 2 derived by Lee.[3] However, the regression coefficient for inventory was found to be non significant at the ten percent level of confidence, and in this case the results were questionable. However, it

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[3]B. M. Lee, op. cit.

Table 23

Broiler Chicken Prices and Revenue[a]
With a Five Percent Inventory Reduction
for 1972 Forecasts

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	14.57	14.60	6471	6486
February	15.21	15.28	6257	6285
March	14.90	15.00	7267	7316
April	15.22	15.42	6935	7026
May	15.75	15.97	7234	7338
June	15.54	15.79	7226	7344
July	15.75	16.02	7818	7956
August	15.66	15.93	7736	7871
September	15.73	16.08	7334	7498
October	14.91	15.25	7051	7216
November	15.04	15.41	7367	7548
December	15.04	15.43	6780	6955
Year	15.29	15.51	85481	86839

[a]deflated values, 1961 = 100.
[b]with inventory reduced five percent.

was found that with a twenty percent decrease in the inventory level, the price of roaster chickens was predicted to increase, other things being equal.

The Canadian weighted average price was predicted to increase by 3.8 percent when the inventory level was reduced by twenty percent, producer total revenue was predicted to increase by 3.8 percent. The monthly prices and revenue are summarized in Table 24 following. It would appear that any increase in price would have to be brought about by a substantial reduction in the level of inventory and might

Table 24

Roaster Chicken Prices and Revenue[a] With a Twenty Percent Inventory Reduction 1971

	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	13.69	15.31	646	723
February	13.86	15.29	689	761
March	14.11	15.68	682	758
April	14.29	15.53	577	627
May	16.12	16.16	752	754
June	16.23	16.31	587	597
July	16.67	16.71	641	651
August	16.64	16.66	608	607
September	16.63	16.87	809	821
October	16.67	17.00	734	748
November	16.20	16.62	833	855
December	16.20	16.41	886	898
Year	15.57	16.12	8449	8746

[a] deflated values, 1961 = 100.
[b] with twenty percent reduction in inventory.

mean a substantial loss in short-term income from current sales.

Similarly, the 1972 forecasted situation was analyzed with the assumption of a twenty percent decrease in inventory, other things being equal. The 1972 Canadian weighted price was predicted to be 15.24 (20.88) cents per pound and generated a total revenue of 8.7 (11.8) million dollars with the inventory level reduced by twenty percent. The apparent explanation for the slight increase in price and total revenue was the fact that the regression

Table 25

Roaster Chicken Prices and Revenue[a] With a Twenty Percent Inventory Reduction in 1972 Forecasts

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	15.18	15.19	742	742
February	15.36	15.38	794	794
March	15.50	15.52	780	781
April	15.61	15.63	658	659
May	15.68	15.70	767	768
June	15.45	15.47	588	589
July	15.41	15.22	626	618
August	14.82	14.85	574	575
September	14.70	14.73	760	762
October	14.76	14.79	692	694
November	14.93	14.96	820	823
December	15.16	15.19	889	891
Year	15.22	15.24	8705	8788

[a] deflated values, 1961 = 100.

[b] with twenty percent reduction in inventory.

coefficient is not significantly different from zero and indicates that the results are questionable. It would appear that the major difference in price was attributed to slaughter and the other variables in Equation 2. Table 25 summarizes the monthly results for 1972 with a twenty percent reduction in inventory levels.

Case 3: Broiler Turkey

In order to determine potential gains to producers through a supply management pricing and volume strategy in order to reduce inventory levels, the level of inventory was reduced by five percent, other things being equal. The Canadian weighted average price was predicted to be 18.24 (24.28) cents per pound. Or in other words, if the inventory had been an estimated five percent lower, producer prices were predicted to be about eleven percent higher (Table 26). The total revenue was predicted to be 14.5 (19.3) million dollars.

Table 26

Broiler Turkey Prices and Revenue[a] With a Five Percent Inventory Reduction 1971

	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue
	¢/lb.		$000	
January	17.73	18.88	832	886
February	16.21	18.46	906	1032
March	16.12	17.50	1456	1581
April	16.37	17.94	1216	1334
May	16.52	17.74	1079	1159
June	16.57	17.52	981	1037
July	16.90	16.97	1016	1021
August	16.87	17.05	1075	1087
September	16.57	18.16	930	1020
October	16.25	19.17	1065	1256
November	15.93	19.20	1143	1414
December	16.69	19.35	1461	1694
Year	16.52	18.24	13166	14521

[a] deflated values, 1961 = 100.

[b] five percent inventory reduction.

Similarly, the 1972 forecasted situation was analyzed with a five percent reduction in the forecasted inventory level. It was found that the forecasted price level was expected to increase about 7.0 percent from 16.43 (22.49) to 17.72 (24.24) cents per pound. The estimated total revenue increased from 12.0 (16.5) to 13.0 (17.3) million dollars. The potential gain in price and total revenue would benefit producers if the inventory levels were forced down through a supply management procedure to limit output (Table 27).

Table 27

Broiler Turkey Prices and Revenue[a]
With a Five Percent Inventory Reduction
1972 Forecasts

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Forecasted Total Revenue[b]
	¢/lb.		$000	
January	17.40	17.63	694	703
February	16.81	17.24	799	820
March	16.26	16.90	1248	1298
April	16.23	17.07	1025	1079
May	15.83	16.86	879	936
June	16.00	17.22	805	866
July	16.28	17.67	881	957
August	16.40	17.96	1098	1123
September	16.84	18.57	993	1095
October	16.65	18.54	1145	1276
November	16.90	18.94	1273	1428
December	15.90	18.09	1253	1426
Year	16.43	17.72	12098	13004

[a]deflated values, 1961 = 100.

[b]five percent inventory reduction.

Case 4: Hen Turkey

The 1971 hen turkey situation was examined to illustrate the potential gains to producers total revenue through a reduction in hen turkey inventories. If the inventory level for 1971 had been reduced by five percent no substantial increase in total revenue was noted. However, when the inventory reduction was ten percent, other things being equal, the price of hen turkey to producers was predicted to be 18.91 (25.46) cents per pound. The estimated total revenue was about 1.2 percent higher than the actual producer total revenue of 7.7 (10.4) million dollars. If the boards attempt to increase prices then they will undoubtedly have to limit their marketings and cause any fluctuation in demand to be met from inventory holdings. Table 28 summarized the results of the ten percent reduction of inventory for hen turkey meats for 1971. For the 1972 period the marketing boards entered into a tacit agreement to decrease output by ten percent in an attempt to draw down inventory levels and increase producer prices.

Similarly, the 1972 forecasted inventory levels were reduced ten percent to illustrate what happens to hen turkey prices if the forecast values were higher than the actual levels for 1972. The Canadian weighted average price was predicted to be 20.94 (28.78) cents per pound with the estimated total revenue being 8.0 (11.0) million dollars (Table 29). If the tacit agreement were successful, we might expect the 1972 forecasted prices to hold and the

Table 28

Hen Turkey Results with Inventory Reduction of Ten Percent, 1971[a]

Month	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	19.22	19.40	155	156
February	18.44	18.61	205	207
March	17.97	18.13	114	115
April	17.88	18.04	172	174
May	18.08	18.25	187	189
June	17.87	18.03	261	263
July	17.81	17.75	677	675
August	17.87	18.13	1269	1287
September	18.49	18.76	1510	1532
October	19.10	19.38	1452	1473
November	19.64	19.93	899	912
December	20.20	20.48	819	827
Year	18.70	18.91	7727	7816

[a]deflated values.

[b]inventory reduction of ten percent.

Canada Department of Agriculture expects the September to December period to have increased marketings, over the 1971 levels.[4]

Case 5: Tom Turkey

If the inventory levels for 1971 had been reduced by ten percent, other things being equal, the price of tom turkey could have increased by about 1.1 percent and the

[4]Canada Department of Agriculture, Summer Outlook June, 1972, Ottawa: Information Canada, June, 1972. p. 47

Table 29

Hen Turkey Results With Inventory Reduction of Ten Percent for 1972 Forecasts[a]

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	¢/lbs.		$000	
January	18.88	20.61	137	150
February	19.34	19.66	193	197
March	19.20	19.41	110	111
April	18.96	19.17	164	116
May	19.18	19.39	179	181
June	18.75	18.96	246	249
July	18.85	19.06	646	653
August	19.88	20.10	1341	1356
September	21.15	21.38	1641	1659
October	21.97	22.21	1587	1604
November	22.61	22.86	983	994
December	20.44	20.67	743	751
Year	20.68	20.94	7976	8075

[a] deflated values.

[b] inventory reduction of ten percent.

estimated total revenue could have increased from 15.3 (20.6) to 15.5 (20.8) million dollars. In other words, if the inventory level had been reduced by ten percent we could have expected a one percent increase in the price level. Table 30 summarizes the results of the inventory reduction for 1971.

Likewise, if the tacit agreement were successful in reducing output in 1972 by ten percent for tom turkeys we might expect the forecasted price to be 17.51 (24.08) cents per pound. On the other hand, an additional ten percent

Table 30

Tom Turkey Prices And Revenues[a]
With a Ten Percent Reduction in Inventory 1971.

Month	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	19.03	19.23	426	431
February	18.62	18.82	313	317
March	17.60	17.80	377	382
April	17.70	17.90	425	430
May	17.81	17.99	482	487
June	18.71	18.92	727	735
July	17.71	17.91	1258	1273
August	17.05	17.24	2026	2049
September	17.54	17.74	2993	3028
October	18.29	18.49	2728	2758
November	17.87	18.06	2416	2443
December	18.07	18.26	1170	1182
Year	17.83	18.03	15347	15520

[a]deflated values.
[b]with an inventory reduction of ten percent.

decrease in the forecasted inventory levels could be expected to increase the price level to 17.71 (24.35) cents per pound. The total revenue was predicted to increase by about 1.0 percent with the ten percent reduction in forecasted inventory for 1972 (Table 31).

Summary of Inventory Reduction Implications

It would appear beneficial to have the cold storage stocks reduced for all poultry meats especially for broiler chickens in order to increase producer prices. Through a careful application of supply management practices producer total revenue and prices might be expected to increase

Table 31

Tom Turkey Prices and Revenues[a]
With a Ten Percent Inventory Reduction for 1972

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	18.77	18.99	336	340
February	18.20	18.40	245	248
March	17.05	17.24	292	296
April	16.71	16.90	321	325
May	16.52	16.71	461	467
June	16.78	16.96	587	593
July	16.40	16.59	1049	1061
August	16.16	16.35	2018	2041
September	17.56	17.76	3148	3183
October	18.66	18.87	2924	2956
November	18.28	18.48	2595	2624
December	17.28	17.46	1007	1018
Year	17.51	17.71	14989	15157

[a]deflated values.
[b]with an inventory reduction of ten percent.

due to reduced carrying costs for cold storage not being discounted from prices paid to producers. This would involve a co-ordinated effort of all producers in Canada. Moreover, if price increases were felt to be the major objective of the boards, they might undertake a market development program to increase the demand for poultry products in Canada.

The next section outlines the potential price and total revenue increases that might be expected given Lee's framework of demand for the five categories of poultry meat in Canada.

MARKET DEVELOPMENT IMPLICATIONS

In order to illustrate the potential benefits to producers from a market development program, the demand curves for the five categories of poultry meat could have been shifted to the right by five percent. This shift to the right would have been feasible if the costs of such a program were less than the increased revenue. However, the costs are unknown and the analysis was conducted to indicate the potential gains in producer revenues, if it were feasible to shift demand. To shift the demand curves, the monthly intercept coefficients were adjusted by five percent, other things being held constant. The shifted demand schedules indicated that, if the quantity had been held constant at the predetermined levels, the price would have been expected to increase, and thus could have yielded higher producer total revenues.

Case 1: Broiler Chicken Demand Shift

If the demand for broiler chicken had been shifted (increased) by five percent, other things being equal, the Canadian weighted average price for 1971 could have been increased by about sixteen percent from 14.87 (19.85) to 17.24 (23.01) cents per pound. The total revenue could have been increased from 79.2 (105.7) to 91.8 (122.5) million dollars if the quantity had been held constant at the 1971 monthly levels. Table 32 summarizes the 1971 monthly results with a five percent shift in demand. Similarly the 1972 situation was estimated with a five percent shift in the

Table 32

Broiler Chicken Prices and Revenue[a]
With Demand Increased by Five Percent, 1971

Month	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	14.15	16.42	5983	6944
February	14.01	17.07	5487	6689
March	14.19	16.81	6590	7810
April	14.34	17.14	6222	7438
May	14.76	17.71	6456	7747
June	15.15	17.50	6706	7751
July	15.45	17.75	7303	8392
August	15.42	17.67	7253	8311
September	15.51	17.74	6885	7875
October	15.30	16.89	6891	7607
November	15.03	17.05	7009	7952
December	14.96	17.04	6421	7317
Year	14.87	17.24	79211	91839

[a]deflated values, 1961 = 100
[b]demand shifted +5.0%.

demand curve and the Canadian average weighted price was predicted to be 17.27 (23.61) cents per pound. The total revenue was predicted to be 96.5 (132.0) million dollars, other things being equal. Table 33 summarizes the 1972 forecasted results with a five percent shift in demand.

Case 2: Roaster Chicken Demand Shift

In the case of roaster chickens the demand was shifted to examine the potential gains in total revenue. If the demand curve had been increased by five percent the deflated Canadian average weighted price could have been

Table 33

Broiler Chicken Prices and Revenues[a]
With Demand Increased by Five Percent 1972

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	----------¢/lb.------		---------$000---------	
January	14.57	16.33	6471	7254
February	15.21	17.02	6257	6999
March	14.90	16.76	7267	8177
April	15.22	17.11	6935	7798
May	15.75	17.70	7234	8131
June	15.54	17.52	7226	8144
July	15.75	17.78	7818	8827
August	15.66	17.72	7736	8752
September	15.73	17.80	7334	8301
October	14.91	16.97	7051	8028
November	15.04	17.16	7367	8402
December	15.04	17.16	6780	7735
Year	15.29	17.27	85481	96553

[a]deflated values, 1961 = 100.
[b]demand shifted +5%.

Table 34

Roaster Chicken Prices and Revenues[a]
With Demand Increased by Five Percent 1971

Month	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	13.69	21.18	646	1000
February	13.86	21.40	689	1065
March	14.11	21.56	682	1042
April	14.29	21.69	577	876
May	16.12	21.79	752	1017
June	16.23	21.35	587	772
July	16.67	21.32	641	820
August	16.64	20.95	608	766
September	16.63	20.85	809	1015
October	16.67	20.93	734	921
November	16.20	21.14	833	1087
December	16.20	21.41	886	1171
Year	15.57	21.30	8449	11558

[a]deflated values, 1961 = 100.
[b]demand shifted +5%.

21.30 (28.42) cents per pound and the total revenue generated could have been 11.5 (12.1) million dollars, other things being equal (Table 34). Similarly, the 1972 situation was analyzed with a five percent shift in the demand curve. The deflated Canadian average weighted price was estimated to be 21.30 (29.13) cents per pound and the total revenue generated was predicted to be 12.1 (16.6) million dollars (Table 35). In other words, given a five percent increase in demand, we might have expected total revenue to increase by 37.0 and 39.0 per cent in 1971 and 1972, respectively.

Table 35

Broiler Roaster Prices and Revenues[a]
With Demand Increased by Five Percent 1972 Forecasts

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	15.18	21.18	742	1035
February	15.36	21.40	794	1105
March	15.50	21.56	780	1086
April	15.61	21.69	658	915
May	15.68	21.79	767	1066
June	15.45	21.35	588	812
July	15.41	21.32	626	866
August	14.82	20.95	574	811
September	14.70	20.85	760	1078
October	14.76	20.93	692	982
November	15.09	21.14	830	1163
December	15.16	21.41	889	1256
Year	15.22	21.30	8705	12182

[a]deflated values, 1961 = 100.
[b]demand shifted +5%.

A program of market development in order to increase consumer demand for roaster chicken might have been possible, if undertaken by the various boards. It might have been possible to increase price and total revenue by about 35 to 40 percent, if demand had been shifted by five percent.

Case 3: Broiler Turkey Demand Shift

The potential of a market development program for turkeys at the national level would have appeared to be quite feasible, if the potential gains were greater than the costs associated with the program. In order to illustrate the potential gains from such a development program

with respect to broiler turkeys the 1971 and 1972 market situations were analyzed assuming the demand was increased by five percent, other things being equal.

The 1971 deflated Canadian average weighted price was predicted to be 21.89 (29.23) cents per pound and generated a total revenue of 17.4 (23.2) million dollars (Table 36). In other words, the average weighted price could have been expected to increase by about 32 percent, if a market development program had been successful in shifting demand by five percent. Similarly, the 1972 weighted average price was predicted to increase by about 37 percent, (Table 37). The total revenue for 1972 was predicted to be 16.2 (22.2) million dollars. The producers of broiler turkeys could have expected their total revenues to increase substantially, if the program had been successful as indicated by the 35 percent increase in total revenue. The venture would have been profitable if the total cost had been less than the expected gain in revenue.

Case 4: Hen Turkey Demand Shift

The potential for a market development program could have been analyzed if the demand curve had been shifted by five percent. The 1971 deflated Canadian average weighted price was estimated to be 24.33 (32.74) cents per pound. The total revenue was estimated to be 10.0 (13.5) million Dollars (Table 38). Similarly, the 1972 weighted average price was predicted to be 24.47 (33.64) cents per

Table 36

Broiler Turkey Prices and Revenues [a]
With Demand Increased by Five Percent
1971

Month	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	17.73	21.44	832	1053
February	16.21	21.87	906	1223
March	16.12	21.28	1456	1922
April	16.37	21.37	1216	1589
May	16.52	21.06	1079	1376
June	16.57	21.33	981	1263
July	16.90	21.76	1016	1309
August	16.87	22.14	1075	1412
September	16.57	22.67	930	1273
October	16.25	22.56	1065	1478
November	15.93	22.90	1143	1644
December	16.69	21.70	1461	1900
Year	16.52	21.89	13166	17447

[a] deflated values, 1961 = 100.

[b] With demand shifted +5%.

Table 37

Broiler Turkey Prices and Revenues[a]
With Demand Increased by Five Percent
1972 Forecasts

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	17.40	22.61	694	901
February	16.81	22.07	799	1049
March	16.26	21.60	1248	1658
April	16.23	21.64	1025	1367
May	15.83	21.29	879	1182
June	16.00	21.55	805	1084
July	16.28	21.93	881	1187
August	16.40	22.15	1098	1483
September	16.84	22.68	993	1338
October	16.65	22.58	1145	1553
November	16.90	22.93	1273	1728
December	15.90	21.97	1253	1731
Year	16.43	22.09	12098	16269

[a]deflated values, 1961 = 100
[b]with demand shifted +5%.

pound and the total revenue generated was 9.4 (12.9) million dollars. If the quantities had been regulated at the monthly levels there would be a substantial increase in the price of hen turkey meats (Table 39).

The total costs of any market development program could have totalled as much as the increase in total revenue. However, it would be hoped that only a small percentage of the increased total revenue would have to be used for promotion. Each province's share of the expenses

Table 38

Hen Turkey Prices and Revenues[a]
With Demand Increased Five Percent in 1971

Month	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	19.22	23.32	155	188
February	18.44	22.43	205	249
March	17.97	22.27	114	141
April	17.88	21.89	172	211
May	18.08	22.26	187	231
June	17.87	21.87	261	319
July	17.80	22.01	677	837
August	17.87	23.29	1269	1654
September	18.49	24.93	1510	2036
October	19.10	25.95	1452	1972
November	19.64	26.80	899	1226
December	20.29	24.26	819	979
Year	18.70	24.33	7727	10050

[a]deflated values, 1961 = 100.
[b]with demand shifted +5%.

Table 39

Hen Turkey Prices and Revenues[a]
With Demand Increased Five Percent
With 1972 Forecasts

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	18.89	23.44	137	170
Februarly	19.34	22.55	193	226
March	19.21	22.39	110	128
April	18.96	22.02	164	191
May	19.19	22.39	179	209
June	18.75	22.00	246	289
July	18.85	22.14	646	758
August	19.89	23.39	1341	1577
September	21.15	25.03	1641	1942
October	21.97	26.06	1587	1882
November	22.61	26.92	983	1170
December	20.44	24.42	743	887
Year	20.68	24.47	7976	9435

[a]deflated values, 1961 = 100.
[b]with demand shifted +5%.

would probably be proportional to its market share. However, no attempt was made here to propose a system for sharing development expenses, but only to show the potential gain in producer prices and revenues.

Case 5: Tom Turkey Demand Shift

In order to explore the possibility of increasing prices and producer total revenue through a market development program for tom turkey meats the demand curves were shifted five percent, other things held constant. The 1971 Canadian weighted average price was predicted to be 22.72

(30.55) cents per pound and the total revenue was estimated to be 19.5 (26.3) million dollars (Table 40). Similarly, the 1972 deflated Canadian weighted average price was estimated to be 22.83 (31.38) cents per pound and the total revenue was estimated to be 19.5 (26.8) million dollars, (Table 41).

Summary of Market Development Implications

If a market development program had been undertaken that generated a five percent increase in demand, substantial gains in producer prices and revenues of about 25 to 30 percent appear to be realistic, if the quantity marketed could have been regulated at or near the levels for 1971 and 1972. Although it was not analyzed, it may be possible to increase both price and quantity of poultry meats when the demand curves were shifted. Particular methods of achieving estimates of potential gains were not within the scope of this study but the calculations undertaken do provide a guideline for the types of gains that might be achieved from an effective market development program. Likewise, the value of poultry meats could be increased and various cut up parts and pre-cooked meats could be held in cold storage, and be ready for immediate delivery to consumers. With the advent of new prepared dishes and cooking practices it might be possible to increase hen and tom turkey meats consumption in the period from January to July. Any market development program

undertaken, should be done with the co-ordinated efforts of the various poultry boards, as well as in conjunction with the various government departments, and processing and food outlets to insure a successful program.

Table 40

Tom Turkey Prices and Revenues[a]
With Demand Increased Five Percent in 1971

Month	Actual Price	Estimated Price[b]	Actual Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	19.02	23.32	426	522
February	18.62	22.70	313	382
March	17.59	21.36	377	458
April	17.69	21.03	425	505
May	17.80	21.14	482	572
June	18.70	21.43	727	832
July	17.70	21.04	1258	1496
August	17.05	20.99	2026	2495
September	17.53	22.90	2993	3910
October	18.28	24.45	2728	3648
November	17.86	24.05	2416	3253
December	18.06	22.68	1170	1468
Year	17.83	22.72	15347	19547

[a]deflated values 1961 = 100.
[b]demand shifted +5%.

Table 41

Tom Turkey Prices and Revenues[a]
With Demand Increased Five Percent
With 1972 Forecasts

Month	Forecasted Price	Estimated Price[b]	Forecasted Total Revenue	Estimated Total Revenue[b]
	¢/lb.		$000	
January	18.77	23.60	336	423
February	18.20	22.98	245	309
March	17.05	21.62	292	371
April	16.71	21.30	321	409
May	16.53	21.16	461	591
June	16.78	21.58	587	755
July	16.41	21.20	1049	1356
August	16.17	21.00	2018	2621
September	17.56	22.92	3148	4108
October	18.66	24.47	2924	3833
November	18.28	24.07	2595	3419
December	17.28	22.86	1007	1332
Year	17.51	22.83	14989	19532

[a]deflated values, 1961 = 100.

[b]demand shifted +5%.

CHAPTER VI

LIMITATIONS, CONCLUSIONS AND IMPLICATIONS

The results obtained in this study indicate several important implications of market regulation for poultry meats in Canada. The study was undertaken to show the potential role that the marketing boards might have as a unified organization working to co-ordinate and strengthen their regulatory powers. The conclusions and implications illustrate the effects on total revenue through alternative levels of production, and distribution throughout the year and alternative pricing strategies within a given framework of demand. Some of the limitations of the study are discussed in this chapter, followed by a review of the major conclusions and implications reached in this study.

Limitations of the Study

The analysis has not considered the effects of joint regulation of poultry meat in pricing and volume strategies. The substitutability of poultry meats such as broiler chicken and roaster chickens might be quite high. A recent production study indicated that broilers are being marketed at heavier weights,[1] and in turn might be substituted for

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[1] J. C. Flinn, Economic Choices in Broiler Production, Department of Agricultural Economics, The University of Guelph, Publication No. AE71/1, 1971, p. 23.

lighter weight roasters. Furthermore, the analysis makes no attempt to draw any conclusions about individual provincial producer profit levels, but assumes that if total revenue increases, other things being equal, each producer would benefit from the supply management regulation. Likewise, the analysis assumes that biological production can be altered in order to regulate the marketings at constant rates, without increasing production costs for broiler chickens, roaster chickens and broiler turkeys. Another limitation of the analysis was that it was applied only at the producer level and no attempt was made to determine the effects of price and/or quantity regulation on the retail level.

The statistical significance of some of the variables used in the demand specifications derived by Lee for the five categories of poultry meats places a set of limitations on the reliability of the results obtained in the analysis. For example, in the case of roaster chickens the regression coefficient for inventory was insignificant and this meant that the inventory reduction analysis was questionable. On the other hand, the regression coefficient being not significantly different from zero could be an indication of the fluctuation and instability of the price and inventory of roaster chicken.

Likewise, in the case of roaster chickens the dummy variable analysis, indicated that for the months of June, July, August, September, October, November and December the

regression coefficients were insignificant and this might indicate that the model was incorrectly specified to show that price was associated with a monthly rather than a semi-annual or quarterly demand model for roaster chickens.

Another limitation of the analysis was the forecast values of the 1972 input data needed to simulate the market regulation analysis. A comparison of actual 1972 data with the forecast data reveals that some of the forecasts are not completely accurate and in some cases the error tends to accumulate. For example, the broiler chicken inventory forecast results were bias upward due to the fact that the forecasting technique used was unable to take into consideration the regulation of output for 1972 which in turn would affect the magnitude of the inventory forecasts. Likewise, the forecast values for tom turkey inventory were bias upward because the forecasting technique was unable to account for the short-run decision of the marketing boards to limit output by ten percent and thus cause tom turkey inventory to decline.

Finally, the analysis provided information on a range of characteristics of market regulation within a given framework of demand. In order to obtain this information a very large volume of input data was required and some weaknesses were apparent from data being unavailable. To the extent that certain types of data were not available, this places a limitation on the analysis. For example, optimal inventory allocation was not possible because storage costs were not

available for poultry meats. Likewise, a profit maximization analysis was not possible because cost data were not available in order to equate marginal cost with marginal revenue, and to obtain the optimal output and price for the various categories of poultry meat. The analysis was also limited to the national level due to the lack of data on interprovincial movements of poultry meats since 1965. Finally, errors in data collection and errors in model specification also placed a limitation on the analysis.

Summary of Major Conclusions

The information developed was of a suggestive nature implying that through a strong co-ordinated group action, the total revenue of producers could be stabilized and/or improved by the implementation of certain regulatory techniques. The organizational role of producer boards could be used to influence demand for poultry meats through market development program including those discussed within the study by the analysis and others to achieve higher prices and total revenues if output were regulated. In the five cases examined for poultry meats the following general conclusions apply:

1. More price or quantity stability could be introduced into the poultry meats economy in Canada for broiler chicken, roaster chicken and broiler turkeys by holding price or quantity constant at the average price or quantity throughout the year.

2. Stability could be introduced into the hen and tom turkey portion of the industry through a quarterly price setting mechanism or by adjusting the rate-of-flow within the year. The analysis indicated that a substantial gain in producer total revenue was possible if the volume strategy was used.
3. If demand could be shifted, then there is considerable latitude for improved producer prices and total revenue. The organizational role of the various boards could be further applied through such a program due to the fact that the boards would be working together and use only the best ideas of all the boards to plan and co-ordinate a market development program. Moreover, they would probably work with different power groups in society, for example, the federal and provincial governments, consumer associations and retail-wholesale trades to help develop new and better poultry products for consumption.

Summary Implications of Research Results

The supply management analysis for the five categories of poultry meats at the national level indicated that a greater degree of stability could be brought about in the industry. In the cases for broiler chicken, roaster chicken and broiler turkey meats, stabilization could be

achieved either by a pricing or quantity strategy that holds price or quantity marketed at predetermined constant levels throughout the year. In the cases of hen turkey and tom turkey meats, an orderly marketing scheme and quarterly price stabilizing scheme were found to improve the revenue situations for these meats. Moreover, the supply management techniques used were assumed to be implemented through the co-ordinated group action of all poultry boards.

The analysis also indicated that a market development program to shift demand to the right might materially benefit producers. The assumption employed in this analysis was that if demand were shifted by five percent, then producer price would be increased if the quantity marketed were regulated at the 1971 and 1972 levels. The profitability of a market development program to shift demand is unknown at the present time.[2] However, the analysis does suggest an upper limit of expenditures to shift demand as being the amount of the potential gain illustrated for the five categories of poultry meats in Chapter V.

Finally, there are a number of important areas for further research that the study tends to suggest. If producer marginal cost curves could be estimated, then an

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[2]At present the Manitoba Department of Agriculture in Co-ordination with the Manitoba Turkey Producers' Marketing Board are exploring the possibilities of further processing Manitoba Heavy Tom Turkeys. See: G. W. Epp, "Marketing Alternatives for the Manitoba Turkey Producers' Marketing Board," Manitoba Department of Agriculture, Winnipeg, March, 1972, (Mimeograph Report).

analysis under the assumption of profit maximization might be possible providing, in turn, valuable information on price and level of output for the boards to form regulatory policies for the various poultry meats. Likewise, if the products were jointly regulated a different set of supply management price and quantity strategies might have been arrived at. Further research is also needed in the area of market discrimination in order to establish the allocation of new regional quotas under a national agency allowable under Bill C-176.

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APPENDICES

APPENDIX I

PRODUCER MARKETING BOARDS IN CANADA

FOR POULTRY MEATS

Broiler Chicken Boards

1.	British Columbia Broiler Marketing Board	1961
2.	Alberta Broiler Growers' Marketing Board	1965
3.	Ontario Broiler Chicken Producers' Marketing Board	1965
4.	Saskatchewan Broiler Chicken Producers' Marketing Board	1966
5.	Nova Scotia Chicken Marketing Board	1966
6.	New Brunswick Broiler Marketing Board	1967
7.	Manitoba Chicken Broiler Producers' Marketing Board	1968

Turkey Boards

1.	Ontario Turkey Producers' Marketing Board	1965
2.	British Columbia Turkey Marketing Board	1966
3.	Saskatchewan Turkey Producers' Marketing Board	1966
4.	Alberta Turkey Growers' Marketing Board	1967
5.	Manitoba Turkey Producers' Marketing Board	1968

Combined Broiler Chicken and Turkey Board

1.	Federation des Producteurs de Volailles du Quebec	1971

APPENDIX II

IMPORT ORDERS TO RESTRICT MOVEMENTS INTO PROVINCES

Commodity	Date	Province
Eggs	May 11, 1970	Quebec
Broilers	August 24, 1970	British Columbia
Broilers	September 3, 1970	Ontario
Broilers	September 18, 1970	New Brunswick
Broilers	September 18, 1970	Nova Scotia
Turkeys	September 18, 1970*	Saskatchewan
Eggs	September 18, 1970*	Saskatchewan
Broilers	September 18, 1970*	Saskatchewan
Turkeys	September 24, 1970	British Columbia
Broilers	October 2, 1970**	Manitoba
Turkeys	October 13, 1970	Alberta
Broilers	October 15, 1970	Alberta
Eggs	October 16, 1970	Alberta
Eggs	January 4, 1971	British Columbia

* implemented October 23, 1970

** implemented October 26, 1970.

APPENDIX III

PROVINCIAL PLANS OPERATING UNDER PROVINCIAL LEGISLATION

Broiler Chicken Plans

1.	British Columbia Chicken Producers' Marketing Scheme	1961
2.	Alberta Broiler Growers' Marketing Plan	1965
3.	Ontario Broiler Chicken Producers' Marketing Plan	1965
4.	Saskatchewan Broiler Chicken Producers' Marketing Plan	1965
5.	Nova Scotia Chicken Marketing Plan	1966
6.	New Brunswick Broiler Growers' Marketing Plan	1967
7.	Manitoba Chicken Broiler Producers' Marketing Plan	1968

Turkey Plans

1.	Ontario Turkey Producers' Marketing Plan	1965
2.	British Columbia Turkey Producers' Marketing Scheme	1966
3.	Saskatchewan Turkey Producers' Marketing Plan	1966
4.	Alberta Turkey Growers' Marketing Plan	1967
5.	Manitoba Turkey Producers' Marketing Plan	1971

Combined Broiler Chicken and Turkey Plan

1.	The Quebec Poultry Producers' Joint Plan	1971

APPENDIX IV

ENABLING LEGISLATION FOR POULTRY MARKETING BOARDS IN CANADA

1.	Natural Products Marketing Act of Saskatchewan	1945
2.	Natural Products Marketing Act of British Columbia	1948
3.	Natural Products Grades Act of New Brunswick	1952
4.	Natural Products Marketing Act of Nova Scotia	1954
5.	Marketing of Agricultural Products Act of Alberta	1955
6.	Farm Products Marketing Act of Ontario	1960
7.	Agricultural Marketing Act of Quebec	1964
8.	Natural Products Marketing Act of Prince Edward Island+	1970
9.	Natural Products Marketing Act of Newfoundland+	1970
10.	Natural Products Marketing Act of Manitoba	1971

+No poultry producer marketing boards to-date.

APPENDIX V

CONVERSION TABLE FOR CALCULATION OF CURRENT VALUES

Month	CPI 1971	CPI* 1972
January	1.303	1.349
February	1.309	1.352
March	1.313	1.356
April	1.322	1.359
May	1.327	1.362
June	1.330	1.366
July	1.341	1.369
August	1.350	1.372
September	1.347	1.376
October	1.349	1.379
November	1.354	1.382
December	1.363	1.386

*1972 values are forecasted values

APPENDIX VI

U-COEFFICIENTS OF ENDOGENOUS VARIABLES IN POULTRY MEATS TSLS MODEL, 1963-1970

Variable	U-Coefficient
Broiler Chicken Equation (1)	
$PBRF_t$	0.01293
$PHTF_t$	0.01346
$INVBR_t$	0.05118
$PLBR_t$	0.01414
Roaster Chicken Equation (2)	
$PRCF_t$	0.01563
$PHTF_t$	0.01346
$INVRC_t$	0.08520
$PLRC_t$	0.01873
Broiler Turkey Equation (3)	
$PBTF_t$	0.01189
$PBRF_t$	0.00419
$INVBT_t$	0.06868
$PLBT_t$	0.01987
Hen Turkey Equation (4)	
$PHTF_t$	0.00583
$PBRF_t$	0.00419
$INVHT_t$	0.00714
$PLHT_t$	0.00631

APPENDIX VI

U-COEFFICIENTS OF ENDOGENOUS VARIABLES IN POULTRY MEATS TSLS MODEL, 1963-1970

Variables	U-Coefficient
Tom Turkey Equation (5)	
$PTTF_t$	0.00788
$PBRF_t$	0.00419
$INVTT_t$	0.01204
$PLTT_t$	0.00606

APPENDIX VII

FORECASTED VALUES VERSUS ACTUAL VALUES
OF VARIABLES USED IN 1972
SUPPLY MANAGEMENT FORECAST MODELS

Month	CPI Forecasted	CPI+ Actual	Population Forecasted	Population Actual*
			--------000----------	
January	134.9	136.7	22144	-
February	135.2	137.3	22277	-
March	135.6	137.4	22410	-
April	135.9	138.2	22544	-
May	136.2	138.3	22677	-
June	136.6	140.2	22810	22845
July	136.9	141.4	22943	-
August	137.2	-	23076	-
September	137.6	-	23210	-
October	137.9	-	23343	-
November	138.2	-	23476	-
December	138.6	-	23609	-

- not available

* D.B.S., Population Clock Estimate June 1, 1972.

+ D.B.S. 62-002 Prices and Price Indexes

APPENDIX VII

FORECASTED VALUES VERSUS ACTUAL VALUES
OF VARIABLES USED IN 1972
SUPPLY MANAGEMENT FORECAST MODELS
(CONTINUED)

Month	Forecasted PBRR	Actual* PBRR	Forecasted PHTR	Actual PHTR	Forecasted PHF	Actual** PHF
	¢/lb.		¢/lb.		$/cwt	
January	36.62	39.83	34.02	34.58	22.15	20.84
February	36.54	38.30	33.87	36.15	22.09	22.39
March	36.46	38.05	33.72	36.60	22.04	22.01
April	36.38	37.53	33.57	37.21	21.98	21.52
May	36.30	38.84	33.42	37.85	21.92	22.37
June	36.22	-	33.27	-	21.87	22.36
July	36.14	-	33.12	-	21.81	22.39
August	36.06	-	32.97	-	21.75	-
September	35.98	-	32.82	-	21.69	-
October	35.90	-	32.67	=	21.64	-
November	35.82	-	32.57	-	21.58	-
December	35.73	-	32.37	-	21.52	-

- not available
* Calculated from D.B.S. 61-002, Prices and Price Indexes, Ottawa, Information Canada, Monthly Report, 1972.
** Estimated from Marketing and Trade Statistics.

APPENDIX VII

LANDED PRICES FOR CHICKEN

(CONTINUED)

Month	Forecasted PLBR	Actual* PLBR	Forecasted PLRC	Actual PLRC
	-----¢/lb.----------		-------¢/lb.--------	
January	26.70	26.95	26.31	-
February	27.55	28.00	26.27	-
March	27.51	27.65	26.23	-
April	27.46	27.25	26.19	-
May	27.42	27.75	26.15	-
June	27.38	28.75	26.10	-
July	27.33	29.25	26.06	-
August	27.29	27.85	26.02	-
September	27.25	27.42	25.98	-
October	27.20	27.00	25.94	-
November	27.16	26.75	25.90	-
December	27.12	27.30	25.85	-

- not available

* Chicago Board of trade - Commodity futures prices reported in Wall Street Journal.

APPENDIX VII

LANDED PRICES FOR TURKEY

(CONTINUED)

Month	Forecasted PLBT	Actual+ PLBT	Forecasted PLHT	Actual** PLHT	Forecasted PLTT	Actual** PLTT
	¢/lb.		¢/lb.		¢/lb.	
January	33.86	-	31.90	-	32.45	-
February	33.82	-	30.57	-	32.41	-
March	33.77	-	30.04	-	32.37	-
April	33.73	-	31.78	34.50	32.34	33.50
May	33.68	34.75	31.25	-	32.30	-
June	33.64	-	30.75	-	32.26	
July	33.60	-	31.29	-	32.23	-
August	33.55	-	31.74	-	32.19	-
September	33.51	-	30.95	-	32.15	-
October	33.46	-	31.25	-	32.11	-
November	33.42	-	31.14	-	32.07	-
December	33.35	-	31.07	-	32.03	-

- not available

+ C.D.A. - "Broiler Turkey" in Poultry Market Report, Weekly Report No. 21, June 2, 1972, Ottawa, Information Canada, 1972.

** C.D.A. - "Heavy Turkey" in Poultry Market Report, Weekly Report No. 16, April 28, 1972, Ottawa, Information Canada, 1972.

APPENDIX VII

BROILER CHICKEN INVENTORY

(CONTINUED)

Month	Actual 1970	Actual 1971	Actual* 1972	Forecasted 1972
	----------000 lbs.----------			
January	13705	22402	16096	16660
February	13091	20840	17528	16790
March	12616	20617	15205	16919
April	14153	17194	13662	15050
May	14240	18166	13615	15179
June	14161	17353	13194	15709
July	14900	16563	11496	15439
August	14631	16001	-	16569
September	15217	15385	-	14699
October	16088	15075	-	15829
November	19445	13748	-	15959
December	20142	13547	-	16089

* C.D.A. Poultry Market Report, Weekly Reports, Ottawa, Information Canada, 1972.

APPENDIX VII

ROASTER CHICKEN INVENTORY

(CONTINUED)

Month	Actual 1970	Actual 1971	Actual* 1972	Forecasted 1972
	----------000 lbs.----------			
January	6806	8031	3372	4286
February	6909	8451	4470	5311
March	7479	8218	3780	4335
April	7331	7927	3140	4360
May	7209	7480	3743	4384
June	6780	6502	4401	4409
July	6669	5183	4395	4433
August	6943	4285	-	4583
September	7050	3311	-	4327
October	6752	3050	-	5072
November	8062	2867	-	5317
December	8265	4007	-	5566

* C.D.A., Poultry Market Report, Weekly Reports, Ottawa, Information Canada, 1972.

APPENDIX VII

BROILER TURKEY INVENTORY

(CONTINUED)

Month	Actual 1970	Actual 1971	Actual* 1972	Forecasted 1972
	----------000 lbs.----------			
January	3581	3211	4266	7047
February	6012	4354	5889	7091
March	6594	4718	6449	7136
April	4309	5723	3823	7180
May	5756	5472	4962	7225
June	4706	5368	4735	7269
July	4686	6804	5778	7314
August	5762	9133	-	7358
September	7005	10287	-	7403
October	6116	9110	-	7447
November	4049	6869	-	7492
December	5636	6584	-	7536

*C.D.A., Poultry Market Report, Weekly Reports, Ottawa, Information Canada, 1972.

APPENDIX VII

HEN TURKEY INVENTORY

(CONTINUED)

Month	Actual 1970	Actual 1971	Actual* 1972	Forecasted 1972
	----------000 lbs.----------			
January	7565	8567	6028	4292
February	8026	8193	7396	4321
March	8032	8373	7459	4350
April	5778	8316	4842	4379
May	5664	6677	5131	4408
June	5170	7169	4436	4438
July	5359	7722	4986	4467
August	7803	10046	-	4497
September	13433	15487	-	4528
October	18025	20730	-	4558
November	21017	21809	-	4589
December	24761	22519	-	4620

C.D.A., Poultry Market Report, Weekly Reports, Ottawa, Information Canada, 1972.

APPENDIX VII

TOM TURKEY INVENTORY

(CONTINUED)

Month	Actual 1970	Actual 1971	Actual* 1972	Forecasted 1972
	000 lbs.			
January	13681	18631	17395	19179
February	13223	18677	17148	19131
March	11341	17428	13863	19081
April	8443	15814	10869	19034
May	7008	14021	8585	18985
June	5232	12245	5519	18938
July	4242	11358	3836	18889
August	5105	13662	-	18840
September	12127	19722	-	18793
October	19691	30687	-	18743
November	30265	35717	-	18696
December	37289	37192	-	18648

*C.D.A., Poultry Market Report, Weekly Reports, Ottawa, Information Canada, 1972.

APPENDIX VII

FORECASTED VALUES VERSUS ACTUAL VALUES OF VARIABLES USED IN 1972 SUPPLY MANAGEMENT FORECAST MODELS (CONTINUED)

Month	Forecasted PBRF	Actual* PBRF	Forecasted PRCF	Actual* PRCF
	¢/lb.		¢/lb.	
January	14.57	14.63	15.18	15.72
February	15.21	15.84	15.36	16.38
March	14.90	16.01	15.50	16.37
April	15.22	15.89	15.61	16.25
May	15.75	15.90	15.68	16.63
June	15.54	15.69	15.45	16.76
July	15.75	15.55	15.41	16.61
August	15.66	-	14.82	-
September	15.73	-	14.70	-
October	14.91	-	14.76	-
November	15.04	-	15.04	-
December	15.04	-	15.16	-
Year	15.29	-	15.22	-

- not available.
* Preliminary 1972 Data from C.D.A. Poultry Market Reports, Ottawa, Information Canada, 1972.

APPENDIX VII

FORECASTED VALUES VERSUS ACTUAL VALUES

OF VARIABLES USED IN 1972

SUPPLY MANAGEMENT FORECAST MODELS

(CONTINUED)

Month	Forecasted PBTF	Actual* PBTF	Forecasted PHTF	Actual* PHTF	Forecasted PTTF	Actual* PTTF
	----------¢/lb.-----		---------¢/lb.-------		--------¢/lb.--------	
January	17.40	16.64	18.88	17.19	18.78	17.92
February	16.81	18.02	19.34	18.20	18.20	19.11
March	16.26	18.92	19.21	18.19	17.05	18.92
April	16.23	18.60	18.96	17.88	16.71	19.50
May	15.83	18.79	19.18	18.79	16.52	21.64
June	16.00	17.47	18.75	17.47	16.78	20.32
July	16.28	16.97	18.85	17.85	16.40	18.74
August	16.40	-	19.88	-	16.16	-
September	16.84	-	21.16	-	17.56	-
October	16.65	-	21.97	-	18.66	-
November	16.90	-	22.61	-	18.27	-
December	15.90	-	20.45	-	17.27	-
	16.43	-	20.68	-	17.51	-

- not available

* Preliminary 1972 Data from C.D.A. Poultry Market Reports, Weekly Reports, Ottawa, Information Canada, 1972.

APPENDIX VII

FORECASTED VALUES VERSUS ACTUAL VALUES OF VARIABLES USED IN 1972 SUPPLY MANAGEMENT FORECAST MODELS (CONTINUED)

Month	Forecasted QBRS	Actual* QBRC	Forecasted QRCS	Actual* QRCS
	-------000 lbs.----		-----000 lbs.-------	
January	44401	40869	4887	4397
February	41126	41028	5167	4033
March	48768	48211	5037	5442
April	45559	44092	4220	5115
May	45929	43816	4894	4809
June	46483	54596	3805	6000
July	49637	46671	4062	3867
August	49390	-	3874	-
September	46610	-	5172	-
October	47294	-	4693	-
November	48962	-	5502	-
December	45072	-	5866	-
Year	559236	-	57185	-

- not available.
* Preliminary 1972 Data from C.D.A. Poultry Market Reports, Weekly Reports, Ottawa, Information Canada, 1972.

APPENDIX VII

FORECASTED VALUES VERSUS ACTUAL VALUES

OF VARIABLES USED IN 1972

SUPPLY MANAGEMENT FORECAST MODELS

(CONTINUED)

Month	Forecasted QBTS	Actual* QBTS	Forecasted QHTS	Actual* QHTS	Forecasted QTTS	Actual* QTTS
	-------000 lbs.-----		-----000 lbs.------		------000 lbs.------	
January	3989	4853	728	555	1793	2179
February	4754	4745	1002	428	1348	1100
March	7679	5943	573	1527	1717	1628
April	6319	4265	869	655	1923	1919
May	5553	5154	935	768	2794	1620
June	5033	7350	1315	1821	3497	2799
July	5413	4652	3426	4266	6398	6259
August	6696	-	6745	-	12481	-
September	5897	-	7758	-	17921	-
October	6881	-	7221	-	15661	-
November	7537	-	4348	-	14200	-
December	7882	-	3634	-	5828	-
Year	73640	-	38559	-	85568	-

- not available.

* Preliminary 1972 Data from C.D.A. Poultry Market Reports, Weekly Reports, Ottawa, Information Canada, 1972.