ANALYSIS OF CONTRACT INNOVATION ON THE WINNIPEG COMMODITY EXCHANGE: THE CASE OF CANOLA OIL AND CANOLA MEAL

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By

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WILLIAM ALLAN OAKLEY

A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

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ABSTRACT

ANALYSIS OF CONTRACT INNOVATION ON THE WINNIPEG COMMODITY EXCHANGE: THE CASE OF CANOLA OIL AND CANOLA MEAL.

By: William A. Oakley

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Developing and implementing new commodity futures contracts ranges between one and two million dollars. The need for good market research is essential to increase the probability of choosing the most successful contract.

The objective of the thesis is to review the methodologies for evaluating new commodity futures contracts. They are:

1. a general state of the industry approach.
2. the commodity characteristic approach to contract innovation.
3. the econometric approach to contract innovation.

The desirability of providing trading facilities for canola oil and/or canola meal futures contracts on the Winnipeg Commodity Exchange was then analyzed according to the methodologies reviewed.

The methods of analysis covers both qualitative and quantitative factors deemed important in studying contract innovation. The analysis takes into account past studies and presents a list of recommendations related to the desirability of the Winnipeg Commodity Exchange providing facilities for the trading of canola oil and/or canola meal futures.

The general market analysis indicates many significant changes and trends for canola oil and canola meal. The trends would tend to support the inclination for new futures contracts for oil and meal. Statistics relating to production, domestic consumption, exports, market standing, and the underlying futures contract all

indicate that the present situation is supportive for innovation.

The commodity characteristic approach supports the findings of the general market analysis. Six out of the seven criteria related to commodity characteristics would support contract innovations for canola oil and canola meal. The concerns of storage, grading, price volatility, homogeneity, non manufactured good, and natural and competitive market flow criteria are all supportive of successful futures trading. The criteria and analysis of sufficient market supply and demand, specifically market concentration is the only qualitative consideration that would not support the proposed innovation of the canola oil and canola meal futures contracts.

The econometric approach estimates potential trading volumes on the basis of past contracts introduced on the Winnipeg Commodity Exchange. Variables considered are related to relative residual risk of cross hedging as compared to own hedging, market liquidity, cash price volatility, and cash market size. For canola oil, based on past trends and observations, the model forecasts that the trading volume would be approximately 215 ten tonne contracts traded daily and 424 ten tonne contracts for meal. These average daily volumes are predicted to occur within the first three years of the contracts life cycle.

The principle recommendation of this thesis is that the Winnipeg Commodity Exchange should not attempt to innovate futures contracts for canola oil and meal at this time. This is not to suggest that the contracts under consideration will not generate sufficient trading volume for survival, but rather the limited resources that are available to be used for contract innovation be placed in an area that offers a higher probability of success.

In addition, it is recommended that the Winnipeg Commodity Exchange does not abandon thoughts of diversification or modification of their most successful contract. Options on the existing canola contract may provide considerable benefits.

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Chapter I

1. INTRODUCTION

1.1 History of Rapeseed in Canada

The Canola[1] industry in Canada is important for reasons of farm income enhancement, diversity of income sources, and its value added component due to crushing. In Canada, seed production alone has grown from a meager existence in the 1930's to its present stature of production for the 1988 cropping season of 4.1 million tonnes. This corresponds to a street value in excess of $1.4 billion dollars. Canola oil[2] constitutes over one third of all of the vegetable oils used in Canada. This oil is the major economic product derived from the seed. Canola meal represents over 57% of the original weight of the canola processed. It is an important secondary economic product.

Canada is the worlds second largest producer of canola only behind the Peoples Republic of China(see appendix A table 9). Other major producers are India, France, United Kingdom, and Poland.

Fred Solvoniuk, a Polish immigrant, was the first to grow canola on the North American Continent. However, the lack of marketing channels slowed its acceptance and spread throughout Canada. With the beginning of World War II, the traditional supplies of European grown canola were blocked. Concurrently, demand had dramatically increased because canola oil was needed as a steam engine lubricant. National defence required added supplies and the Wartime Agricultural Supply Board requested that Canada escalate its production of canola.

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[1] The name "Canola" represents rapeseed varieties with less than 3 mg/g glucosinolates in its meal and with less than 5% euric acid content in its oil.

[2] "Canola" will be used for the remainder of this study as it refers to canola and other varieties of rapeseed.

In 1942, Government owned experimental farms were supplied with enough seed stock to propagate sufficient quantities for wider scale plantings. Given guaranteed high target prices and government contracts that ensured sales for all production, the farming community became involved in large scale canola production. By 1948, Canadian canola production climbed to 29,000 tonnes from almost nothing in 1942.

However, this prosperity was short lived. With the end of World War II, the Canadian Wheat Board removed its system of guaranteed prices and allowed canola prices to find their market clearing equilibrium level. This equilibrium price was less than 3 cents per pound. As well, steam engines were being phased out and replaced by diesel power for which canola oil was not an acceptable lubricant. This all contributed to the declining demand. By the beginning of the 1950's, canola plantings in Western Canada was below 500 acres.

By 1958, export markets for both edible oil products and industrial oils had developed in Canada. Since this time, Canadian canola production has grown to its current level of approximately 4.1 million tonnes annually. Canola is now second only to wheat in terms of cash returns to farmers. Estimated annual production value for the 1988 fall season is in excess of $1.4 billion dollars.

1.2 History of The Winnipeg Commodity Exchange[3]

The Winnipeg Commodity Exchange was first organized in 1887 to provide a meeting place for buyers and sellers of grain. Its objective was to set out regulated, mutually agreeable rules of trade and communication facilities which would link Western Canada with the rest of the grain trading world.

Originally the Exchange was located in the basement of the Winnipeg City Hall. This

[3] For an extensive history of the Winnipeg Commodity Exchange please see Levine.

facility was a call market which is considered to be the forerunner to the modern futures markets. In 1892 the Exchange moved to a new location on Princess Street. 1903 saw the exchanges first futures contract for wheat began trading. Oats and flaxseed futures followed in 1904. Barley futures were introduced in 1913 and rye in 1920. However, due to wartime measures, the wheat futures trading was temporally suspended from 1917 to 1920.

Since this time, the Exchange has operated within an open market marketing system as well as under the current environment which includes pooled price marketing and regulation under the Canadian Wheat Board, the Canadian Grain Commission, and the Federal Grain Futures Act. Even under this cloak of regulation, the Exchange has prospered. Contracts for barley, corn, wheat, oats, potatoes, feeder cattle, rapeseed, rye, flax, silver, gold, treasury bonds, treasury bills, and options on gold have traded.

Today the Exchange is currently located in the Commodity Exchange Tower and is considered the largest agricultural exchange in Canada and the sixth largest exchange in North America. In 1987 a record of 2.4 million futures contracts were traded with a value in excess of $9 billion. Canola futures trading also established a new record in 1987 of 1.3 million contracts. In 1988, the recording of contract trading volume was amended. Pit trades are now used by the Winnipeg Commodity Exchange. For 1988, the level of pit trades were in excess of 1.7 million contracts.

After 101 years, the Exchange is central to commercial activity and at the hub of the private grain industry in Canada. It is a significant contributor to this countries heritage and to the growth of the Canadian grain trade (see Levine 1987).

1.3 Futures Markets

Futures markets were initially developed to provide both buyers and sellers of agricultural commodities improvements in their selling and purchasing practices. A futures contract is a legally binding commitment to either make or take delivery of a given quality and quantity of a commodity at a mutually agreed upon price at a specified date in the future. As well, the time frame in which the contract is to be executed is set out. In Canada, futures markets are self regulated, regulated by the federal government under the Grain Futures Act, and by the Manitoba government via the Manitoba Securities Commission.[4]

1.3.1 Functions of Commodity Futures Markets

In traditional terms, the function of commodity futures markets is to provide a vehicle where market participants can either assume risks or seek to avoid risks. These risks are associated with fluctuating market prices. However this is only a simplistic description of the functions of an exchange. Although the traditional view of the function of futures markets is the provision of price insurance, there exists other reasons for the use of these markets. The following list is a synthesis of various authors view on the economic functions of futures markets.

Six economic functions of futures markets:[5]

1. provision of public information.
2. prediction of prices into the future.
3. the ability to exchange risk of price fluctuations to the risk of basis fluctuations.
4. enhancement of the financing of inventories.
5. allocation of supplies over time.
6. pricing of future transactions.

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[4] For further elaboration on the mechanisms and intricacies of futures markets please see Carter and Loyns (1986), and the Chicago Board of Trades Commodity Trading Manual (1985).

[5] For further elaboration please see Keynes (1930), Working (1970), Martin (1983), Carter (1985), Stein (1986).

1.3.2 Market Participants.

In general there exists two broad classes of future market participants: hedgers and speculators. Hedgers are those who attempt to decrease the price risk associated with owning a commodity. Hedgers use futures markets as a means of risk protection against value loss due to adverse price fluctuations. The practice of risk reduction involves a purchase or sale for future delivery as a temporary substitute for a merchandising transaction to be made later.

Speculators on the other hand assume such price risks for which hedgers are trying to avoid. The speculators objective is to anticipate price changes and through market activities derive profits. This procedure is completely separate from the operations of production, processing, marketing, or handling of the physical commodity. Speculators are crucial to a contracts success because these market participants provide the liquidity in the market that permits hedgers to put on and take off their hedges at relatively low costs (see Gray 1960a, Working 1967, and Working 1970). Hedgers and speculators are therefore assumed to be the major market participants.

1.4 **Objective and Scope of Study**

1.4.1 Statement of the Problem

The cost of developing and implementing new commodity futures contracts is in the area of one half to two and a half million dollars. The need for good market research is essential (see Marton 1984, Sandor 1973, and Silber 1981). Considerable man hours and limited resources are expended in the areas of contract innovation. It is therefore apparent that these resources should be expended in the areas which offer the largest probability of returning adequate benefits to offset the innovation costs. Therefore, market studies have an important role in future contract innovations.

1.4.2 Objective

The objective of this thesis is to determine the desirability of providing facilities for the trading of canola oil and/or canola meal futures contracts on the Winnipeg Commodity Exchange.

The analysis will consist of three methodologies related to the theory of contract innovation. They are;

1. a general state of the industry study.
2. the commodity characteristic approach to the theory and study of contract innovation.
3. the econometric approach to the theory and study of contract innovation.

The range of analysis will cover both qualitative and quantitative factors deemed important to the study of contract innovation. The analysis will take into account past studies related to this matter and terminate with a list of recommendations related to the desirability of the Winnipeg Commodity Exchange providing facilities for the trading of canola oil and/or canola meal futures. Potential direction for further research will also be provided.

1.5 Organization of the Study

The study will consist of four chapters. The final objective will be to determine the desirability of providing facilities for the trading of canola oil and/or canola meal futures contracts on the Winnipeg Commodity Exchange.

Chapter I consists of the introduction. Included is a historic and general discussion on futures markets, the problem statement, and an objective statement.

Chapter II consists of a literature review and theoretical considerations.

Chapter III consists of the market analysis portion of the thesis.

A summary is presented in chapter IV. This summary contains the conclusion and recommendations of the study.

Chapter II

2 Literature Review and Theoretical Considerations

2.1 Introduction

Since the advent of the first commodity futures market, economists and exchanges alike have been puzzled as to why some contract innovations succeed and others fail. Failure is described as insufficient market interest and trading volume. It has been estimated that from 1921 to 1983 over 180 different futures contracts existed in the United States alone. However the failure rate of these contracts approaches 80% (see Carlton 1984). The intent of this chapter is to review relevant literature which has concentrated on the determinants of contract success.

From the available literature dating back to the 1910's, three approaches have been identified relating to theoretical considerations of contract success. The three approaches discernable from the available literature regarding contract innovation are;

1. the general market approach.
2. the commodity characteristic approach.
3. the econometric approach.

These qualitative methods (1 and 2) consist of a list of required factors that at some time where deemed necessary and sufficient for a successful innovation. However, only a selected number of these factors have remained significant.

The third approach, the econometric method, has evolved as a more recent synthesis of contract and commodity characteristics that have remained important over time. The econometric analysis considers changes that have occurred since the derivation of the first two approaches and forms a synthesis of the remaining significant factors. This method can therefore be considered the eclectic theory of futures market success.

2.2 The Commodity Characteristic Approach

Early researchers who studied futures markets success focussed on the nature of the commodity itself. Commodity characteristics were identified that, at the time were felt to be both necessary and sufficient for a successful futures market. These factors were found to be lacking in markets without a futures market but present for those commodities which had a futures market.

Traditional studies list the following attributes as both necessary and sufficient for a commodity to have a successful futures market (see Baer and Woodruff 1929, Baer and Saxon 1949, Kohls 1967, and Sandor 1973).

1. the commodity must be able to be stored and be durable within storage.
2. the commodity must be accurately weighable and be a non-intellectual good.
3. the commodity must have sufficient price volatility.
4. the commodity must be homogeneous.
5. the commodity must be a basic, non manufactured good.
6. supply and demand for the commodity must be sufficiently large.
7. the commodities supplies must flow naturally to a competitive cash market with low delivery costs.
8. the commodities forward contracting procedure must be inefficient or non existent.

The rationale for the inclusion of each of these attributes is as follows.

2.2.1 Durability and Storability

One of the economic functions of commodity futures markets is that of allocating supplies overtime. Holders of sufficient quantities of a commodity have the choice of either selling it now or holding it in storage for future sales. Storage is possible only if the quality and value of the good does not deteriorate while it is held in storage.

In the early years of futures trading this storage criteria was an important parameter for a markets success. This non-perishability rule was supported by the facts that such contracts as grains, cotton, coffee, silk, tin, cocoa, and rubber were successful. However as technology and public perception changed, this attribute became less important. Technical advances allowed previously unstorable and perishable commodities to be stored without the problems of rancidity and quality degradation. Refrigeration, dehydration and vacuum sealing all contributed to extending a commodities life cycle. Futures markets in eggs, butter, broiler chickens, pork bellies, and frozen orange juice are examples of technology produced futures contracts.

2.2.2 Accurate Grading and Weighing

Another commodity characteristic deemed important by many researchers is that of homogeneity. It is generally accepted that most commodities have various qualities, purities, or varietal characteristics. These differences are often to great for commercial buyers and sellers to ignore. Therefore, for trading to occur between buyers and sellers, either the goods need to be visually inspected or they must be accurately and impersonally graded.

It is important to realize that futures markets trade only highly standardized contracts. Futures contracts are highly uniform and well specified commitments for a carefully described good for delivery at a specific time and in a certain manner. For a contract to be trusted and therefore used by market participants, grades must be able to accurately designate classes with little variation in desired characteristics. Furtell (1970a and 1970b) associates this inability to accurately and confidently grade live cattle as a major factor contributing to the failure of the live cattle futures market in the United States. This live cattle contract specified delivery of choice steers. However, choice steers is a category that includes a wide variety of quality and weight combinations. This created a problem because cash prices for the deliverable cattle covered a broad range corresponding to the different combinations while there was only one futures price.

Therefore it is believed that a necessary condition for a contract innovation to be successful is that there must exist the ability to accurately and with a great degree of confidence designate standard grades for that commodity.

2.2.3 Price Volatility

The degree of cash price volatility is one of the attributes that has remained important over the years. It has remained important due to the fact that this volatility is critical to attracting both hedgers and speculators (the primary market participants). Price volatility is exactly what hedgers are trying to protect themselves from. Conversely, this same price volatility is what speculators require in order to derive a profit for the provision of liquidity services. It can be assumed and tested that markets with low price volatility provide little incentive for hedgers or speculators to enter that market.

A study performed by Telser and Higinbotham provides us with evidence to support this conclusion (see Telser and Higinbotham 1977). By studying 51 commodities, they concluded that the most actively traded commodity contracts were those with the most variation in their annual and monthly cash prices. They also found that as the price volatility ranking decreased, the trading volume of various contracts correspondingly fell. This led to the conclusion that there is a strong positive correlation between cash price volatility and volume of trade in a specific futures contract.

2.2.4 Homogeneity

The concept of homogeneity is related to the concept of standard grades. However there is a distinction between the ability to specify a standard grade of a given commodity from the results of an implemented grading system.

A necessary condition is that a grading system for a commodity must be both standardized and homogeneous within grades for a contract innovation to succeed. The prerequisite of both standardization and homogeneity is that commodity grades must exist with a high degree of market acceptance and confidence. Otherwise, market participants will be wary of using a newly innovated futures contracts. Futures market participants would not agree to deliver or accept delivery of an unidentified form. The homogeneity criteria within grades is essential for accurate descriptions of grades and market participants trust.

2.2.5 Basic Non Manufactured Goods

The idea of only basic non manufactured goods as potential futures market innovations dates back to the early 1900's. The problem of manufactured goods reflect the concerns of distinctive designs, colors, styles, or compositions which would destroy the homogeneity and gradability of the set of similar goods. A futures contract specification would not be able to capture all the differences in quality made possible through manufacturing. This lack of homogeneity due to the manufacturing process would therefore require the buyer of such a good to visually inspect the merchandise prior to contracting between parties. This is believed to be sufficient to ensure that a futures market for a manufactured good would fail.

This criteria however has proven to be untrue in the case of plywood. Plywood is a prime example of a manufactured good whose futures market innovation was successful. Plywood is manufactured by the process of cutting, mulching, gluing, and forming of the primary product wood. The question that therefore must be asked is not whether a good is considered a manufactured or a primary good but rather if it is homogeneously gradable. The homogeneity and grading criteria has been previously been discussed in section 2.2.4 and 2.2.2.

2.2.6 Sufficient Supply and Demand

The ideology of that a broad cash market being necessary for contract success is not a new or difficult concept to comprehend. Firstly, a broad cash market provides a potentially larger number of market participants from which to draw participation. Secondly, a large market supply of the commodity makes establishing market dominance difficult for one or a small number of people or firms. Finally, a significant level of market supply and demand fosters a continuous meeting of market forces which in turn leads to efficient price discovery. These three factors help market participants build confidence and trust in the system which in turn leads more entrants to the market place.

2.2.7 Natural and Competitive Market Flows

The ability for a good to move freely and efficiently to market is critical to the success of any futures market. Two aspects related to this free movement is the considerations of competition or government intervention and delivery costs.

Anti competitive forces such as restrictive government involvement, monopolies, or cartels who control available supplies would greatly influence, through their marketing activities, natural market prices. This is believed to be sufficient to warrant against a futures market in that area. Barer and Woodruff (1929) outline a situation of effective control of the market which would enable the manipulation of prices. This effective control would prevent the efficient operation of a futures market. A Canadian example of this type of monopolist control would be that of the Canadian Wheat Board. The Canadian Wheat Boards effective control over exports of wheat, oats, and barley prevents the natural meeting of market supply and demand of these goods. These actions therefore precludes future trading in these areas.

The second theoretical consideration relating to unrestricted supply is that of low delivery costs. Relatively low delivery costs promotes the convergence of futures and cash prices. This arbitrage is an essential parameter to the success of the futures market. Garbade and Silber (1983, pp.451-452) have found that "the incentive to undertake such (futures) transactions declines as a function of delivery costs. If those delivery costs are high, even relatively large cash futures price differences may not generate arbitrage orders. Therefore price convergence will not necessarily occur."

It is important to note that the option of cash settlement may enhance the convergence of cash and futures price even when delivery costs are high or possibly difficult to accomplish. Cash settlement, if an acceptable contract is able to be specified, can enhance efficient price conversion and must be considered for potential new contract innovations.

2.2.8 Breakdown of Forward Contracting

A forward contract, like futures contracts, may provide similar economic benefits as these listed in section 1.3.1. However, satisfaction of each of these benefits are not the same. Forward contracting is a viable alternative to the use of futures markets that in some areas have become quite advanced.

Both Gray (1966), and Barer & Saxon (1949) discuss the specific examples of onions, potatoes, and coal which have a well developed forward contracting system available to commercial participants. They concluded that the existence of these well developed and used forward contracting channels may keep potential futures market participants out of a newly designed futures market. This has been attributed to the human natures reluctance to change.

2.2.9 Summary

The above discussion relating to the theory of the commodity characteristic approach to futures market innovation contains restrictive conditions that were at one time or are still considered relevant. However, overtime many of these attributes have either ceased to be or become less important. Technical advances in the area of storage has enabled futures trading in such commodities as frozen orange juice, frozen turkeys, pork bellies, and broiler chickens. Also, changes in the way grading is conducted and the manufacturing criteria has become less important. Plywood, a good which is manufactured and believed to be difficult to accurately grade with an adequate degree of homogeneity, has done quite well trading as a futures contract.

This is not intended to suggest that commodity characteristics are not an important consideration in the decision on whether or not to innovate a specific futures contract. However, it must realize that there are other factors important to explaining the theory of contract success.

2.3 The Econometric Approach

The econometric approach to the theory and study of futures contract innovation is a quantitative method which attempts to predict contract success. This is accomplished by analysis of potential futures contract trading volume prior to the actual innovation of the contract. This method draws a positive correlation between trading volume and contract success. It assumes new futures contract innovations success can be predicted from a model based on general market theory.

The model is a time series cross section regression based on the ordinary least squares with dummy variables estimation procedure. The dependant variable is trading volume and is explained by four independent variables. The functional form of the model is specified in such a way as to allow for interaction among the variables. Data from past contract innovations introduced on the Winnipeg Commodity Exchange is used for the model estimation.

The models hypothesis is that market participation in a particular futures market is a function of a number of factors that combine in a complex manner to produce annual trading volume. The most significant variables influencing trading volume are assumed to be the relative residual risk of the cross hedge market versus the own hedge (RRi), the liquidity of the cross hedge markets (Liq_i), the cash price volatility ($CPVol_i$), cash market size ($Size_i$), and residuals (e) (see Black 1986).

It is now appropriate to propose a testable model for the study of contract innovation. The specification of the model is designed to allow interaction among variables and is based on efficient cross hedge considerations, contract, and commodity characteristics historically deemed important to the theory of contract success and the importance of high trading volume.

The purpose of this econometric analysis is to provide information to evaluate a decision on whether canola oil and/or canola meal futures trading on the Winnipeg Commodity Exchange will be successful. However, there is a problem of choosing an appropriate dependant variable to measure success. A literature search reveals that past research by Carlton (1984), Sandor (1973), and Silber (1981) have equated success with a high level of trading volume. The choice of the dependant variable influences the choice of estimation technique and independent variables in the model. Trading volume will be used as the appropriate measure of success. Another important aspect of using trading volume as the dependant variable is that it will maintain a continuous non disjointed measure for success. This will therefore allow us to avoid estimation problems that would accompany a qualitative measure of the dependant variable.

It is now an appropriate time to specify the variables for the model that will be used to explain contract success. The independent variables are the exogenous variables that the Winnipeg Commodity Exchange may consider when choosing a commodity for market analysis and possible implementation for futures trading. The first set of independent variables to be considered are those which are related to efficient cross hedge considerations.

The efficient cross hedge considerations links the success of newly innovated futures contract with how well existing cross hedge markets serves and meets the needs of hedgers of the commodity. For the analysis, two quantitative measures will be used to characterize the efficient cross hedge considerations. These two measures will consider the reduction in price change risk in the commodity and the cross hedge markets liquidity.

The first independent variable will therefore consider the relative residual risk for a commodity if cross hedging is used as opposed to own hedging. This variable is intended to measure how much better a hedge reduces the risk of price fluctuation when the own futures market is used as opposed to a cross hedge futures market. This measure is therefore intended to compare the price risks borne by a hedger if the own hedge or the cross hedge market is used.

In the literature, the most dominate measure of risk reduction in a hedged portfolio is the variance for a regression equation when the changes in cash prices is related to futures price changes (see Ederington 1979). In other words, the r^2 obtained from the regression of ;

$$\text{Change cash price} = B_1 + B_2 \text{ [change futures price]} + e \qquad (1)$$

This analysis will focus not on how much of a risk reduction is available to a hedger, but rather the ratios of residual risk (amount of price change risk remaining) between cross hedges and own hedges will be considered. Residual risk, as described by Garbade and Silber (1983a, and 1983b), refers to the price change risk still borne by a hedger as compared to the lack of risk in a perfect hedge. Residual risk, the risk remaining from a perfect hedge, of a hedged portfolio can be measured by $1-r^2$.

Firstly, this relationship must be calculated for both the cross hedge market and the own hedge market before the relative residual risk measure can be derived for all commodities innovated on the Winnipeg Commodity Exchange in the last 25 years. The measure is stated in terms of price changes and daily data is used for the computations (see Working 1953A).

Data requirements for the relative residual risk variable include both cash and futures prices for both the own hedge and the cross hedge. The time period for the analysis starts with this independent variable and for all other independent variables at the start of trading of the innovation and lasts for the shorter of three years or until the contracts trading volume statistically approaches zero.

It is assumed that:

$$d \text{ Volume } i \,/\, d \text{ RRi} > 0 \qquad (2)$$

The partial derivative indicates the hypothesized effect that the relative residual risk (RRi) variable will have on a new innovated futures contracts volume. If a cross hedge exists that is as good as or better at reducing the risk of price fluctuations when compared to a newly innovated own hedge, failure of the new innovation is likely. Conversely, the opposite may be true as well. A higher residual risk from cross hedging (ie. a poor cross hedge) creates the opportunity for a successful innovation.

The second independent variable for consideration is that of the liquidity cost of using the own futures market rather than the best existing cross hedge market for a commodity. This liquidity cost variable is designed to capture relative costs of using the existing cross hedge futures market versus the own hedge futures market. Selected researchers such as Gray (1960b) have emphasized the cost aspect of hedging as one of the most important indicators of potential futures market success and efficiency.

Simplistically, transaction costs on any organized exchange can be considered the commissions, margins, and payments for liquidity services. Commissions and margins can be ignored for this type of analysis since the objective is to compare the costs of two hedging strategies and these costs can be assumed to be similar in both markets. The intention is therefore to measure the liquidity costs for futures trading. Two common measures are that of the spread between bid and offer quotes and market breadth.

A bid is an offer to purchase a futures contract at a specified price and an offer indicates a willingness to sell a futures contract at a given price. A narrow spread between the bid and offer quotes is characteristic of a market which is liquid. A wide spread is conversely characteristic of an illiquid market which is associated with high charges for liquidity services.

On the other hand, market breadth is described as the number of market orders that can be filled without influencing price. That is the size of a market order that can be accommodated without changing the price level. It is assumed that a market with high liquidity costs will fail to attract market participants.

However, bid offer spreads and the market breadth data is not currently available due to the fact that in most instances the data has never been collected or recorded. Therefore, average daily trading volume will be used as the proxy measure of market liquidity. It is assumed;

$$d \text{ volume } i / d \text{ liquidity } i < 0 \qquad (3)$$

Equation 3 indicates the hypothesized effect of the liquidity variable in the model. If the partial derivative is less than zero, it means that the more liquid the cross hedge futures market is (ie. the more efficient the cross hedge market is) the lower the probability of success of the new own contract innovation which is relatively less liquid and therefore less efficient. This result is due to the higher liquidity costs expected from a new, low volume market versus the established and typically more liquid cross hedge market.

Because it is assumed that hedgers compare the transaction costs between a newly innovated own hedge and the existing cross hedge market when choosing a hedging vehicle, it is important to consider market liquidity when studying futures contract innovation. Therefore a relative measure of liquidities between the newly innovated futures market and the existing cross hedge market is desired. The relative measure of liquidity is therefore measured by using the cross hedge market alone. This is due to the assumption that a newly innovated market is illiquid by definition. Therefore, average daily trading volume of the cross hedge futures market is used as the measure of liquidity costs.

The efficient cross hedge approach considers variables that are important considerations when analyzing potential futures contract innovation. However, these variables may be necessary but not sufficient when deriving an econometric model which considers the prediction of contract success. Therefore, variables which consider cash market size and cash price volatility will also be introduced.

For a more complete model for predicting futures contract success let the variable relating to the cash market price volatility be introduced (CPVol.). It is hypothesized that;

$$\text{d volume i / d cash price volatility i} > 0 \qquad (4)$$

Equation 4 indicates the expected effect of price volatility on contract trading volume. The partial derivative being positive indicates that the greater the volatility of cash prices in the market, that is the greater the need for a risk management tool, and therefore the greater the expected hedging and contract speculation.

The measure of cash price volatility that will be used for analysis will be the average daily coefficient of variation of cash prices for each commodity over there respective time periods for analysis. Past studies have tended to use the variance or standard deviation of changes in cash prices. These measures are not suitable due to the inconsideration of the sample means. When an absolute value of variance or standard deviation is presented by itself (that is without consideration of the sample means) the measures are difficult to interpret and compare across numerous samples which have significantly different mean values. Therefore the mean value of the sample must be considered for analysis. Standard deviation of samples will therefore be stated relative to their sample means (standard deviation / sample mean). This coefficient of variation shows the degree of variability of the sample relative to the mean value of the sample. This will allow for a more accurate analysis over samples which have differing means.

Therefore, the measure that is to be used will be a measure of the cash markets price variability and can be stated as;

$$\text{coefficient of variation} = \text{standard deviation} / \text{sample mean} * 10^2 \qquad (5)$$

The measure of cash price variability that will be employed in this study will be the yearly coefficient of variation of daily cash prices of the underlying cash commodity. It is expected that higher coefficient of variations will result in larger futures market trading volume.

The final independent variable to be considered in this model will be a measure that will consider the size of a contracts underlying cash market. The variable representing cash market size (Size) is therefore introduced. It is hypothesized that;

$$d\ \text{Volume}\ i / d\ \text{Size}\ i > 0 \qquad (6)$$

Equation 6 indicates the expected effect of the size of the cash market on the model. The partial derivative being greater than 0 indicates that the greater the size of the underlying cash market, the larger the potential pool of futures market participants and therefore potentially more interest in the new contract innovation. This assumption is supported by Cornell (1981). Cornell believed that when the Chicago Board of Trade introduced a futures contract whose underlying commodity was commercial paper, that the contract was almost assured to be a success due to the extra large amount of cash paper outstanding.

The measure used in the model is based upon an estimate of the potential number of market participants. Therefore the potential market interest in the newly innovated futures contract will be measured in terms of contract equivalent size. Contract equivalent size calibrates markets (ie. yearly pounds of potatoes harvested, dollar amount of commercial paper outstanding, liters of crude oil produced) into a common and comparable measure for analysis. To derive the contract equivalent size of each market under consideration, the annual size of each market in terms of their industry measure is divided by the size of the futures contract specification. This yields a measure across all commodities that is translated into a common unit of measure that is indicative of the potential number of yearly futures contracts outstanding for each of the commodities under consideration. It is expected that the larger the potential number of futures contracts available for a given commodity the better the chances of market success.

It is believed that the four independent variables of the model will interact amongst each other in their influence on the dependant variable volume. According to Black (1986)

> ... a 10% reduction in the relative residual risk from cross hedging versus own hedging (if) for example, the cross hedge improves, does not affect the expected decrease in volume the same if the cross hedge market is highly liquid versus relatively illiquid. The interaction is illustrated best by the extreme cases. If the residual risk were zero from a cross hedge, then a higher or lower level of liquidity should be irrelevant. Likewise, if cash price volatility is extremely low, then a higher or lower level of cross hedge liquidity is irrelevant, as is the size or relative residual risk measure.

In summary, a testable model with one dependant variable and four independent variables has now been proposed for formulation and testing. What is now required is the specification of the models functional form and the choice of estimation procedure.

It has been hypothesized that futures contract trading volume is a function of a measure of relative residual risks of cross hedging compared to own futures hedging, relative liquidity of cross hedging compared to own hedging, cash price volatility, and cash market size. It is assumed that the absolute size of the partial derivatives of the dependant variable contract trading volume with respect to the independent variables RRi, Liqi, CPVoli, and Sizei exceed zero.

The exact functional relationship of the model will be in a log-log format and may be expressed as follows:

$$\text{Ln Volume}_{ij} = B_1 + B_2 \text{ Ln } RR_{ij} + B_3 \text{ Ln } Liq_{ij} + B_4 \text{ Ln } CPVol_{ij} + B_5 \text{ Ln } Size_{ij} + e_{ij} \quad (7)$$

where;

Volume = the actual annual trading of commodity i over the jth year.
RRij = the ratio of residual risk for the cross hedge to the residual risk for the own hedge for commodity i over the jth year.
L ij = the relative liquidities of the cross hedge market and the own hedge for commodity i over jth year.
CPVolij = the cash price volatility for commodity i over the jth year.
Size ij = The size of the underlying cash market in contract equivalent terms of commodity i over the jth time period.
E ij = the random residual variable for commodity i over the jth year. This variable will pick up the effects of other factors that may influence trading volume. It will be assumed the residuals are normally and independently distributed about 0.

Theoretical consideration will be given to all contracts innovated since 1963 on the Winnipeg Commodity Exchange. This model has the beneficial property that it can be used for an out of sample prediction on the desirability of providing facilities for the trading of canola oil and/or canola meal futures contracts on the Winnipeg Commodity Exchange.

CHAPTER III

3. MARKET ANALYSIS

3.1 General Market Conditions

The canola industry in Canada has undergone significant changes in the last fifteen years. It is therefore timely that a study on the desirability of the Winnipeg Commodity Exchange providing trading facilities for canola meal and canola oil be made. The last time a study was preformed on this topic dates back to 1984 and was limited in its scope (see Tod 1984). Since the time of the last study, many factors have changed that may provide insight into the topic at hand.

3.1.1 Industry Statistics for Canola, Canola Oil, Canola Meal: Canada

The production of canola is undertaken almost exclusively in the prairie provinces. From 1963 to 1988, production of canola across Canada has increased from 190,000 tonnes to 4,636,000 tonnes. This increase in production corresponds to a 25 year annual production increase of 13.6%.(see appendix A table 2 and appendix B illustration 1).

The primary economic derivative of this seed production is that of the oil extracted from seed crushing. Since 1963, Canadian crushers have increased oil production from 146,000 tonnes to 633,000 tonnes. In terms of annual growth, the oil production turns out to be 16.3% per year.(see appendix A table 2 and appendix B illustration 1).

Canola meal, the secondary residual product obtained through the crushing process has also seen a significant production gain in the 25 year period. Production has increased from 20,700 to 892,000 tonnes. In terms of annual growth, the meal production has seen a yearly growth of 16.3%.

3.1.2 Domestic Disappearance of Canola, Canola Oil and Canola Meal

From 1963 to 1988, canola has had a positive gain in its level of domestic disappearances. In the 25 year period for consideration, there has been observed an average annual compounded growth rate of 17.5%.

Correspondingly, canola oil and canola meal over the period 1972 to 1988 has seen domestic disappearance increase from 109,000 and 164,000 to 329,000 and 448,000 respectively.(see appendix A table 2 and appendix B illustration 2).

3.1.3 Exports of Canola, Canola Oil and Canola Meal

Exports of canola and its byproducts have had similar trends to that of their levels of domestic disappearance. Over the time period 1963 to 1988, exports of canola to selected countries have increased from 120,000 tonnes to 2,126,000 tonnes. Since 1972, canola oil has also seen an increase in its level of exports. The level of exports have increased from 25,000 to 304,000 tonnes annually.

Canola meal exports have had a similar experience to that of oil as exports have increased from 19,500 to 444,000 tonnes over the 14 year period since 1972. (see appendix A tables 3,4,5 and appendix B illustrations 3,4,5)

3.1.4 AREA SEEDED

During the period 1973 to 1987, Canada has seen a steady increase in area of production of canola in Canada. There has been a 106% increase in hectares planted from 1297 to 2670 hectares. This corresponds to an average annual compounded gain of 5.3%.

In comparison, production has increased at an annual average of 8.5%. The majority of the increase in planted acres has occurred in western Canada with only limited increases in acreage and production in Ontario.(see appendix A table 7 and appendix B illustrations 6,7).

3.1.5 World Production of Oilseeds

On a global basis the production of all oilseeds has seen a fairly stable growth. Total production of all major oilseed across all major producers has increased from 120,031,000 tonnes to 198,010,000 tonnes in the period 1976 to 1987. This corresponds to a yearly average gain of 4.7%.

Canola, as a percentage of total world oilseed production, has fared fairly well. In 1976, the share of the worlds oilseed production attributed to canola was 5.8%. Recent figures indicate that canola now has a 11.1% market share of oilseed production. This corresponds to a dollar value in excess of $8.8 billion. Over this time period Canada has become more important in the worlds market place as a canola grower. Canadian market share of world canola production over the same time period has increased from 12.1% to 19.2% (see appendix A tables 8,9 and appendix B illustration 8).

3.1.6 Canadian Oilseed Comparison

In the period 1975 to 1984, there has been some fairly significant movements in the market shares of various vegetable oils across Canada. Canola has been the largest of the gainers of market share of the Canadian vegetable oil market. In this period its market share has increased from 32.7% to 54.5%. The only other oil which has shown positive growth in this area has been sunflowers which has seen a meager climb from 3.4% to 4% of the domestic market. Loosers of oil market shares over this period has been soybean, corn, palm,coconut, and peanut (see appendix A table 10 and appendix B illustrations 9 and 10).

When data from 1969 to 1984 is considered, it is seen that out of all oilseeds grown whose primary purpose is for vegetable oil production, canolas popularity has grown more than any of its competitors. In 1969 the canola harvest totaled 760,000 tonnes. When comparison is made to the 1984 figures it is seen that the harvest has increased 3,724,000 tonnes which corresponds to an increase in canolas market share of all vegetable oils from 48% to 70% (see appendix A table 10). Soybeans, canolas chief competitor in the oilseed market, has seen only a slight increase in market share of production from 11% to 17% over the same period. Flaxs market share has decreased from 41% to 13% (see appendix B illustrations 12, 13, and 14).

An easy comparison can be made by converting the production of all oilseed crops into oil equivalents at industry published extraction rates (see table 1).

It is evident that in terms of oilseed production, canola is the most important crop in terms of vegetable oil production and acreage planted in Canada.(see appendix A tables 10,11,12,13 and appendix B illustrations 9 through 24).

3.1.7 Crushing of Oilseeds and Production of Oils and Meals: Canada

It is now realized that both canola and soybean production and crushing have over the years increased in Canada. Over the last 15 years, a number of industry statistics can be observed (see table 2).

Table 1

Oil Equivalents

		Canola	Flax	Soybean
Oil Equivalents of Production (million of pounds)	1969	668	556	81
	1987	3284	588	435
Average Annual Compounded Growth (%)		8.75	.04	9.25
Market Share of all Oil Production	1964	51%	42%	6%
	1987	76%	14%	10%
Acres Seeded ('000 acres)	1969	2012	2341	322
	1988	8970	1410	1326
Market Share of Planted Acres	1969	43%	50%	7%
	1988	71%	16%	12%
Change of Market Share of acres Seeded (1969 to 1988)		65%	(68%)	70%

Table 2

CRUSHINGS OF OILSEEDS AND THE PRODUCTION OF OILS AND MEALS: CANADA

SELECTED INDUSTRY STATISTICS

		Commodity	
		canola	soybeans
crush ('000 bu)	1974	12050	23314
	1988	57522	35416
average annual compounded gain		11%	2.8%
oil production ('000 pounds)			
	1974	234286	241259
	1988	1182431	367436
average annual compounded gain		11.4%	2.8%
meal production	1974	179265	544351
	1988	674140	671528
average annual compounded gain		9.2%	1.4%
industry crush capacity	1974	1996 tonnes/day	
	1988	6470 tonnes/day	

total capacity increase of 224%

average annual compounded growth 8.8%

As well, industry crush capacity has also seen substantial changes. In 1974, the oilseed industry had a daily crush capacity of 1996 tonnes. Current industry statistics indicate that the current industry crush capacity is up to 6470 tonnes per day. This corresponds to an increase in the average daily crush capacity of 8.8% per year. (see appendix A tables 14 through 17 and appendix B illustration 25 and 26).

Historically, the major market outlet for Canadian oilseed oils and meals is domestic consumption. The majority of these products are marketed through eastern Canadian outlets. However, reliance on exports is growing at a terrific rate. Exports of total canola meal production has increased from 9.5% to 49.8% over the last 15 years. Exports of the total canola oil production has increased from 18.5% to 48% over the same 15 years.

3.1.8 Financial Situation of Canadian Crushers

Since the 1970's and progressing throughout the 1980's the financial condition of the Canadian canola crushing industry has deteriorated (see Task Force on the Future of Canola Crushing Industry In Western Canada: Financial Report). This brings up the question and the potential need for risk management tools and enhanced marketing of production for crushers. Often marketing tools exist but are not used due to the trait of human nature that wants to maintain the status quo and resist change. However, given the aforementioned financial situation of the Canadian canola crushing industry, it is logical to assume and easily test the acceptance or at minimum, consideration of any tools such as the innovation of futures markets for canola oil and or canola meal that may help an entire industry that appears to be in financial difficulty. From 1980 to 1985, return on invested capitol (ROI) ratios have been calculated for oilseed crushing plants across Canada (see appendix A table 18). ROI is a ratio that can be used to measure the performance of a firm or an industry which has large capitol investments. Its implications to this study are that it can be used to measure how effectively total assets are being used. This ratio was calculated as an industry average weighted by year and in total. In 1980, the industry calculated ROI ratio was 34.1%. In 1985, the ROI figure was (8%). With performance decreasing, it is believed that the Canadian crushers will be receptive on new futures contract innovations. This is due to the need for risk management and marketing tools for an industry whose returns are obviously on the decline.

Another available financial ratio is the debt/equity ratio (see appendix A table 19). The definition of the debt/equity ratio is that of a measure that indicates the extent to which the industry has been capitalized by debt. That is the contribution of creditors to the organizations or industries financing. The ratio has increased from .57 in 1980 to 4.07 in 1985. This indicates that the Canadian oilseed crushings industry is being financed more and more from debt capitol. This has the implication of placing crushers in a more risky financial situation. As with the declining ROI ratio, this provides indication of an increased need for a risk management tool to help crushers minimize market risks.

The third ratio for consideration is that of the current ratio (see appendix A table 20). This ratios purpose is to measure the ability to pay short term obligations. The current ratio measures the extent to which short term liabilities are covered by assets that can be turned into cash during the period which these liabilities must be met. In 1980 the current ratio for the canola crushing industry was 1.41. This ratio has now declined to 1.22 in 1985. The change in this ratio indicates that crushers as a whole are less able to pay off short term liabilities. They can therefore be considered to be in a more fragile position than they were 15 years ago. The implications of this declining ratio is similar to the two previously mentioned.

The fourth industry statistic under consideration is that of net income (see appendix A table 21). Net income is defined as the excess of all revenues and gains for a period over all expenses and losses of the period. For the canola crushing industry net income has decrease from $27,230,000 in 1980 to ($13,255,000) in 1985. This net loss is for the industry as an aggregate and means that improvements and capitol purchases are less likely to be undertaken. These figures provide an indication that the industry as a whole has suffered declining profits. Corresponding to net income often comes gross margin figures (see appendix A table 22). Gross margin is net sales less cost of sales. Over the same time period, the canola crushers gross margins have decreased from 15.4% to 6.2%. This indicates declining market control and gives further indication of need of marketing improvements in the industry.

3.1.9 Futures Market

An important consideration to the innovation of a canola oil and/or canola meal futures contract is that of the underlying futures contract. This underlying contract is the Winnipeg Commodity Exchanges canola futures market. This underlying contract has been trading since 1963 and is the most successful futures contract traded in Canada. Trading volume for this canola contract has increased over the last 25 years at an annual rate of growth of 18.7%. (see appendix A table 24, appendix B illustration 27). The open interest, defined as unliquidated purchases or sales has seen an 4.9% annual increase in the last 11 years. The canola contract currently traded on the Winnipeg Commodity Exchange is an important consideration when innovation of a canola meal and canola oil futures innovation is considered.

A complex of canola, canola oil, and canola meal offers unique opportunities. This triangular complex would allow for more complete risk management in the areas of inputs and outputs of crushers. An example of this is as follows. Occasionally, markets can be confronted with larger than usual canola prices. This would usually indicate tightening supplies and cause processing margin that may be unfavorable or negative. In this situation, the sales return on canola meal and canola oil in relation to seed prices is insufficient to allow for profitable processing. Rarely do plants shut down in such a situation due to high fixed operating costs, instead production slows and this together with the ability to reverse hedge operations in the futures market complex, tends to correct this unfavorable cost/price relationship. This decline in seed processing eases the drain on tight supplies and tends to curb the rising seed prices. At the same time, reduced processing will tend to lead to tighter supplies of oil and meal, increasing their prices. As the seed prices are held down, the cost/price relationship tends to reverse, and favorable processing margins are reestablished.

Opportunity to lock in input costs and output revenues and thus better choose production plans, would improve the decision making process, take away risk of unknowns, and provide the opportunity to choose and lock in processing margins.

3.1.10 Summary

In summary, a number of trends can be seen regarding canola and its by products markets. Over the last 25 years the production of canola, canola oil and canola meal have all seen dramatic increases. As well, the demand side has seen domestic consumption and exports rising. Production of the primary seed, crush capacity, and the actual crush of oil and meal have all seen gains.

The above indicates favorable conclusions regarding the objective of providing insight into whether or not futures markets for canola oil and canola meal markets on the Winnipeg Commodity Exchange can sustain sufficient trading volume.

3.2 Commodity Characteristic Considerations For Contract Innovation

Since the advent of the first successful commodity futures contract, economists and market analysts have been attempting to identify characteristics of commodities that are both necessary and sufficient to ensure the successful trading of that contract. A selected set of commodity based factors were lacking in markets without futures markets but present for commodities which had a futures market.

Traditional research studies list a set of attributes considered to be both necessary and sufficient for a commodity to have a successful futures market. Applying this methodology to canola meal and canola oil as the market circumstances relating them to the Winnipeg Commodity Exchange to provide an indication as to whether or not the canola oil and or canola meal futures contracts are suitable for futures trading.

3.2.1 Storability

Given one of the economic functions of futures markets being that of allocating supplies over time the concept of storage for seasonally produced goods becomes increasingly apparent. Assuming producers or owners of stocks of a given commodity have the choice of selling now or storing it for sale in the future. Working (1949) indicates that futures markets provide good market information relating to the value of a good into the future.

Applying this desirable criteria of durability and storability to the case of canola oil and canola meal yields favorable results. For the case of canola oil, it is known to be a very stable product with an extraordinary long shelf life when compared to substitute products. Canola oil is more stable than most vegetable oils. Its special properties can be protected when in storage by keeping it in a tightly covered container in a dark local. Refrigeration is not required.

Canola meal, like its sister product oil, is also a very storable commodity. Discussions with local crushers (CSP Winnipeg) indicates that canola meal stores better than its potential substitute soymeal. Canola meal resists sweating and binding up during prolonged storage periods due to its more granular appearance. Under favorable conditions, canola meal can be stored in excess of twelve months. In comparison, soymeal has a rated storage period of six to eight months.

3.2.2 Grading

The concept of grading is an important consideration with respect to contract innovation on any futures exchange. It is accepted that agricultural production of any commodity yields various qualities, purities or characteristics. However, futures trading requires accurate and consistently standard grades for the commodity (see Furtell 1970b).

Canola oil has an industry accepted grading system (see table 3). This system is based on scientific principles and neither provides advantage to buyer or seller. It is believed that these descriptions are impartial and a trusted measure by market participants. Market participants appear to trust the accuracy of this grading system for describing canola oil. This trust in the grading system would therefore prevent the need for inspection of goods for transactions.

Canola meal is the meal obtained after the removal of most of the oil. In Canada this extraction is done in crushing plants using a press solvent extraction

<u>Table 3</u>

CANOLA OIL

A) shall be the oil produced from the low erucic acid oil-bearing seeds of varieties derived from the Brassica napus L. and Brassica campestris L. species;

B) shall be refined, bleached and deodorized;

C) shall have

(1) a relative density (20^oC/water at 20^o) of not less than 0.914 and not more than 0.920;
(2) a refractive index ($n_D 40^oC$) of not less than 1.465 and not more than 1.467;
(3) a saponification value (milligrams potassium hydroxide per gram of oil) of not less than 182 and not more than 193;
(4) an iodine value (Wijs) of not less than 110 and not more than 126;
(5) an unsaponifiable matter content of not more than 20g/per kilogram;
(6) an erucic acid content of not more than 5% (w/w) of the component fatty acids;
(7) an acid value of not more than 0.6mg potassium hydroxide per gram of oil, and
(8) a peroxide value of not more than 10mEq peroxide oxygen per kilogram of oil; and

D) may contain oxystearin.

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standards will be promulgated under the Canadian Agricultural Products Standards Act.

method or a direct solvent extraction process. This meal, the byproduct of oil extraction from the whole seed, is either stored in a bulk form or a pelletized form with no less than 3 milligram equivalents of 3-buytenyl isothrocyanate per gram of oil free dried meal. This byproduct, as with the oil itself, is believed to be impartial and accurate describable. It is therefore accepted that inspection of canola meal is not required to complete transactions between buyers and sellers due to the ability to provide accurate descriptions.

3.2.3 Price Volatility

Price volatility is the third critical factor to both hedgers and speculators. The lack of such variation in market prices would not warrant the need for price insurance. Hedgers would therefore have no incentive to use the market. As well, speculators would have little chance to profit from fluctuating prices and therefore they too would have no incentive to use the market.

Analysis of the Canadian market between 1963 and 1965 indicates canola had a coefficient of variation (C.V.) of 7.23 (for comparison see table 4).[7] For the case of canola oil and canola meal in 1988, the C.V.s are 31.1 and 22.1 respectively. Comparing canola meal and canola oil cash price volatility with previous contract innovations show the volatility of canola oil and meal are very high thereby making futures markets appealing to both hedgers and speculators.

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[7] it is therefore apparent that the more successful innovations tended to have the higher C.V.'s. It can be seen from the table that canola oil and canola meal compare favorably with comparisons made to historic data.

Table 4

CASH PRICE VOLATILITY
for contract innovations on the Winnipeg Commodity Exchange

Year	Contract Innovation	Cash Market	Coefficient of Variation
1983	Alberta Barley	Barley	1.68
1974	Eastern Corn	Corn	4.14
1974	Domestic Wheat	Feed Wheat	4.86
1975	Domestic Wheat	Feed Wheat	4.50
1976	Domestic Wheat	Feed Wheat	6.94
1974	Domestic Oats	Feed Oats	4.97
1975	Domestic Oats	Feed Oats	4.13
1976	Domestic Oats	Feed Oats	12.69
1974	Domestic Barley	Feed Barley	3.75
1975	Domestic Barley	Feed Barley	5.94
1976	Domestic Barley	Feed Barley	7.28
1968	Maritime Potato	Potato	2.00
1967	Live Cattle	Cattle	2.33
1968	Live Cattle	Cattle	8.84
1969	Live Cattle	Cattle	3.95
1963	Vancouver Canola	Canola	1.20
1964	Vancouver Canola	Canola	4.12
1965	Vancouver Canola	Canola	10.20
1981	Silver 200oz.	Silver	13.96
1981	Gold 20oz.	Gold	3.92
1981	Long Term Bonds	Del. Bonds	2.11
1981	T-Bills	Del. Bills	1.24
1974	Gold 100oz.	Gold	9.11
1975	Gold 100oz.	Gold	9.11
1976	Gold100oz.	Gold	5.98
1972	Gold 400oz.	Gold	1.91
1973	Gold 400oz.	Gold	17.28
1974	Gold 400oz.	Gold	10.08
1988	**Canola oil**	**Canola oil**	**22.10**
1988	**Canola meal**	**Canola meal**	**31.10**

3.2.4 Homogeneity

The ability to accurately and consistently designate standard grades for a commodity is a necessary condition for successful futures trading. Futures market participants would not readily use a market where the acceptable grade(s) for delivery had a wide variation in acceptable characteristics which they have no control over. The potential of wide variation within a specific deliverable grade adds uncertainty for both buyers and sellers of such a contract.

In the case of canola oil, various grades do not formally exist. Instead scientifically measurable characteristics are used with acceptable ranges as a description of the product. (see section 4.2.2). This therefore solves the problems,
eluded to by Garbade and Silber (1983b), and Kohls (1967). These researchers found that if a products is potentially to heterogeneous to establish a standard, narrowly defined contract then the probability of successful futures trading is limited. For the case of canola oil, it appears that heterogeneity does not appear to be of concern.

Canola meal, is a relatively homogeneous product because most of the canola meal produced is extracted with a solvent extraction press method. This method of oil extraction leads to a homogeneous product. This meal can be stored in either a bulk or pelletized form and is specified to contain no less than 3 milligrains equivalents of 3 butenyl isothiocyanate per gram of oil free dried meal.

It can therefore be concluded that both canola oil and canola meal satisfy the theoretical consideration of homogeneity proposed by past researchers who considered the question of contract innovation.

3.2.5 Basic Non Manufactured Goods

In the early years of futures trading, the concerns of distinctive design, colour, style, and composition played an important role in the innovation process. This was due to the problems of specifying a futures contract that both buyers and sellers could have confidence in.

The homogeneity of canola oil and canola meal alleviates the potential problems associated with non basic manufactured goods concerns. It is worthwhile to point out that the concept of only basic non manufactured goods being suitable for future trading may not be of practical concern but rather the concept of homogeneity precludes further analysis in this line of reasoning.

3.2.6 Sufficient Supply and Demand

In future trading, a broad cash market is desired due to the positive correlation between the size of the market and:

A. the potential number of futures market participants.
B. the level of efficient price discovery.
C. the difficulty of potential market dominance and possible cornering of the market.

In the case of canola oil and canola meal, supply and demand can be looked at separately. The production of canola oil and canola meal in Canada comes from 11 plants located throughout Canada with a total combined capacity of 6330 tonnes per day (see appendix A table 17). Of this total crush, the Saskatchewan and Manitoba Wheat Pools control 27.6%, Archer Daniels Midland control 18.9%, Burns Limited control 11.5%, United Grain Growers and British Columbia Packers together control 11.4%, Alberta Wheat Pool controls 10%, N.A.R.P. and Canada Packers each control 9.5% and Menco controls 1.6%.

On the basis of production percentages, it can be seen that the market concentration is quite high as the two largest crushers, Manitoba and Saskatchewan Wheat Pools and Archer Daniels Midland control 46.5% of market supply. As market concentration increases, a threat of market manipulation grows. It must be noted that the effective control of total supply is not complete. Any attempt to artificially manipulate supply and thus price signals can bring forth production from remaining plants accounting for 53.5% of the market and thus provide corrective forces on price.

On the other hand, figures indicate that there are six refining plants in Western Canada and nine plants in Eastern Canada controlled by four and eight firms respectively (see appendix A table 16). The total refining capabilities are approximately 707,000 tonnes per year. Of this total refining capacity, Canada Packers Incorporated controls 37.3%, CSP Foods Limited controls 18%, Monarch Foods Company controls 11.6%, Canbra Foods Limited controls 9.6%, Proctor and Gamble Incorporate controls 7.1%, and the remaining firms all control less than 7% each.

From the above figures it can be seen that the two largest refiners control approximately 55.3% of the potential refining capacity. This level of market concentration poses a concern, however it is believed that the number of other smaller plant lessen further concern.

On the demand side, Canadian domestic consumption of canola meal and canola oil is approximately equal to the exports. Exports of meal and oil are made to approximately 8 and 12 countries respectively. (see appendix A tables 4 and 5). World trade in oil and meal is quite extensive and market manipulation by any of the purchasers appears to be limited.Canadian consumption is varied across numerous industries and as well do not appear to cause any significant problems.

In conclusion, a potential problem exists because of a high market concentration but with adequate market surveillance and threat of substantial penalties, it can be concluded that only a slight to insignificant risk of potential problems associated with the distribution of market supply and demand.

3.2.7 Natural and Competitive Market Flows

The ability for canola oil and canola meal to move freely to market is critical to the possibility of success of the proposed futures markets. It is difficult to fathom a futures market for a good whose market supply is completely controlled by some group. The controlling supplier would either dictate or strongly influence prices and thus threaten manipulation (see Black 1986).

In the case of canola oil and canola meal, the Canadian market place appears to be relatively free of anti competitive forces. In Canada, government intervention appears to be minimal as related to canola oil and canola meal marketing. As for competitive behaviour between either supplies or consumers of canola oil or canola meal, no information appears to be available in the literature.

It is therefore concluded that for the commodities under consideration the market appears to be relatively free from government involvement with respect to market flows. These competitive market flows in the canola oil and canola meal markets are therefore conducive to futures trading.

3.2.8 Summary

In summary, the commodity characteristics considerations for contract innovation are favorable. The criteria relating to the ability to store and grade canola oil and canola meal supports the innovation of these contracts. Price volatility for the innovation of the oil and meal contract looks extremely promising when compared to past contract innovations on the Winnipeg Commodity Exchange. As well, consideration of homogeneity and basic non manufactured goods criterion are also satisfied. The problem areas identified under commodity characteristic considerations are the potential problems associated with insufficient market supply and demand and the potentially high level of market concentration. Actual or perceived market manipulation has the potential to cause a new contract innovation to fail. These problems are therefore indicated as areas suitable for further research and analysis.

3.3 ECONOMETRIC ANALYSIS

3.3.1 Introduction

Regression analysis is a statistical technique that attempts to explain and predict variation in a single variable, the dependant variable, as a function of the movements of a set of independent variables. The primary purpose of regression analysis is to quantify and use behavioral relationships postulated by economic theory. Given that the objective of the study is to evaluate the potential success of a canola oil and/or a canola meal futures contract, regression analysis will be used to predict potential trading volume given historically observed economic conditions.

Econometrics is used to verify the behavioral relationships assumed in economic theory and it forms the basis for much of the empirical research undertaken in economics. It is often described as a combination of economic theory, mathematical economics and statistics. An opening editorial in the 1933 edition of Econometrica may clarify the scope and method of econometrics:

> But there are several aspects of the quantitative approach to economics, and no single one of these aspects, taken by itself, should be confounded with econometrics. Thus, econometrics is by no means the same as economic statistics. Nor is it identical to what we call general economic theory, although a considerable portion of this theory has a definite quantitative character. Nor should econometrics be taken as synonymous with the application of mathematics to

> economics. Experience has shown that each of these three viewpoints, that of statistics, economic theory, and mathematics, is a necessary, but not by itself sufficient, condition for the real understanding of the quantitative relations in modern economic life. It is the unification of all three that is powerful. And it is this unification that constitutes econometrics.

Econometrics is a special form of economic analysis and research in which general economic theories are specified in mathematical terms and are combined with empirical measures of economic phenomena.

The two major purposes of econometric analysis is;

1. the verification or rejection of economic propositions.
2. to forecast the value of the dependant variable given assumed or predicted values of the independent variables.

As a statement, the objective of this thesis is to forecast the potential trading volume for a canola meal and/or a canola oil futures contract on the Winnipeg Commodity Exchange.

3.3.2 Methodology and Model Specification

It is now appropriate to apply the model for the study of contract innovation to the unique circumstances of the Winnipeg Commodity Exchange. The specification of the model is designed to allow interaction among variables and is based on efficient cross hedge considerations, contract, and commodity characteristics historically deemed important to the theory of contract success and the importance of high trading volume.

3.3.2.1 Dependant Variable

The purpose of the econometric analysis is to provide information to evaluate a decision on whether canola oil and/or canola meal futures trading on the Winnipeg Commodity Exchange will be successful. Trading volume will be used as the appropriate measure of success. The choice of trading volume as the dependant variable is due to the fact that a volume measure will maintain a continuous non disjointed measure for success. This will therefore allow us to avoid estimation problems that would accompany a qualitative measure of the dependant variable.

3.3.2.2 Independent Variables

It is now an appropriate time to specify the variables for the model that will be used to explain contract success. The independent variables are the exogenous variables that the Winnipeg Commodity Exchange may consider when choosing a commodity for market analysis and possible implementation for futures trading.

The first independent variable for consideration is the relative residual risk for a commodity if cross hedging is used as opposed to own hedging. This measure is intended to compare the price risks borne by a hedger if the own hedge or the cross hedge market is used.

The relative residual risk variable used for this model is therefore the ratio of residual risks from cross hedging to own hedging. If we calculate :

$$\text{residual risk of cross hedge/residual risk own hedge} = \quad (8)$$

$$1-r^2_c/1-r^2_o = \quad (9)$$

$$var(r^*_c)/var(u) \ / \ var(r^*_o)/var(u) = \quad (10)$$

$$var(r^*_c)/var(r^*_o)^8 \quad (11)$$

---

8 $1 - r^2$ = variance of the hedged portfolio / variance of the unhedged portfolio or the proportion of the risk still borne by the hedger. Please see Ederington 1979.

Table 5

Average Daily Contract Trading Volumes

(of contract innovations on the Winnipeg Commodity Exchange)

Date Innovated	Contract	Average Daily Contract Trading Volume
1983	Alb. Barley	72.42
1974	Eastern Corn	52.00
1974	Dom. Wheat	858.5
1975	Dom. Wheat	260.2
1976	Dom. Wheat	94.10
1974	Dom. Oats	850.0
1975	Dom. Oats	518.7
1976	Dom. Oats	409.0
1974	Dom. Barley	3093.1
1975	Dom. Barley	1045.0
1976	Dom. Barley	906.00
1968	Maritime Potato	16.10
1967	Live Cattle	4.40
1968	Live Cattle	12.70
1969	Live Cattle	13.00
1963	Vancouver Canola	74.25
1964	Vancouver Canola	193.5
1965	Vancouver Canola	694.0
1981	Silver 200oz.	11.40
1981	Gold 20oz.	8.68
1981	Long Term Bonds	7.2
1981	T-Bills	11.80
1974	Gold 100oz.	140.33
1975	Gold 100oz.	72.70
1976	Gold 100oz.	14.90
1972	Gold 400oz.	24.30
1973	Gold 400oz.	53.30
1974	Gold 400oz.	316.6

where var(u) is the variance of the unhedged portfolio. The relative residual risk variable for each commodity innovated on the Winnipeg Commodity Exchange will be derived on a yearly basis over the desired time range(see table 6). It is assumed that:

$$d \text{ Volume } i / d \text{ RRi} > 0 \qquad (12)$$

The second independent variable for consideration is that of the liquidity cost of using the own futures market rather than the best existing cross hedge market for a commodity. Average daily trading volume will be used as the proxy measure of market liquidity. It is assumed;

$$d \text{ volume } i / d \text{ liquidity } i < 0 \,. \qquad (13)$$

The average is calculated yearly for all contracts considered from the date of innovation and lasts for the lessor of three years or until the volume of trade statistically approaches zero(see table 7). It is believed that the higher the volume of trade in the cross hedge market, the more relatively costly is own hedging. Therefore, it is believed that this variable is negatively correlated to trading volume as described by the partial derivative.

The efficient cross hedge variables are important considerations when analyzing potential futures contract innovation. However, these variables may be necessary but not sufficient when deriving an econometric model which considers the prediction of contract success. Therefore, variables which consider cash market size and cash price volatility will also be used.

For a more complete model for predicting futures contract success let the variable relating to the cash market price volatility be introduced (CPVol.). It is hypothesized

Table 6

Relative Residual Risks

Year	Contract Innovation	Best Cross Hedge and Exchange		Relative Residual Risk Variable
1963	Rapeseed	Soybeans	(Chi)	3.64
1964	Rapeseed	Soybeans	(Chi)	0.48
1965	Rapeseed	Soybeans	(Chi)	1.24
1974	Gold 100oz.	Gold	(Wpg)	0.83
1975	Gold 100oz.	Gold	(Wpg)	1.37
1976	Gold 100oz.	Gold	(Wpg)	0.73
1972	Gold 400oz.	Gold	none	4.74
1973	Gold 400oz.	Gold	none	2.96
1974	Gold 400oz.	Gold	none	3.08
1974	Dom. Wheat	Corn	(Chi)	1.98
1975	Dom. Wheat	Corn	(Chi)	1.39
1976	Dom. Wheat	Corn	(Chi)	1.14
1974	East. Corn	Corn	(Chi)	1.28
1981	Silver 200oz.	Silver	(Chi)	0.94
1981	T-Bills	T-Bills	(Chi)	1.24
1983	Alb. Barley	Corn	(Chi)	2.35
1981	Gold 20oz.	Gold	(Wpg)	1.18
1981	LT-Bonds	LT-Bonds	(Chi)	0.76
1969	Mar. Potato	Potato	(CME)	1.00
1974	Dom. Barley	Corn	(Chi)	2.99
1975	Dom. Barley	Corn	(Chi)	1.72
1976	Dom. Barley	Corn	(Chi)	2.25
1967	Live Cattle	Live Cattle	(CME)	0.83
1968	Live Cattle	Live Cattle	(CME)	1.00
1969	Live Cattle	Live Cattle	(CME)	3.64
1974	Dom. Oats	Corn	(Chi)	1.57
1975	Dom. Oats	Corn	(Chi)	1.68
1976	Dom. Oats	Corn	(Chi)	2.73

Table 7

Market Liquidity

Year	Contract Innovation	Best Cross Hedge Market and Exchange	Market Liquidity Variable
1963	Rapeseed	Soybeans(Chi)	18299
1964	Rapeseed	Soybeans(Chi)	13958
1965	Rapeseed	Soybeans(Chi)	22524
1974	Gold 100oz.	Gold(Wpg)	320
1975	Gold 100oz.	Gold(Wpg)	207
1976	Gold 100oz.	Gold(Wpg)	59
1972	Gold 400oz.	none	2
1973	Gold 400oz.	none	2
1974	Gold 400oz.	none	2
1974	Dom. Wheat	Corn(Chi)	47750
1975	Dom. Wheat	Corn(Chi)	45390
1976	Dom. Wheat	Corn(Chi)	41486
1974	East. Corn	Corn(Chi)	48159
1981	Silver 200oz.	Silver(Chi)	3082
1981	T-Bills	T-Bills(Chi)	12462
1983	Alb. Barley	Corn(Chi)	112003
1981	Gold 20oz.	Gold(Wpg)	590526682
1981	LT-Bonds	LT-Bonds(Chi)	33678
1969	Mar. Potatoes	Potato(CME)	323
1974	Dom. Barley	Corn(Chi)	47750
1975	Dom. Barley	Corn(Chi)	45390
1976	Dom. Barley	Corn(Chi)	41486
1967	Live Cattle	Live Cattle(CME)	349
1968	Live Cattle	Live Cattle(CME)	348
1969	Live Cattle	Live Cattle(CME)	1368
1974	Dom. Oats	Corn(Chi)	47750
1975	Dom. Oats	Corn(Chi)	45390
1976	Dom. Oats	Corn(Chi)	41486

that;

$$d \text{ volume } i / d \text{ cash price volatility } i > 0. \quad (14)$$

The measure of cash price volatility that will be used for analysis will be the average yearly coefficient of variation of cash prices for each commodity over there respective time periods for analysis (see table 4, section 3.2.3). This coefficient of variation shows the degree of variability of the sample relative to the mean value of the sample. This allows for a more accurate analysis over samples which have differing means.

Therefore, the measure that is to be used will be a measure of the cash markets price variability and can be stated as;

$$\text{coefficient of variation} = \text{standard deviation} / \text{sample mean} * 10^2 \quad (15)$$

The measure of cash price variability that will be employed in this study will be the yearly coefficient of variation of daily cash prices of the underlying cash commodity.

The final independent variable to be considered in this model will be a measure that will consider the size of a contracts underlying cash market. (see table 8). It is hypothesized that;

$$d \text{ Volume } i / d \text{ Size } i > 0. \quad (16)$$

The measure used in the model is based upon an estimate of the potential number of market participants. Therefore the potential market interest in the newly innovated futures contract will be measured in terms of contract equivalent size.

It is believed that the four independent variables of the model will interact amongst each other in their influence on the dependant variable volume.

In summary, a testable model with one dependant variable and four independent variables has now been proposed for formulation and testing. What is now required is the specification of the models functional form and the choice of estimation procedure.

Table 8

Cash Market Size

Year	Contract Innovation	Contract Equivalent Size
1963	Rapeseed	8360
1964	Rapeseed	13230
1965	Rapeseed	22600
1974	Gold 100oz.	16983
1975	Gold 100oz.	16536
1976	Gold 100oz.	16918
1972	Gold 400oz.	112108
1973	Gold 400oz.	108241
1974	Gold 400oz.	100310
1974	Dom. Wheat	488513
1975	Dom. Wheat	627515
1976	Dom. Wheat	866627
1974	East. Corn	233564
1981	Silver 200oz.	1848946
1981	T-Bills	110000
1983	Alb. Barley	192000
1981	Gold 20oz.	59052682
1981	LT-Bonds	310000
1969	Mar. Potatoes	63459
1974	Dom. Barley	404286
1975	Dom. Barley	437251
1976	Dom. Barley	482866
1967	Live Cattle	304728
1968	Live Cattle	299688
1969	Live Cattle	296784
1974	Dom. Oats	254745
1975	Dom. Oats	280619
1976	Dom. Oats	313268

It has been hypothesized that futures contract trading volume is a function of a measure of relative residual risks of cross hedging compared to own futures hedging, relative liquidity of cross hedging compared to own hedging, cash price volatility, and cash market size. It is assumed that the absolute size of the partial derivatives of the dependant variable contract trading volume with respect to the independent variables RRi, Liqi, CPVoli, and Sizei exceed zero.

3.3.3 Methodology

Since the independent and dependant variables have been introduced, it is now appropriate to specify the data requirements, the model, and the method of estimation. Once these three steps have been completed the model will be estimated and used for prediction to provide insight into whether or not the introduction of a canola oil and/or a canola meal futures contract innovated on the Winnipeg Commodity Exchange will succeed or fail.

The model will be developed and tested via a time series cross section regression analysis of the average daily futures trading volume for all innovations introduced on the Winnipeg Commodity Exchange since 1963 as a function of relative residual risk, the liquidity of the cross hedge market, the cash price volatility and the size of the cross hedge market. The model will be tested for goodness of fit and statistical acceptability of the explanatory variables. The sample of innovations to be used to estimate the model will be that of all contracts introduced on the Winnipeg Commodity Exchange over the last 25 years. This corresponds to 14 contracts since 1963 (see table 9).

The time frame for each contract begins from the date of innovation and will last for the lessor of three years or until the trading volume of the contract under

Table 9

Contract Innovation on The Winnipeg Commodity Exchange and Related Best Cross Hedge Market

Year	Contract	Date Innovated	Best Cross Hedge and Market
1983	Alberta Barley	02/28/83	Corn(Chicago)
1974	Eastern Corn	08/12/74	Corn(Chicago)
1974	Domestic Wheat	07/25/74	Corn(Chicago)
1974	Domestic Oats	07/25/74	Corn(Chicago)
1974	Domestic Barley	07/25/74	Corn(Chicago)
1969	Maritime Potato	08/25/69	Potato(CME)
1968	Live Cattle	09/03/68	L.Cattle(CME)
1963	Vancouver Rapeseed	09/16/63	Soybean(Chi)
1981	200oz. Silver	02/09/81	Silver(Chi)
1981	20oz. Gold	02/09/81	Gold(Wpg)
1981	LT Bonds	02/09/81	LT-Bonds(Chi)
1981	T Bills	02/09/81	TBill(Chi)
1981	100oz. Gold	06/10/74	Gold(Wpg)
1981	400oz. Gold	11/15/72	None

consideration statistically approaches zero. The data over these periods has been collected from three sources. The majority of the cross hedge data was obtained from the Dunn and Hargitt Data Bank (see Dunn and Hargitt 1988). Futures market data related directly to the contract innovations of the Winnipeg Commodity Exchange was collected from either the daily records of trade or the annual statistical publications. Finally, the cash market data was collected from the Toronto Globe and Mail, the Winnipeg Free Press and the London Times. All of the data used has been checked for computational accuracy through both visual inspection and statistical analysis via SAS procedure of proc means. If errors exist, it is because they are so small that they are not statistically or visually detectable. If errors in the data due exist, they must be so small that it will be assumed that they will not vary results significantly. The dependant and independent variables for the model are found in table 10.

3.3.4 Procedures and Assumptions

The time series cross section regression analysis (TSCSReg), which was used to estimate the model is a procedure which analyzes a class of linear economic models that commonly arise from the combination of time series and cross sectional data. These models can be viewed as a two way design with covariates and are a special case of the method of restricted least squares.

This procedure of combining time series and cross sectional data was used for a number of reasons. First, based on theoretical considerations, time series analysis is usually more appropriate than cross sectional data analysis when considering and estimating economic relationships. However, time series analysis does contain many problems. One of the most important problems that may occur is associated with the intercorrelation of the independent variables which tend to change over time. If this

Table 10

Contract Innovations on the Winnipeg Commodity Exchange

(appropriate model variables and values)

Date	Contract Innovation	Average Daily Volume	Relative Residual Risk	Liquidity	Cash Price Volatility	Market Size
1983	Alb. Barley	72.42	2.35	112003	1.68	192000
1974	East. Corn	52.00	1.28	48159	4.14	233564
1974	Dom. Wheat	858.5	1.98	47750	4.86	488573
1975	Dom. Wheat	260.2	1.39	45390	4.50	627515
1976	Dom. Wheat	94.10	1.14	41486	6.94	866627
1974	Dom. Oats	850.0	1.57	47750	4.97	254745
1975	Dom. Oats	518.7	1.68	45390	4.13	280619
1976	Dom. Oats	409.0	2.73	41486	12.7	313208
1974	Dom. Barley	3093	2.49	47750	3.75	404286
1975	Dom. Barley	1045	1.72	45390	5.94	437251
1976	Dom. Barley	906.0	2.25	41486	7.28	4 8 2 8 6 6
1969	Maritime Pot.	16.10	1.00	323	2.00	63459
1967	Live Cattle	4.400	0.83	349	2.33	304728
1968	Live Cattle	12.70	1.00	348	8.84	299688
1969	Live Cattle	13.00	1.01	1368	3.95	296784
1963	Canola	74.25	3.64	18299	1.20	8360
1964	Canola	193.5	0.48	13958	4.12	13230
1965	Canola	694.0	1.24	22524	10.2	22600
1981	Silver 200oz.	11.40	0.94	3082	13.9	1848946
1981	LT Bonds	7.200	0.76	33678	2.11	310000
1981	T-Bills	11.80	1.24	12462	1.24	110000
1974	Gold 100oz.	140.3	0.83	320	9.11	16983
1975	Gold 100oz.	72.70	1.37	207	9.11	16536
1976	Gold 100oz.	14.90	0.73	52	5.98	16918
1972	Gold 400 oz.	24.30	4.74	2	1.91	112108
1973	Gold 400 oz.	53.30	2.96	2	17.3	108241
1974	Gold 400oz.	316.6	3.08	2	10.1	100310

is the case, the accuracy of the estimates can not be assessed. This is due to the tendency towards indeterminacy and the lack of stability of the coefficients of the relationship.

Alternatively, a cross section sample for analysis does not allow for coefficient estimates of variables to vary over time because cross sectional analysis is performed at a single point in time. Therefore, because the condition exists where both cross sectional and time series factors are deemed important to the study, a pooling technique is used. The pooling technique of time series and cross sectional data will, to a certain extent, avoids the problems associated with either time series or cross sectional methods.

The primary concept of this pooling technique as described by Koutsoyiannis (see Koutsoyiannis pp. 403) is to:

> "... obtain estimates of the coefficients from the cross sectional data, insert them into the original function, subtract from the dependant variable the terms involving the estimated parameters, and then regress the residual value ofthe dependant variable on the remaining explanatory variables, obtaining estimates of the remaining coefficients from the time series sample."

It is important to note that there are advantages and disadvantages to the pooling of time series and cross sectional data. The pretext for the combination of these two forms of data for the estimation of an economic relationship is that this procedure under controlled circumstances will yield parameter estimates that are more reliable than those which would be obtained from the application of ordinary least squares (OLS) to the original function with consideration given only to time series data. In particular, the combination of time series and cross sectional data may to a certain extent avoid the estimation problems associated with:

1. multicollinear relationships (ie. linear dependance) among the independent variables which would yield non reliable or fail to yield program statistics.

2. identification problems associated with least square estimates of time series data. Identification is a pre condition for the application of any least square or other simultaneous equation estimation techniques to time series data. With the pooling of time series and cross sectional data the subject of identification may be ignored as it will have no bearing on the parameter estimates.

3. simultaneous equation bias of least squares estimates. Simultaneous equation bias for estimation techniques such as least square time series will yield biased but consistent estimates of the coefficients. This bias would exist if one of the regressors is endogenous, so that the regressor and the error term is correlated.

4. aggregation bias due to the changes in the distribution of one or more of the independent variables.

However, time series cross sectional pooling is by no means without out its problems. The results of a pooled model must be analyzed carefully if the coefficients are to be properly interpreted and used for prediction.

Selected problems due to pooling data are:

1. problems of interpretation of the estimated function. Estimates from the cross sectional data are long run elasticities whereas the estimates from the time series portion of the model are short run elasticities. This difference in the interpretation of the coefficients of estimation is due to the underlying assumptions of time series and cross section forms of regression analysis.

2. problems of accuracy of the cross sectional estimates. Across the samples it is realistic to assume that inter individual differences exist which may account for more or less trading volume. That is the vector for all slope coefficients are not common across all commodities.

3. problems arising from the reference of the cross sectional coefficient estimates to a single point in time. These cross sectional coefficients are calculated at a single point in time and then used to influence the respective variables on the dependant variable in all of the time periods of the time series sample. This therefore implies that we assume the cross sectional coefficients as constants and unchanging over the whole period of the time series sample.

3.3.5 Model Specification

For specification, it is assumed that there are 14 distinct commodities under discussion, indexed by i=1,.....,14. As well, there exists 3 successive time periods indexed by t=1,......,3. This therefore yields a total number of sample points of 27 (N=i*t). The variables of the model can be denoted in standard format by:

Yit = the value of the dependant variable for commodity i in time period t.

$$i = 1,...,14.$$
$$t = 1,....,3.$$

Xjit = the value of the jth explanatory variable for commodity i in time period t.

$$j = 1,...,5.$$

The model can be specified in the standard log linear format of :

$$\text{Ln Volume}_{it} = B_1 + B_2 \text{ Ln } RR_{it} + B_3 \text{ Ln } L_{it} + B_4 \text{ Ln CPVol}_{it} + B_5 \text{ Ln Size}_{it} + e_{it} \quad (17)$$

3.3.6 Computational and Statistical Methods: Assumptions and Choice of Estimation

The adequacy of any estimation method for a model with time series cross sectional pooled data depends primarily on the statistical characteristics of the error components in the model. The computer generated solutions derived by S.A.S Incorporated contains a time series cross sectional procedure that allows for the study of the estimates of the regression parameters in the model under three of the more common error structures. These error structures can be described as;

1. a variance components model.
2. a first order auto regressive model with contemporaneous correlation.
3. a mixed variance component moving average error process.

However, it is important to note that Johnston (1984) provides for the following taxonomy of time series cross sectional models;

Table 11

Taxonomy of Time Series Cross Sectional Models

Model	Intercept Alpha	Assumptions About Vector of Slope coefficients Beta's	Disturbance term U_{it}
I(a)	common for all i,t	common for all i,t	$E(uu') = O_u^2 I_n$
I(b)	common for all i.t	common for all i,t	$E(uu') = V^u$
II(a)	varying over i	common for all i,t	fixed effects model
II(b)	varying over i	common for all i,t	random effects model
III(a)	varying over i,t	common for all i,t	fixed effects model
III(b)	varying over i,t	common for all i,t	random effects model
IV	varying over i	varying over i	$E(uu')=o^2_u I$ or $E(uu')=V$

Because the data for the model came from the pooling of time series and cross sectional data sources and is unbalanced, SAS Incorporated TSCSReg procedure will not yield parameter estimates due to this unbalanced nature of the data. However, a solution exists and pooled data can and will still be used. Pooled data is used for two reasons. Firstly, insufficient observations exist to perform the analysis without pooling. Pooling enabled the enlargement of the sample size and thus the estimation can proceed. Secondly, if it is believed that one or more parameters are the same for more than one group (a plausible assumption) a more efficient estimate of the parameters can be made (since increased sample size always leads to better estimates). It can be noted that even if all the parameters of the cross sections are different and if the error terms within time series are correlated, more efficient estimates can be obtained by estimating the sample as a single pooled source.

Covariance analysis will be used to estimate the model. It is hypothesized that omitted variables may lead to changing cross section and time series intercepts. The first stage of this covariance analysis involves addition of dummy variables to the model to allow for these changing intercepts. Dummy variables are introduced into the model in such a way as to allow for the intercept term to vary across cross section units. After the interpretation and analysis of the parameter estimates, it is concluded that the parameter estimates associated with all of the dummy variables are insignificantly different from zero. That is the threshold level of trading volumes for contract innovations on the Winnipeg Commodity Exchange are not significantly different from zero across the cross sections considered. The second stage of the analysis is the removal of the dummy variables that are not statistically different from zero. That is all of the dummy variables. This result is fortunate from an analysis standpoint. Firstly, the addition of dummy variables into the model would not have identified the variables which were missing from the model and that might have caused the regression line to change both over time and over individuals. The addition of the dummy variables would explain a portion of the error variation but would not yield useful information with respect to the model. Because of this, the dummy variables would have been difficult to interpret. Secondly, the addition of the dummy variables into the final model would require the use of substantial degrees of freedom which would detract from the already limited level. Therefore, OLS with out the use of dummy variables to characterize varying vectors of the slope coefficients is used to estimate the parameters of the model.

3.3.7 Model Estimation and Results

Ordinary least squares (OLS) is used to estimate the parameter values of the model. Preliminary results show that all of the dummy variables used to provide insight into threshold trading levels are insignificantly different from zero. Therefore, these dummy variables are deleted from further analysis in order to maintain the largest potential number of degrees of freedom. The model is specified as;

$$\begin{aligned} \text{Ln Vol}_{it} &= B_1 + B_2 \text{ Ln RR}_{it} + B_3 \text{ Ln Liq}_{it} + \\ &\quad B_4 \text{ Ln CPVol}_{it} + B_5 \text{ Ln Size}_{it} + e_{it} \end{aligned} \tag{18}$$

Estimation of the model is in the natural logarithmic form and will be estimated by ordinary least squares.

The degrees of freedom of the model after deletion of the dummy variables is 26. The degree of freedom is defined by n-k-1 where;

n = the number of observations in the model
k = the number of regressors

The number of degrees of freedom is important for consideration because it is positively correlated to the precision of the model. The 26 degrees of freedom in this model is adequate although more would be desirable. However, due to the nature of the environment that this model is estimated in, the degrees of freedom cannot be enhanced. This situation is accepted as adequate and proceed with the analysis.

The next portion of the model for analysis is that of estimating the model and statistically deciding whether or not the parameter estimates are significantly different than zero (see table 9). To decide on the significance of the parameter estimates the statistical F test will be employed. The F-ratio is the ratio of the explained portion of the total sums of squares, adjusted for the number of regressors (K) and the number of observations (n).

$$F = SSR/(K) \; / \; SSE/(n-K-1) \qquad (19)$$

The purpose of the F test is to test the hypothesis

H_o: $B_1 = ... = B_5 = 0$

with the alternate hypothesis being;

H_a: H_o not true

The observed (F_o) variance ratio is compared with the theoretical value of $F_{critical}$ at a chosen level of significance which is found in the standard F distribution tables with $v_1 = (K)$ and $v_2 = (n-K-1)$ degrees of freedom. The $F_{critical}$ value is the value of the variance ratio that defines the critical region of the test at a chosen level of significance. If $F_{observed} > F_{critical}$, the null hypothesis is rejected and it is accepted that the parameter estimates are significantly different from zero. From the F statistic tables the critical value can be found for alpha=5% level of significance and k numerator and n-k-1 denominator. The models F statistic is observed as 9.974. This is the ratio of the explained to unexplained portions of the total sums of squares.

A two sided test with a five percent level of significance yields an $F_{observed}$ critical value of 3.02. It can be noted that a two sided test must be used. This tests

Table 12

Model Results

Variable	Regression Coeff. (parameter estimate)	Standard Error	t-value	prob>lTl*	Expected Sign
B_1 intercept	3.0715	1.964	1.564	.1321	+
B_2 RR_i	1.8167	0.431	4.218	.0004	+
B_3 CPVol	1.2757	0.332	3.837	.0009	+
B_4 Size	-.3553	0.179	-1.98	.0600	+
B_5 Liquidity	0.3729	0.077	4.875	.0001	-

R^2 = .65
F = 9.974

* t for H_o: parameter=0

primary concern is for testing two sided alternatives on more than one coefficient at a time. It can be seen that $F_{observed} > F_{critical}$. It is therefore concluded that the alternative hypothesis holds true namely the parameter estimates B_1 to B_5 are statistically different from zero. It is also noted that the model as a whole is said to be statistically significant at a 95% level of confidence. Further testing indicates that the equation as a whole remains significant up to the 99.9% level of confidence.

The next step in the analysis of the results is to analyze the fitness of the functional form. The coefficient of determination, R^2, for the model has been calculated. This coefficient shows heuristically the degree of overall statistical fit of the model to the data. That is the ratio of the explained portion of the model to the total sums of squares. A low level of the R^2 value would indicate the need for more model development. It can be noted that for cross sectional data analysis or for pooled data the acceptable level of the R^2 measure is lower than for a regression of time series data alone. If the R^2 is to high, say .80 or above for a pooled data regression, indication would be that there exists a high level of spurious correlation and the need to include a time variable in the model to detrend the correlation between the other variables.

For this model it can be observed that the $R^2 = .645$. This can be interpreted as that 64.5% of the variation in the data is explained by the model. For the analysis at hand, this overall degree of fit is considered acceptable due to the data requirements and the need to pool the data.

The next stage of the interpretation of the results is that of the explanation of the parameter estimates. From the SAS generated results the following parameter estimates are observed;

$B_1 = 3.0715$
$B_2 = 1.8167$
$B_3 = 1.2757$
$B_4 = -.3553$

$B_5 = 0.3729$

It is hypothesized that B_1, B_2, B_3, B_4 would all be greater than or equal to zero and that B_5 would be less than or equal to zero.

Analysis of parameter estimates yields a substantial intercept value. This intercept is analogous to a threshold level of trading volume for newly innovated contracts.

Further analysis of the results indicate that the hypothesis relating to the directional influences of relative residual risk variable (RR_i) and cash price volatility (CPVol.) are correct. The hypothesis relating to the direction of the parameter estimate for the cash market size variable (Size) turned out to be surprising. It was assumed that variable would also have a positive influence on trading volume. However, analysis of past innovations shows that cash market size has a very slight negative parameter estimate.

Discussions with market participants leads to an explanation of this observed phenomenum. When studying the actual use of a market, it is found that the number of people who use a market is not strongly related to the potential number of trading units. Therefore it can be believed that the potential number of futures contracts in the market is either not correlated or only slightly correlated to futures market use. A case in point is what can be observed in the canola market in the 1988 season. Due to the lack of moisture, production of canola and soybeans in North America was much lower than previous years. Therefore, due to lower production, the potential number of futures contracts in the market was less than previous years. However, trading volume in the canola and soybean futures contracts saw a dramatic increase. Therefore this is a case where the hypothesized relationship did not hold true. These deviations from the expected indicates potential areas for further research.

It was also assumed the parameter estimate relating to the liquidity of the cross hedge market would be negative. In other words, as the volume and therefore the efficiency of the best cross hedge market increased, the effect on the newly innovated contract on the Winnipeg Commodity Exchange would be lower trading volume. The analysis indicates that as a cross hedge markets volume is increasing than so does the volume of the corresponding innovated contract on the Winnipeg Commodity Exchange.

A suggested reason for this relationship is that market perceptions are strongly related across futures markets. Therefore the acceptance and use of these type of trading practices is strongly positively correlated. It has been said that perceptions and not efficiency criteria can drive a market to success. Decision to use a market are based on perceptions and not on the actual benefits. Therefore a case in point can be made regarding say the innovation of the 1963 canola market on the Winnipeg Commodity Exchange. Because the soybean market was perceived to be successful in the Chicago market and canola was seen as a similar product, the potential success of this innovated rapeseed market was enhanced.

The standard errors of the parameter estimates provided by SAS are absolute measures of the unexplained deviations from the means. They are as follows;

intercept	= 1.964
$LnRR_i$	= 0.431
LnCPVol	= 0.332
LnSize	= 0.179
LnLiq	= 0.077

It can be noted that for the remaining parameter estimates standard errors that the are fairly low. This indicates an acceptable level of dispersion in the unexplained portion of the deviations.

The model provides insight into market patterns that affect the probability of success or failure of any contract innovation.

Historically, the contract innovations on the Winnipeg Commodity Exchange which have been the most successful have had selected characteristics in common. Successful contracts have been characterized by:

1) a positive measure of their relative residual risk.

2) a fairly high interest in their cross hedge markets.

3) a high level of cash price volatility.

4) a sufficiently large cash market size.

These findings are intuitively clear. Experience indicates that markets which decrease the risk of price fluctuations, have a large number of interested and active participants, and have volatile cash prices are prime considerations for futures contract innovations.

Conversely, markets with lethargic participants uninterested in change, low price volatility, and limited in size are best left without consideration by the Winnipeg Commodity Exchange as potential innovation areas.

3.3.8 Forecast

Given the model formulation and results, it is now possible to compare how well the model would have predicted trading volume of futures contract innovations on the Winnipeg Commodity Exchange (see table 13). If the Vancouver canola and the domestic barley contracts are used as an illustration, it can be seen from table 12 that the model forecasts well. For the canola contract, the model predicted a daily trading volume 735 contracts. When this is compared to the observed trading volume of 694 contracts daily it can be seen that the prediction was accurate. For the domestic barley contract, the model underestimated the actual trading volume. The model predicted 602 contracts trading daily where as 906 actually traded.

The objective of this study is to determine the desirability of providing facilities for the trading of canola oil and/or canola meal futures contracts on the Winnipeg

Table 12

Comparisons of Actual and Predicted Trading Volumes

on the Winnipeg Commodity Exchange

Year	Contract	Actual Average Daily Contract Trading Volume	Predicted Average Daily Contract Trading Volume
1965	Vancouver Canola	694	735 *
1976	Domestic Barley	906	602 **

* equation (12): Ln Volume = 3.07 + 0.39 + 2.96 - 3.56 + 3.74 = 6.6
Volume = 735

** equation (12): Ln Volume = 3.07 + 1.47 + 2.53 - 4.65 + 3.97 = 6.4
Volume = 602

Commodity Exchange. This will be done by predicting potential trading volume of these contracts based on past performance from other futures contract innovations. The model for forecasting has been derived, interpreted, and accepted in section 3.3.7.

One of the purposes of the econometric analysis is to forecast trading volume in a systematic and consistent manner. A confidence interval is presented to indicate that a sampling distribution exists for the predicted trading volume. The forecast volumes for canola oil and canola meal are found by substituting industry observed values into equation (17). However, two assumptions will have to be made in order to use the model for volume prediction of potential canola oil and canola meal markets. First, it must be assumed that the time period used for the estimation process of the model will provide similar conditions to those of the period of the actual trading. Second, since canola oil and canola meal futures prices do not exist, the calculation of the "own" portion of the relative residual risk variable will be estimated. The alternate measure uses the average of past innovated contracts hedging performance. Past experiences of contract innovations on the Winnipeg Commodity Exchange provide the best estimate on how well a new contract will be designed. Therefore, the average residual risk from own hedging for the estimated sample of innovations will be used for the own portion of the residual risk measure (RR_{own}). The variables, their measurement procedures and their magnitudes is as follows.

For the independent variable relating to the measure of the relative residual risk (RR_i) of own hedging compared to cross hedging the procedure is as follows. The average measure of past contract innovations is .625. This is the value of the denominator of the relative residual risk measure for both the canola oil and the canola meal futures markets. With respect to canola oil, the numerator of the RR_i variable is estimated by regressing the changes of canola oil cash prices from the I.S.T.A reports against changes in the soyoil futures market prices in Chicago. The r^2 for this regression is .652 (1 - .652 = 0.348). Therefore, the RR_i measure to be used for the prediction regarding canola oil is

$$RR_{ic} / RR_{io} = .348/.625 = 0.557 \quad (20)$$

The regression of changes canola meal cash prices versus changes in the Chicago soymeal futures prices yields an r^2 of .261 (1 - .2605 = 0.739). Therefore the RR_i measure to be used for forecasting potential trading volume of a canola meal contract is

$$RR_{ic} / RR_{io} = .739/.625 = 1.18 \quad (21)$$

The liquidity variable defined in section 4.3.2.2 is easy to estimate for the canola oil and canola meal futures contracts. This liquidity variable is the average daily trading volume for the best cross hedge market. The Chicago soyoil and soymeal futures contracts traded on the Chicago Board of Trade are deemed the most appropriate cross hedge markets which have an average daily trading volume of 20,622 and 20,354 respectively. Therefore, the liquidity variable for the prediction of canola oil volume is 20,622. For canola meal the liquidity variable is 20,354.

The third independent variable relates to the volatility of the cash prices. Relevant coefficients of variations where obtained from I.S.T.A. cash prices for canola oil and canola meal between January 7 1988 and October 20 1988. These coefficients of variation to be used in the forecasting of potential trading volume of the proposed canola oil and canola meal futures contracts are;

Canola oil:

$$C.V. = \text{standard deviation/sample mean} * 10^2 = 74.88/434.875 = 17.219 \quad (22)$$

Canola meal:

$$\text{C.V.} = \text{standard deviation/sample mean} * 10^2 = 16.46/153.9 = 10.695 \qquad (23)$$

The final independent variable is the contract equivalent size of the cash market. Before this measure is completed, a proposed size of the potential contracts must be determined. Discussion with market participants yield two views relating to the potential size of the contracts.

The first proposal relates to the currently available modes of transportation in the industry. Currently the majority of canola oil and canola meal is transported through the rail system. For canola oil, the product is shipped out in rail tanker cars which hold on average 17,000 imperial gallons of oil. At an average rate of 9 pounds per imperial gallon, each car contains approximately 170,000 pounds or 70,000 kilograms of oil. At the current market price of approximately 34 cents per pound, the value of such a car load would be $51,000. For meal, the average hopper car is holds 80 tonnes of meal. At the current value of meal being approximately $194 per tonne the value of the hopper car would be in the area of $17,000. If the contract size of the canola oil and meal futures should relate to the size of the rail transportation facilities, the contract sizes can be assumed as being 70 tonnes for the oil contract and 80 tonnes for the meal contract.

The second proposal relating to contract size relates back to the underlying futures contracts. If the 20 tonne canola contract traded on the Winnipeg Commodity Exchange is considered with canola oil and meal extraction rates, the following can be calculated. Canola oil has an extraction rate of 42%. Relating this to the 20 tonne contract it can be seen that;

42% of 20 tonnes = 8.4 tonnes of canola oil

This potential 8.4 tonne contract has a value of approximately $5,555. If this contract is rounded to the 10 tonne size the value moves to $6,600 per job size contract. Board lots would then be of the 100 tonne size with a value of $66,000.

For canola meal, an extraction rate of 57.4% exists. It can be seen that the relation being;

$$57.4\% \text{ of } 20 \text{ tonnes} = 11.48 \text{ tonnes of canola meal} \qquad (24)$$

This potential 11.48 tonne contract would have a value of $2455. Rounding down to 10 tonne size we see the value of a job lot being approximately $2,200. Board lots would then be in the 100 tonne range and have a value of approximately $22,000.

For the forecast of potential trading volume of a canola oil and a canola meal futures contracts on the Winnipeg Commodity Exchange it is assumed that the second of these two methods is the most desirable. This is due to the ability to easily relate these contract sizes to the underlying canola contract, the agreeable dollar value of this size of contract, the tick potential of this size of contract, and the job lot/board lot multiplicity of these sizes. Because of these reasons, the need for minimal education relating to contracts of these size, and the consistency of past innovations to these concerns, it is believed that the 10 and 100 tonne sizes for canola oil and canola meal are appropriate for this analysis.

For the forecast, the value of the size variable will then be

$$\text{canola oil: } 416490 \text{ tonnes}/10 \text{ tonne} = 71{,}649 \text{ potential contracts} \qquad (25)$$

$$\text{canola meal: } 981540 \text{ tonnes}/10 \text{ tonnes} = 89{,}154 \text{ potential contracts} \qquad (26)$$

The production figures used for the measure of this variable are from I.S.T.A.'s predictions of the 1988 Canadian production of canola oil and canola meal.

It is now appropriate to forecast potential trading volumes. (see tables 14 and 15). For canola oil, an average daily contract trading level of 215 of a 10 tonne size is predicted. For canola meal, an average daily contract trading level of 424 of a 10 tonne

TABLE 14

FORECASTED TRADING VOLUMES FOR CANOLA OIL FUTURES CONTRACT

Variable Values

RR $= RR_c / RR_o$ = .348 / .625 = .557

Liq = 20,662

CPVol = 17.219

Size = 71,649

Prediction

Ln Volume = 3.0715 + 0.0745 - 1.0631 - 3.9720 + 3.7044 = 5.3714

Volume = 215 *

Confidence Interval

95% confidence interval for trading volume

$215 \pm (S_f * t_c) = 215 \pm (14.018 * 1.714)$

= 239 ... 191

* average daily contract trading volume of a canola oil contract on the Winnipeg Commodity Exchange is 215 10 tonne contracts per day.

S_f = standard error of the forecast derived from the model estimation.

t_c = critical value of the t statistic with n-K-1 degrees of freedom.

TABLE 15

FORECASTED TRADING VOLUMES FOR CANOLA MEAL FUTURES CONTRACT

Variable Values

RR $= RR_c / RR_o = .739 / .625 = 1.18$

Liq = 20,354

CPVol = 10.695

Size = 89,154

Prediction

Ln Volume = 3.0715 - 0.3044 + 3.0231 - 4.0498 + 3.6996 = 6.0488

Volume = 424 *

Confidence Interval

95% confidence interval for trading volume

$424 \, ^{+} \, (S_f * t_c) = 424 \, ^{+} \, (14.018 * 1.714)$

$= 448 \ldots 400$

* average daily contract trading volume of a canola oil contract on the Winnipeg Commodity Exchange is 424 10 tonne contracts per day.

S_f = standard error of the forecast derived from the model estimation.

t_c = critical value of the t statistic with n-K-1 degrees of freedom.

size is predicted. These predictions are based on past economic trends and the current economic situation in an econometrically sound manner and is based on an acceptable estimation technique.

3.3.8 Revenue and Cost Considerations

Given the predictions of potential trading volumes of a canola oil and canola meal future contracts on the Winnipeg Commodity Exchange, it is appropriate to calculate corresponding revenue and costs (see table 14). Discussions with the exchange indicate that total revenue for the first year of trading would be $12,524.

Analysis of costs indicate variable costs for the first year of operation would be $58,000. Fixed costs would be $45,300. Therefore total costs or even the variable costs of operating the market would not be covered by the corresponding revenue. However, it must be noted that the calculations are for the first year of trading only. As the proposed contracts mature, the average daily contract trading volume either tends to approach zero or increases substantially as the market matures. As well, there are spinoff effects of more actively traded contracts that are not taken into account in this analysis.

4.3.8 Summary

The econometric model presented in section 4.3 has been used to forecast potential trading volume of the proposed canola oil and canola meal contracts on the Winnipeg Commodity Exchange. The model given its assumptions and estimation procedure indicates that for canola oil it can be expected that trading volume will be in the area of 215 contracts per day. For the case of canola meal, it is expected that the average

TABLE 16

REVENUE AND COST CONSIDERATIONS OF CONTRACT INNOVATIONS

Revenue

daily trading volume *	639
trading days per year *	256
payment per trade	$.08
	$13,078

Variable Costs

Personnel (a) full time recorders 1.5 @ $15,000 year	$22,500
(b) observer trainee 1.5 @ $17,000 year	$25,500
yearly cost of market surveillance	$ 8,000
cost of market development committee	nil.
administrative costs	$ 2,000
	$58,000

Fixed Costs

update bylaws: lawyers fees	$ 2000
update bylaws: print and redistribute	$ 800
market promotion and development	$20,000
trading monitors, computers and software (3 @ $7,500)	$22,500
	$45,300

revenue = $13,087
variable costs = 58,000
fixed costs = $45,300
break even analysis (to cover variable costs) = 2832 contracts traded daily
break even analysis (to cover total costs) = 5044 contracts traded daily

daily contract trading volume will be in the area of 424 contracts per day.

In comparison, when the Winnipeg Commodity Exchanges most successful contract (the Vancouver rapeseed contract) began trading, its average daily trading volume was in the area of 100 trades per day over the first two years. Therefore in comparison, contracts for canola oil and canola meal compare favorably.

Chapter IV

4. Summary, Conclusions, and Recommendations

4.1.1 Summary of Qualitative Methods

A summary of the general market approach and the commodity characteristic approach to the study of contract innovation on the Winnipeg Commodity Exchange yields a number of promising findings.

The general market analysis indicates that for both canola oil and canola meal, many significant changes and trends are apparent. These trends would tend to support the inclination for new futures contracts for canola oil and canola meal.

Statistics related to production, domestic consumption, exports, market standing, and the underlying futures contract all indicate that if the proposed contracts were ever to be innovated, that historically the market is now in its best position.

The commodity characteristic approach supports the findings of the general market analysis. Six out of the seven criteria related to commodity characteristics would support the idea of contract innovations for canola oil and canola meal. The concerns of storage, grading, price volatility, homogeneity, non manufactured good, and natural and competitive market flow criteria are all supportive of successful futures trading.

The criteria and analysis of sufficient market supply and demand is the only qualitative consideration that would not support the proposed innovation of the canola oil and canola meal futures contracts.

4.1.2 Summary of the Quantitative Method

The econometric approach to the study of the proposed contract innovations provides some surprising and beneficial results.

The estimation of the time series cross section regression equation yields a goodness of fit of 65% with all parameters giving explainable and usable measures.

Volume predictions for the proposed contracts are very appealing. For canola oil, based on past trends and observations, the model estimates that trading volume will be approximately 215 10 tonne contracts trading daily. This prediction is based upon the aforementioned model. This volume is expected to be obtained in the first three years of the new contracts life cycle.

The level of trade for the canola meal contract has been predicted as being substantially higher than the prediction made for canola oil. The model predicts that in the first three years of the canola meals contracts life cycle, that a trading volume of approximately 424 10 tonne contracts would be traded daily.

4.1.3 Caveats

Two major caveats are important and must at this time be mentioned. Firstly, it is extremely important that the intention of this quantitative measure is not taken out of context. This econometric model was designed as a tool and is derived from the best available data and is based upon the four previously derived and tested independent variables. It has not been designed to stand or be used on its own.

Secondly, that the general market approach, the commodity characteristic approach, and the econometric approach be considered as a unified piece of research. That is not as individual units. To accurately asses the situation at hand, all of the available information presented must be assimilated. Failure to consider all of the available information in any decision making process may turn out to be costly.

4.2 Conclusion

After consideration and assimilation all of the appropriate information, the following conclusion has been reached. It is this authors conclusion that the Winnipeg Commodity Exchange does not attempt to innovate futures contracts for canola oil and canola meal at this time. This is not to suggest that the contracts under consideration would not generate sufficient volume for survival, but rather that the limited resources that are to be used for contract innovation be placed in an area that offers a higher perceived probability of success.

This conclusion is based on all of the information presented in this thesis.The majority of the analysis would seem to support the innovation of the two proposed contracts. However, given consideration to market concentration on both the crushing and refining side of the canola oil and canola meal industry, support can not be given to the proposed innovations.

This is not intended to suggest that canola oil and canola meal contract will never be suitable for futures trading. What is suggested is that there exists sufficient concern to warrant against the immediate introduction of these contracts. Further concern must be given to this market concentration and its effects on any newly introduced futures contract.

4.3 Recommendations

The following recommendations are presented for consideration to the Winnipeg Commodity Exchange.

1) that the Winnipeg Commodity does not abandon thoughts of diversification for their most successful futures contract. Options on the existing canola contract may provide considerable benefits.

2) that the Winnipeg Commodity Exchange further rely on the academic community

through the Centennial Fellowship and other programs. Suggestions for further studies are indicated in the following areas; further control in the marketing of oats, feeder peas, natural gas, lumber products and options for the rapeseed contract. With the ever changing environment that the Winnipeg Commodity Exchange must operate in, the need for market research, contract maintenance, and innovation is of utmost importance. For our exchange to maintain its competitive and efficient nature, progressive thinking and actions must prevail in order to ensure our markets success and growth within the environment for which we serve. In the academic community their exists a wealth of information and enthusiasm for cooperation with the Winnipeg Commodity Exchange.

3) that the Winnipeg Commodity Exchange actively pursue a program of public education. One of the major issues of new futures development is that of understanding. Enhanced understanding ultimately leads to the matter of market confidence and liquidity. It is therefore suggested that an infrastructure be developed to allow for improved understanding of new and existing contracts thereby building confidence in the use of futures markets as a viable risk management tool. In the academic environment, the benefits and use of such markets appear to be well understood. Therefore, a major effort should be made to make known the track record of futures markets and to show that the system works. This effort is especially important in the early stages of market development and immediately after new contract innovations. Education is fundamental to the making of sound decisions and it is believed that a responsibility of the Winnipeg Commodity Exchange is to inform the farming community and people in related industries and help them become more acquainted with how the market works.

4) that with the current canola contract being the lifeblood of the Winnipeg Commodity Exchange, innovation of any contracts affecting or influencing the underlying canola contract be given paramount consideration. Without the continuing success of the canola contract, the Winnipeg Commodity Exchange would have a much more difficult time maintaining their extensive operations.

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APPENDIX A

TABLE 1

WEIGHTS, AND EXTRACTION RATES FOR CANADIAN AGRICULTURAL PRODUCTS

	bushels per tonne
Wheat	36.743
Oats	64.841
Barley	45.929
Rye	39.368
Flaxseed	39.368
Canola	44.092
Corn	39.368
Soybeans	36.743
Sunflower seed	73.487
Mustard seed	44.092
Peas	36.743
Buckwheat	45.929

	extraction rates (percent)
Flaxseed oil	34.9
Flaxseed meal	61.4
Canola oil	41.9
Canola meal	57.4
Soybean oil	17.1
Soybean meal	78.4
Sunflower oil	41.7
Sunflower meal	35.71

source: Statistics Canada Publication Number 22-201.

Table 2

PRODUCTION AND DISTRIBUTION OF CANOLA MEAL AND OIL;
CANADA

in thousands of tonnes

year	PRODUCTION			DOMESTIC DISSAPEARANCE			EXPORTS		
	SEED	OIL	MEAL	SEED	OIL	MEAL	SEED	OIL	MEAL
58/59	176	7.2	10	17.3	--	--	130	--	--
59/60	81	2.1	3	5.1	--	--	65	--	--
60/61	252	8.9	12.6	21.8	--	--	183	--	--
61/62	254	12.2	17.3	29.8	--	--	157	--	--
62/63	133	15	21.2	36.6	--	--	129	--	--
63/64	190	14.6	20.7	35.7	--	--	120	--	--
64/65	300	20	28.4	48.9	--	--	210	--	--
65/66	517	34.8	49.2	84.9	--	--	309	--	--
66/67	585	46.1	65.3	112.5	--	--	313	--	--
67/68	560	48	67.9	117	--	--	279	--	--
68/69	400	64.5	91.2	157.2	--	--	325	--	--
69/70	757	72.2	102.1	176.1	--	--	504	--	--
70/71	1637	79.7	112.8	194.4	--	110.5	1062	--	--
71/72	2155	112	158.5	273.2	--	164.4	966	--	--
72/73	1300	134	204.2	353.2	109	184.7	1226	25	19.5
73/74	1207	125.6	193.9	334.4	91.1	146.3	889	34.5	47.6
74/75	1163	108.5	157.8	276	89.2	147.1	593	19.3	10.7
75/76	1839	141.7	197.4	347.2	109.1	169.4	683	32.6	28
76/77	837	225.8	314.9	549.7	134.1	207.8	1019	91.7	107.1
77/78	1973	259	357.5	630.3	185.5	201.2	1014	73.5	156.3
78/79	3498	296.3	416.7	725.1	185.6	247.1	1721	110.7	169.6
79/80	3411	364.9	520.8	897.3	213.4	344.5	1743	151.5	176.3
80/81	2483	418.2	573.6	1004.6	229.7	369.9	1372	188.5	203.7
81/82	1848	382.1	551.1	1125	219.1	389.1	1359	163	162
82/83	2224	366.2	521.7	1162	250.2	407.7	1271	116	114
83/84	2609	486	724	1484	262	426	1498	224	298
84/85	3382	512.4	764.4	1594	276.4	446.4	1456	236	318
85/86	3507	498	691	1563	334	400	1456	164	291
86/87	3777	633	892	2013	329	448	2126	304	444
87/88									
88/89									

** SOURCE: GRAINBASE (CGC), STATISTICS CANADA 22-002
-- NOT AVAILABLE

Table 3

EXPORTS OF CANOLA BY COUNTRY OF DESTINATION: CANADA
thousands of tonnes

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	average
Western Europe																
Lux-Belgium	3	1	-	-	1	1	-	1	1	-	-	-	-	1	3	0.8
Denmark	5	-	-	-	-	-	-	-	-	-	2	36	-	-	-	2.9
France	45	13	-	-	2	1	15	50	1	-	2	36	-	-	-	11.0
West Germ.	71	26	17	-	84	14	143	159	38	7	29	34	3	-	2	41.8
Italy	81	15	2	3	-	-	-	15	-	-	-	-	-	-	-	7.7
Neth.	61	50	7	13	113	16	259	228	54	34	55	202	24	37	73	81.7
Norway	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	0.2
Spain	1	-	-	1	-	-	-	-	-	-	-	-	1	-	1	0.3
Switz.	-	-	4	-	-	-	3	25	-	-	-	-	-	-	-	2.1
U.K.	3	-	5	3	16	1	8	9	16	1	-	5	-	-	-	4.5
Africa																
Algeria	-	-	-	-	16	58	68	52	8	35	8	-	-	-	-	16.3
Morocco	-	-	-	-	-	-	13	11	-	-	7	22	-	-	13	4.3
Mozambique	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	0.5
Asia																
Bangladesh	103	48	29	44	-	34	13	22	36	11	23	14	12	3	42	28.9
India	80	19	14	-	-	107	141	-	16	-	-	-	-	-	-	25.1
Japan	699	663	504	619	757	777	1017	1073	1147	1217	1129	1117	1373	1301	1661	1004.0
S. Korea	3	12	-	-	8	-	38	-	26	32	-	-	-	-	11	8.7
W. Hemisphere																
Brazil	-	-	-	-	-	-	-	90	-	-	-	-	-	-	-	6.0
Mexico	24	29	10	-	-	-	-	8	21	22	-	43	43	114	320	42.3
U.S.	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	0.1
Total	1179	876	592	683	1005	1012	1718	1743	1364	1359	1255	1510	1406	1456	2126	

- not available or insignificant
(in thousands of tonnes)

source: Canadian Grain Exports, Canadian Grain Commision.

Table 4

EXPORTS OF CANOLA MEAL BY COUNTRY OF FINAL DESTINATION: CANADA

	1972	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	avg.
Western Europe															
W. Germany	1	-	4	32	84	67	67	81	10	-	19	7	9	8	27.8
Netherlands	11	5	10	20	8	8	23	19	26	2	26	-	-	-	158.0
Norway	-	-	-	13	25	53	38	66	61	52	43	50	-	42	31.6
U.K.	7	4	14	18	21	30	26	12	27	1	4	-	-	21	13.2
Asia															
Japan	-	-	-	2	12	2	1	2	-	3	25	41	67	47	18.0
S. Korea	4	-	-	-	-	4	-	-	5	12	62	64	44	31	12.0
Taiwan	-	-	-	-	4	3	-	2	-	-	5	22	14	12	4.4
W. Hemisphere															
U.S.	6	2	-	11	2	2	17	22	30	45	99	130	120	179	47.5
Total	29	11	28	96	156	169	172	204	159	115	283	256	254	390	

source: Canadian Grain Exports, Canadian Grain Commission

Table 5

EXPORTS OF CANOLA OIL BY COUNTRY OF FINAL DESTINATION: CANADA

	1979	1980	1981	1982	1983	1984	1985	1986
<u>Africa</u>								
Algeria	-	10	68	24	23	12	-	-
Morroco	-	1	-	-	-	11	6	1
S. Africa	-	-	-	-	2	5	-	1
<u>Asia</u>								
China	-	1	-	-	2	2	1	1
Hong Kong	15	15	15	12	14	19	24	14
India	110	107	36	43	103	132	47	112
Japan	9	17	17	5	9	9	6	1
Pakistan	-	1	2	5	2	9	-	25
<u>Oceania</u>								
Australia & New Zealand	4	4	7	9	7	11	22	-
<u>Western Hemisphere</u>								
Chile	6	1	-	-	5	3	-	-
Mexico -	1	-	-	1	-	10	14	-
United States	3	3	4	4	5	11	33	69

exports have increased 255%
average annual compounded growth rate of 9.8%

source: M.L.O. Tod

Table 6

TOTAL EXPORTS OF OILSEED PRODUCTS
CANADA
(TONNES)

YEAR	LINSEED OIL	MEAL	CANOLA OIL	MEAL	SOYBEAN OIL	MEAL	TOTAL OIL	MEAL
1967	9973	--	--	--	13740	153574	23713	153574
1968	4709	--	--	--	14555	119030	19264	119030
1969	9652	--	--	--	20736	150092	30388	150092
1970	11611	--	--	--	30879	111590	42490	111590
1971	13639	--	--	--	46128	135815	59767	135815
1972	10589	--	24982	21443	12529	130147	48100	151590
1973	2231	--	33450	47490	4943	103714	40624	151204
1974	2184	--	19240	10672	5588	92072	27012	102744
1975	5817	--	32620	27984	--	--	38437	27984
1976	4525	--	91648	107088	-	51333	96173	158421
1977	6830	--	73520	156338	1794	41318	82144	197656
1978	7145	--	110689	169660	9039	42619	126873	212279
1979	4744	8012	151548	176309	9039	42691	165331	227012
1980	7895	12187	198138	203959	18653	74088	224686	290234
1981	8588	5326	163088	162085	17273	48712	188949	216123
1982	6606	10561	116644	114468	25079	19228	148329	144257
1983	136	1240	176819	304207	21740	12282	198695	317729
1984	776	830	236783	318924	6576	869	244135	320623
1985	2568	3185	164566	291192	3968	869	171102	295246
1986	1066	1179	304665	444218	870	8375	306601	453772
20YEAR % AVERAGE ANNUAL								

*SOURCE: GRAINBASE

-- N.A.
- INSIG.

Table 7

AREA ('000 HECTARES) AND PRODUCTION ('000 TONNES) OF CANOLA BY PROVINCE
CANADA

YEAR	CANADA AREA	PRODUCTION	PEI AREA	PRODUCTION	NS AREA	PRODUCTION
1973	1297	1223.6	-	-	-	-
1974	1278	1163	-	-	-	-
1975	1829	1840	-	-	-	-
1976	720	837	-	-	-	-
1977	1453	1973	-	-	-	-
1978	2825	3497	-	-	-	-
1979	3408	3411	-	-	-	-
1980	2080	2483	-	-	-	-
1981	1401	1849	-	-	-	-
1982	1777	2225	-	-	-	-
1983	2334	2609	-	-	-	-
1984	3091	3428	-	-	-	-
1985	2803	3508	-	-	-	-
1986	2641	3809	-	-	-	-
1987	2670	3846	-	-	-	-

* SOURCE = STATISTICS CANADA 22-002 FIELD CROP REPORTING SERIES
= GRAIN TRADE OF CANADA 22-001

- insignificant

Table 7 cont.

NB AREA	PRODUCTION	QUE AREA	PRODUCTION	ONT AREA	PRODUCTION	MB AREA
-	-	-	-	-	-	161.9
-	-	-	-	-	-	202.3
-	-	-	-	-	-	303.5
-	-	-	-	-	-	101.2
-	-	-	-	-	-	202
-	-	-	-	-	-	425
-	-	-	-	-	-	546
-	-	-	-	-	-	324
-	-	-	-	-	-	243
-	-	-	-	-	-	344
-	-	-	-	6.9	7.3	384
-	-	-	-	11.3	20.9	486
-	-	-	-	20.2	44.9	405
-	-	-	-	37.6	73.5	405
-	-	-	-	16.2	29.5	405

Table 7 cont.

	SASK		ALB		BC
PRODUCTION	AREA	PRODUCTION	AREA	PRODUCTION	AREA
174.6	587	544	526	488	22
193	587	526	465	424	24
284	809	839	688	692	28
102	304	388	304	336	11
290	587	839	627	805	36
578	1133	1452	1194	1406	73
567	1335	1281	1416	1440	109
295	809	998	890	1134	57
306	546	760	587	760	26
399	607	794	769	975	57
397	850	1066	1012	1066	81
544	1295	1429	1214	1361	85
635	1174	1542	1133	1247	71
578	1020	1497	1133	1610	45
590	1052	1542	1153	1633	45

Table 7 cont.

	WESTERN CANADA	
PRODUCTION	AREA	PRODUCTION
17	1296.9	1223.6
20	1278.3	1163
25	1828.5	1840
11	720.2	837
39	1452	1973
61	2825	3497
123	3406	3411
57	2080	2484
23	1402	1849
57	1777	2225
73	2327	2602
73	3080	3407
43	2783	3467
50	2603	3735
57	2655	3822

Table 8

PRODUCTION OF OILSEEDS
WORLD ('000 TONNES)

CROP	YEAR 1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
SOYBEANS	59479	72809	77539	93556	81102	86602	93708	82987	92866	97080	98086	100718
COTTONSEED	22130	24554	23216	25354	25041	27680	26440	26342	34646	30931	27508	30069
GROUNDNUTS	11115	11159	11960	11589	11830	13415	11667	12574	13431	13977	13848	13164
SUNFLOWER	10020	12935	13008	15480	13124	15123	16800	15483	17895	19573	18626	19575
CANOLA	6920	7940	10737	10074	11134	12342	14913	14327	17046	18589	19795	22065
FLAX	2325	3252	2575	2873	2269	2293	2728	2311	2418	2554	2934	2728
PALMKERNELS	1208	1088	1311	1423	1415	1658	1682	1733	2002	2385	2335	2492
COPRA	4375	4780	4235	4688	4660	4693	4316	3515	4125	5125	4911	4222
SESAMESEED	1765	1818	1854	1840	1713	2077	1793	1949	1926	2212	2241	2237
CASTORSEED	694	773	907	899	780	919	922	944	1054	1172	933	740
TOTAL	120031	141108	147342	167776	153068	166802	174969	162165	187409	193598	191217	198010
CANOLA AS % OF TOTAL.	5.8	5.6	7.3	6.0	7.3	7.4	8.5	8.8	9.1	9.6	10.4	11.1

*SOURCE: ISTA OIL WORLD

Table 9

PRODUCTION OF CANOLA BY MAJOR PRODUCING COUNTRIES: WORLD
('000 tonnes)

COUNTRY	YEAR 1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
DENMARK	81	87	104	150	225	285	360	345	517	573	613
FRANCE	536	388	568	510	1103	990	1147	906	1304	1334	1073
W. GERMANY	222	282	331	322	377	363	570	599	712	803	1025
SWEDEN	244	234	288	260	283	280	319	323	333	323	321
UNITED KINGDOM	111	142	155	198	300	325	580	565	925	895	955
CZECHOSLOVAKIA	134	162	166	80	214	200	178	314	300	285	310
E. GERMANY	323	311	320	203	310	284	308	260	305	381	440
HUNGARY	67	89	108	41	98	88	100	105	106	85	120
POLAND	980	708	691	234	572	496	433	554	911	1073	1293
BANGLADESH	114	134	137	118	122	123	122	131	142	135	135
PEOPLES REP. OF CHINA	1110	1220	1868	2402	2384	4065	5656	4287	4205	5607	5871
INDIA	1551	1650	1860	1428	2002	2382	2207	2608	3030	2639	2750
PAKISTAN	296	236	248	247	253	239	246	217	235	235	240
CANADA	837	1973	3479	3411	2483	1873	2246	2609	3428	3508	3809
OTHER	314	324	396	470	405	385	441	504	593	713	840
TOTAL	6920	7940	10737	10074	11131	12342	14913	14327	17046	18589	19795
% OF TOTAL BY CANADA	12.1	24.8	32.4	33.9	22.3	15.2	15.1	18.2	20.1	18.9	19.2

source: Foreign Agricultural Service, U.S.D.A.

Table 10

MARKET SHARES OF VARIOUS VEGETABLE OILS
CANADA

IN PERCENTAGES

YEAR	CANOLA	SOYBEAN	CORN	SUNFLOWER	PALM	COCONUT	PEANUT	RESIDUAL
1975	32.7	36.4	--	--	11.5	5.8	--	13.6
1976	31	37.4	5.3	3.4	11.8	5.6	2	3.5
1977	36.3	34.9	6.4	3.2	8.7	5.5	2	3
1978	39.3	34.9	7.4	4.3	4.9	4.7	1.8	2.7
1979	44.4	32.2	6.6	3.6	--	--	1.5	11.7
1980	46.8	31.9	6.4	3.9	4.1	3.2	--	3.2
1981	50.7	29.3	6.1	4.1	3.4	3.2	1	2.2
1982	51.8	28.5	6.3	4	2.9	2.7	0.9	2.9
1983	52.5	29.4	4.9	4	3.6	2	0.8	2.8
1984	54.5	28.5	5	4	3.4	2.1	0.9	2.4

** SOURCE = THE CANADIAN OILSEED CRUSHING INDUSTRY, DRIE, SEPT. 1985

MARKET SHARE CALCULATED ON % OF VEGETABLE OILS REFINED IN CANADA
RESIDUAL = 100% - TOTAL MARKET SHARES SPECIFICALLY SHOWN

CANADIAN OILSEED COMPARISON
CANADA

Table 11

acreage
'000 acre

YEAR	FLAX	CANOLA	SOYBEANS	YEARLY TOTALS	% OF YEARS TOTAL FLAX	CANOLA	SOYBEANS
1969	2341	2012	322	4675	50.07487	43.03743	6.887701
1970	3313	4050	335	7698	43.03715	52.61107	4.35178
1971	1768	5360	367	7495	23.58906	71.51434	4.896598
1972	1321	3270	405	4996	26.44115	65.45236	8.106485
1973	1450	3205	470	5125	28.29268	62.53659	9.170732
1974	1450	3160	415	5025	28.85572	62.88557	8.258706
1975	1400	4520	390	6310	22.187	71.63233	6.180666
1976	800	1778	378	2956	27.0636	60.14885	12.78755
1977	1475	3590	550	5615	26.26892	63.93589	9.795191
1978	1300	6980	705	8985	14.46856	77.68503	7.846411
1979	2300	8420	690	11410	20.15776	73.79492	6.047327
1980	1370	5140	685	7195	19.041	71.4385	9.5205
1981	1150	3463	690	5303	21.68584	65.30266	13.0115
1982	1560	4390	900	6850	22.77372	64.08759	13.13869
1983	1061	5767	900	7728	13.7293	74.62474	11.64596
1984	1780	7639	1031	10450	17.03349	73.10048	9.866029
1985	1830	6927	1050	9807	18.66014	70.63322	10.70664
1986	1867	6525	939	9331	20.00857	69.9282	10.06323
1987	1520	6600	1136	9256	16.42178	71.3051	12.27312
1988	1410	8970	1326				

* source: CANSIM
STATISTCS CANADA 22-201

Table 12

CANADIAN OILSEED COMPARISON
CANADA

Oilseed Production
('000 Bushells)

YEAR	Flax	Canola	SOYBEANS	YEARLY TOTALS	% OF YEARS TOTAL FLAX	CANOLA	SOYBEANS
1969	28048	33520	7664	69232	40.51306	48.41692	11.07003
1970	47966	72600	10385	130951	36.62897	55.44058	7.930447
1971	22321	95500	10762	128583	17.35922	74.27109	8.369691
1972	17617	58100	13770	89487	19.68666	64.92563	15.38771
1973	19400	53960	14570	87930	22.063	61.367	16.57
1974	13800	51300	11050	76150	18.12213	67.36704	14.51083
1975	17500	81100	13478	112078	15.61413	72.36032	12.02555
1976	10900	36900	9200	57000	19.12281	64.73684	16.14035
1977	25700	87000	21310	134010	19.17767	64.92053	15.9018
1978	22500	154200	18944	195644	11.50048	78.81663	9.682893
1979	32100	150400	24150	206650	15.53351	72.78006	11.68643
1980	17400	109500	25345	152245	11.42895	71.92354	16.64751
1981	18400	81500	22297	122197	15.05765	66.69558	18.24677
1982	29600	98100	31170	158870	18.63159	61.7486	19.61981
1983	17500	115020	27000	159520	10.97041	72.10381	16.92578
1984	27302	151145	34686	213133	12.80984	70.91581	16.27435
1985	35506	154667	38507	228680	15.5265	67.63469	16.83881
1986	40404	167926	35200	243530	16.59097	68.95495	14.45407
1987	29690	164209	41005	234904	12.63921	69.90473	17.45607

* SOURCE: STATISTICS CANADA AND CANSIM

CANADIAN OILSEED COMPARISON
CANADA

Table 13

OIL EQUIVELENT
(MILLIONS OF POUNDS)

YEAR extrac.rates	FLAX (35.4%)	CANOLA (40%)	SOYBEANS (17.7%)	YEARLY TOTALS	% OF YEARS TOTAL FLAX	CANOLA	SOYBEANS
1969	556	668	81	1305	42.60536	51.18774	6.206897
1970	951	1444	110	2505	37.96407	57.64471	4.391218
1971	442	1900	109	2451	18.03346	77.51938	4.447164
1972	350	1447	146	1943	18.01338	74.47247	7.514153
1973	385	1064	155	1604	24.00249	66.33416	9.663342
1974	298	1058	117	1473	20.23082	71.82621	7.942974
1975	346	1622	143	2111	16.39034	76.83562	6.774041
1976	216	738	98	1052	20.53232	70.15209	9.315589
1977	509	1740	226	2475	20.56566	70.30303	9.131313
1978	446	3084	201	3731	11.9539	82.6588	5.387296
1979	636	3008	256	3900	16.30769	77.12821	6.564103
1980	345	2190	269	2804	12.30385	78.10271	9.593438
1981	365	1630	237	2232	16.35305	73.02867	10.61828
1982	587	1962	331	2880	20.38194	68.125	11.49306
1983	347	2300	287	2934	11.82686	78.39127	9.781868
1984	541	3023	368	3932	13.7589	76.88199	9.359105
1985	703	3093	409	4205	16.71819	73.55529	9.726516
1986	800	3359	373	4532	17.65225	74.11739	8.230362
1987	588	3284	435	4307	13.65219	76.24797	10.09984

* SOURCE: CANSIM AND STATISTICS CANADA 22-201

Table 14

CRUSHING OF OILSEEDS AND PRODUCTION OF OILS AND MEALS: CANADA

	QUANTITY CRUSHED ('000 BUSHELLS)		OIL PRODUCED ('000 POUNDS)		OIL MEAL PRODUCED (TONS)	
YEAR	CANOLA	SOYBEANS	CANOLA	SOYBEANS	CANOLA	SOYBEANS
1962	1616	17861	30800	193592	24094	418526
1963	1574	18606	30759	192655	23199	441526
1964	2156	19541	42431	201057	31465	464888
1965	3746	20654	73384	205296	54017	491440
1966	4963	19876	99367	201522	70838	474365
1967	5159	19846	103471	198999	74175	472321
1968	6934	20054	140543	204027	98207	476328
1969	7768	23679	153042	240564	114232	558743
1970	8575	23437	169892	242325	124381	549175
1971	12050	23314	234286	241259	179265	544351
1972	15572	22507	295342	218531	225056	532382
1973	14745	23601	276968	240675	213772	554864
1974	12168	23336	239163	238855	173903	550250
1975	15307	26565	312389	270491	217568	627724
1976	16882	25546	346429	258659	197134	497435
1977	26910	25347	552197	257753	316486	490472
1978	29023	27024	594898	276455	340739	520043
1979	33914	29078	691559	303163	402564	560093
1980	41458	37140	849492	371398	493280	720672
1981	46923	31841	969321	328216	555273	619457
1982	39571	37733	798528	387560	474112	739936
1983	45472	37459	906640	390737	545309	731335
1984	51541	32946	1020864	349354	630758	627470
1985	57259	33248	1152591	358214	692393	640258
1986	57522	35416	1182431	367436	674140	671528

* SOURCE: STATISTICS CANADA 32-006, 22-007.

Table 15

CRUSH CAPACITY
CANADIAN CRUSHERS

YEAR	CRUSH CAPACITY TONS/DAY	TONNES/DAY
1974	2200	1996
1979	4213	3822
1984	4542	4120
1988	7130	6470

IN THE LAST 14 YEARS

TOTAL INCRESE IN CAPACITY OF 324%
ANNUAL AVERAGE YEARLY INCREASE OF 8.76%

Source: Canola Crushers of Western Canada: Task Force

Table 16

REFINING CAPACITIES IN CANADA

COMPANY	ESIMATED CAPACITY thousand tonnes/year
Western Canada	
Canada Packers Inc.	
Wainwright, Alberta	41
Winnipeg, Manitoba	23
Canbra Foods Limited	
Lethbridge, Alberta	68
CSP Foods Limited	
Altona, Manitoba	41
Nipawin, Saskatchewan	54
Gainers Incorporated	
Edmonton, Alberta	9
total for Western Canada	236
Eastern Canada	
Canada Packers Inc.	
Toronto, Ontario	109
Montreal, Quebec	91
Canada Starch Company Inc.	
Cardinal, Ontario	50
CSP Foods Ltd.	
Dundas, Ontario	32
ADM Agri-Industries Ltd.	
Windsor, Ontario	45
Monarch Fine Foods Co. Ltd.	
Rexdale, Ontario	82
Proctor and Gamble Inc.	
Hamilton, Ontario	50
St. Lawrence Starch Co. Ltd.	
Port Credit, Ontario	7
J.M. Schneider Inc.	
Kitchener, Ontario	5
total for Eastern Canada	471
Total Canada	707

Source: Canola Crushers of Western Canada, Task Force

Table 17

Canadian Crushing Facilities

Alberta Food Products: Fort Saskatchewan, Alberta.

Established:	1979
Owners:	Alberta Wheat Pool & Japan Alberta Oil Mill Company Limited
Capacity:	630 tonnes
Plant Type:	Expeller-Solvent

Canbra Foods Limited: Lethbribge, Alberta.

Established:	1957
Owners:	Burns Foods Limited & private shareholders
Capacity:	730 tonnes
Plant Type:	Expeller-Solvent, complete refining and packaging facilities.

Canadian Vegetable Oil Processors Limited: Hamilton, Ontario.

Established:	1957
Owners:	Burns Foods Limited & private shareholders
Capacity:	730 tonnes
Plant Type:	Expeller-Solvent, complete refining and packaging facilities.

CSP Foods Limited: Altona, Manitoba.

Established:	1943
Owners:	Saskatchewan Wheat Pool & Manitoba Wheat Pool
Capacity:	400 tonnes
Plant Type:	Expeller-Solvent

CSP Foods Limited: Harrowby, Saskatchewan.

Established:	1982
Owners:	Saskatchewan Wheat Pool & Manitoba Wheat Pool
Capacity:	600 tonnes
Plant Type:	Expeller-Solvent

CSP Foods Limited: Nipawin, Saskatchewan.

Established:	1973
Owners:	Saskatchewan Wheat Pool & Manitoba Wheat Pool
Capacity:	450 tonnes
Plant Type:	Expeller-Solvent, complete refining and packaging facilities.

CSP Foods Limited: Saskatoon, Saskatchewan.

Established: 1946
Owners: Saskatchewan Wheat Pool & Manitoba Wheat Pool
Capacity: 300 tonnes
Plant Type: Direct-Solvent

Maple Leaf Monarch Company: Windsor, Ontario

Established: 1979
Owners: Archer Daniels Midland Company
Capacity: 1200 tonnes
Plant Type: Expeller-Solvent

Memco Limited: Red Deer, Alberta

Established: 1977
Owners: Memco Limited
Capacity: 100 tonnes
Plant Type: Expeller-Solvent

Northern Alberta Rapeseed Processors Co-op Limited: Sexsmith, Alberta

Established: 1976
Owners: NARP Co-op Limited & Euro Cana Trade Limited(Hamburg)
Capacity: 600 tonnes
Plant Type: Expeller-Solvent

United Oilseed Products Limited: Loydminister, Alberta

Established: 1973
Owners: United Grain Growers & B.C. Packers
Capacity: 720 tonnes
Plant Type: Expeller-Solvent

Table 18

RETURN ON INVESTED CAPITOL
Canola Crushing Industry Weighted Average By Year and In Total

	R.O.I.*
1980	34.1%
1981	24.8%
1982	(16.2%)
1983	(5.3%)
1984	(0.6%)
1985	(8.0%)

* R.O.I = [net income before interest on long term debt, taxes and non-recurring items] / [average total assets - average current liabilities for the year].

source: Task Force on the Future of the Canola Crushing Industry in Western Canada.

Table 19

DEBT/EQUITY RATIOS
Canola Crushing Industry Average by Year

	Debt*/Equity
1980	0.57
1981	0.92
1982	1.98
1983	2.90
1984	4.67
1985	4.09

* debt includes amounts due to shareholders

Source: Task Force on the Canola Crushing Industry In Western Canada.

Table 20

CURRENT RATIOS
CANOLA CRUSHING INDUSTRY AVERAGE BY YEAR

	CURRENT RATIO [1]
1980	1.41
1981	1.36
1982	1.23
1983	1.38
1984	1.38
1985	1.22

1. current ratio = current assets/current liabilities

source: Task Force on the Future of the Canola Crushing Industry in Western Canada.

Table 21

NET INCOME (LOSS) ANALYSIS
CANOLA CRUSHING INDUSTRY AGGREGATE BY YEAR AND IN TOTAL

	Net Income (loss) ('000) [1]
1980	$ 27,230
1981	21,105
1982	(26660)
1983	(15340)
1984	(11516)
1985	(13255)
total	(18436) [2]

notes:

1. net income (loss) excluding non-recurring items and earnings of subsidiaries.
2. after recieving $40,689 operating susidies from government.
3. based on fiscal year end between December of the preceding year and July of the indicated year.

source: Task Force on the Future of the Canola Crushing Industry in Western Canada.

Table 22

GROSS MARGIN ANALYSIS: CANADA
Canola Crushing Industry Average By Year

	Gross Margin*
1980	15.40%
1981	13.20%
1982	2.60%
1983	7.60%
1984	7.30%
1985	6.20%

* gross margin = net sales less cost of sales

source: Task Force on the Futre of the Canola Crushing Industry in Western Canada.

Table 23

ECONOMIC IMPACT OF THE WESTERN CANADIAN CANOLA CRUSHING INDUSTRY
(Fiscal Year 1984)

Standard Economic Indicators*

Total Plant Output (from financial statements)	$489 million
Household Income (multiplyer 0.627)	$307 million
Gross Domestic Product at Factor Cost	$440 million
Gross output (multiplyer 3.096)	$1,516 million
Employment (500 * 5.427)	2,710 jobs

Impact on Producers

Farm Returns from Seed Sales	$373 million

* multiplyers from Economic Multiplyers for Alberta Industries and Commodities, 1984, Alberta Bureau of Statistics, Alberta Treasury for SIC 106.

SIC 106 includes includes crushings of soybeans, canola, flax seed and sunflower seed, but excludes corn oil.

Source: Canola Crushers of Western Canada, Task Force

Table 24

WINNIPEG COMMODITY EXCHANGE CONTRACT TRADING VOLUME

RAPESEED CONTRACT

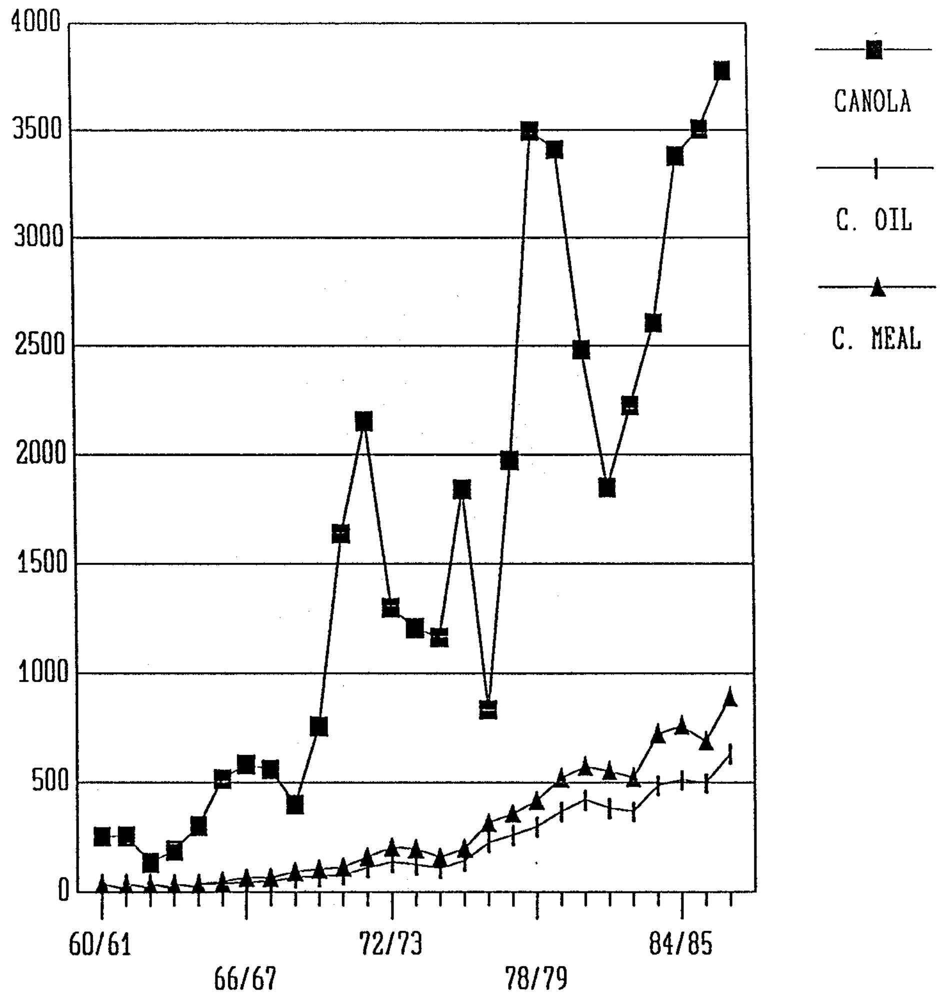
YEAR	VOLUME (YEARLY)	OPEN INTEREST (AVG. DAILY)
1963	20036	
1964	49802	
1965	143725	
1966	286052	
1967	119983	
1968	119180	
1969	206939	
1970	421670	
1971	524966	
1972	590691	
1973	568301	
1974	386317	
1975	299264	
1976	323174	
1977	443425	
1978	523454	17772
1979	624986	15813
1980	713353	17583
1981	591578	16311
1982	569436	13905
1983	649138	17649
1984	764684	15480
1985	934788	18498
1986	1085842	21643
1987	1316285	26705
1988	1430772	29954

**SOURCE = WINNIPEG COMMODITY EXCHANGE STATISTICAL ANNUALLY and records of trade.

APPENDIX B

ILLUSTRATION 1

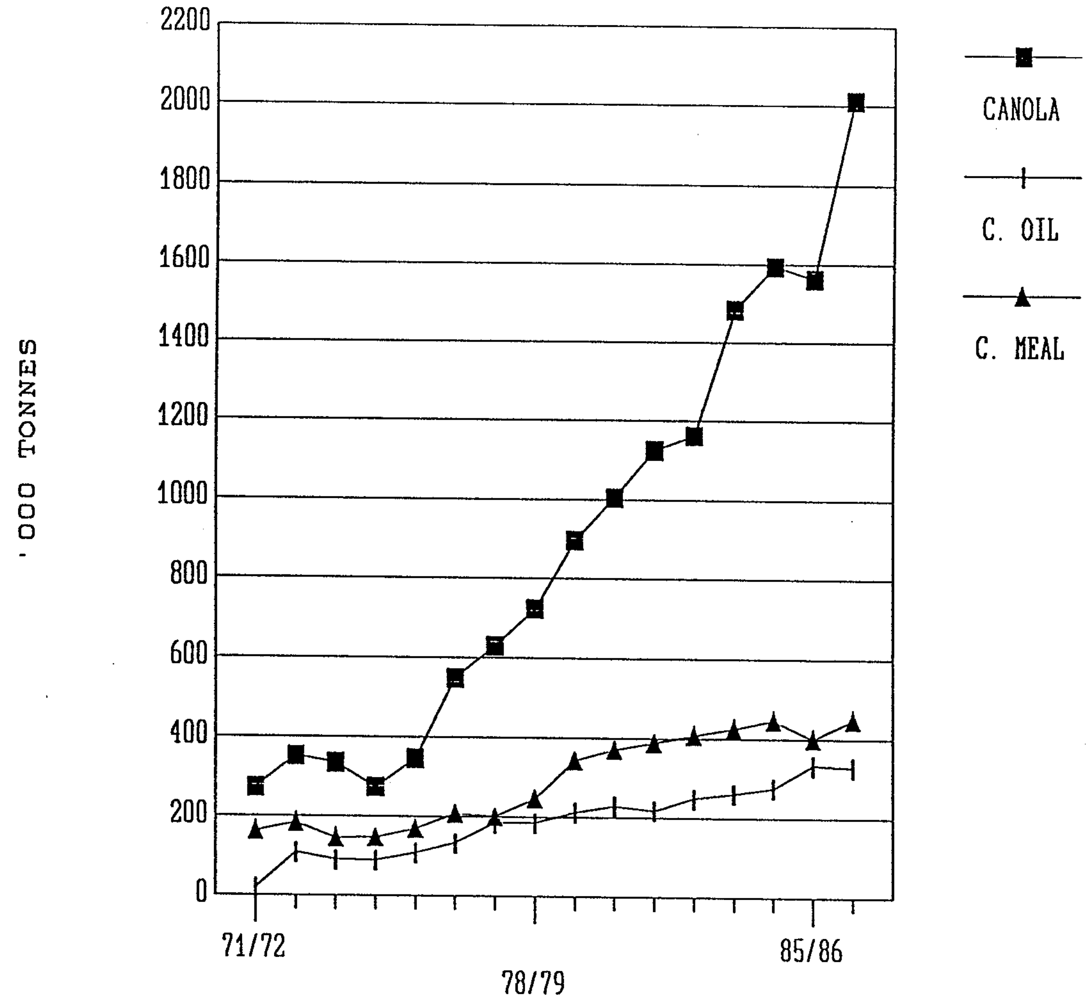
Canadian Production
Canola, Canola Oil, Canola Meal



Source: Grainbase, Canadian Grain Commission and Statistics Canada, Publication Number 22-002.

ILLUSTRATION 2

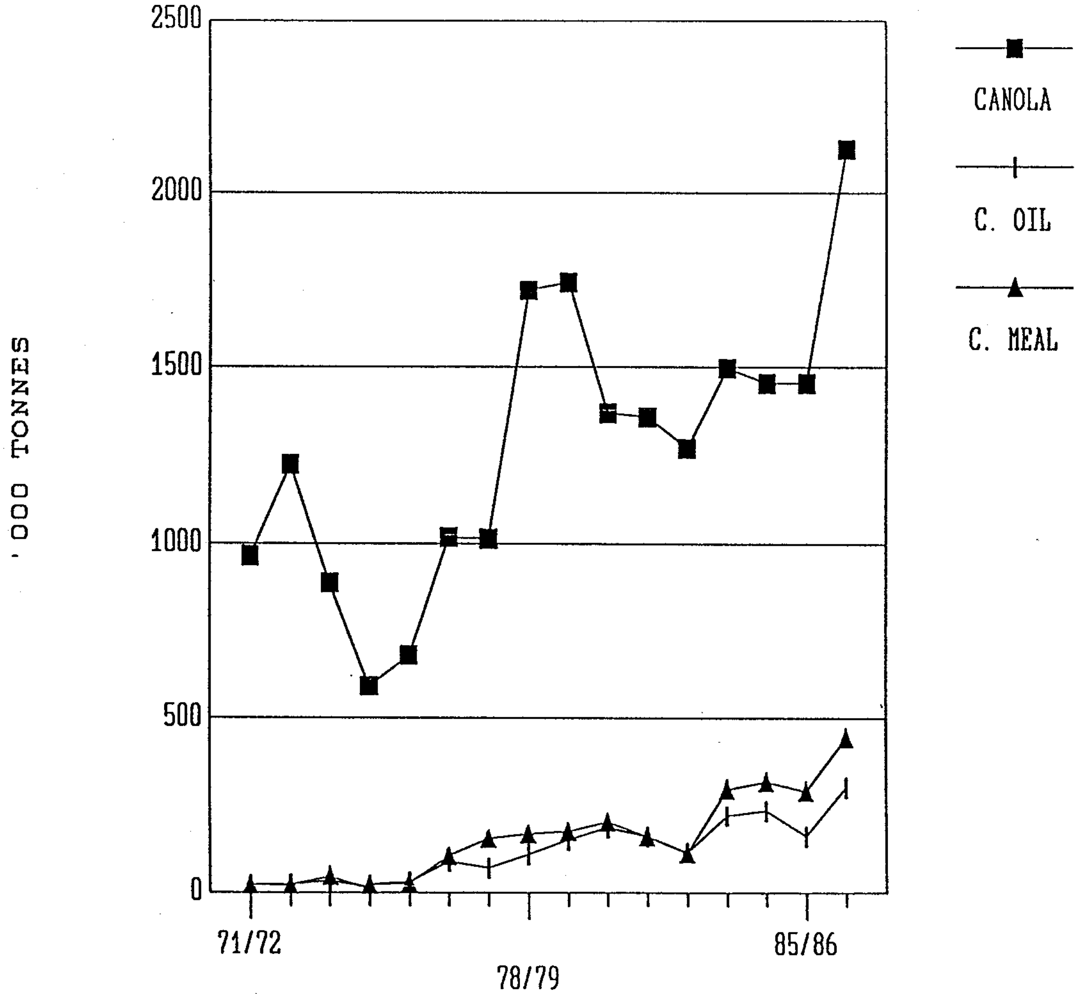
Domestic Disappearance
Canola, Canola Oil, Canola Meal



Source: Grainbase, Canadian Grain Commission and Statistics Canada, Publication Number 22-002.

ILLUSTRATION 3

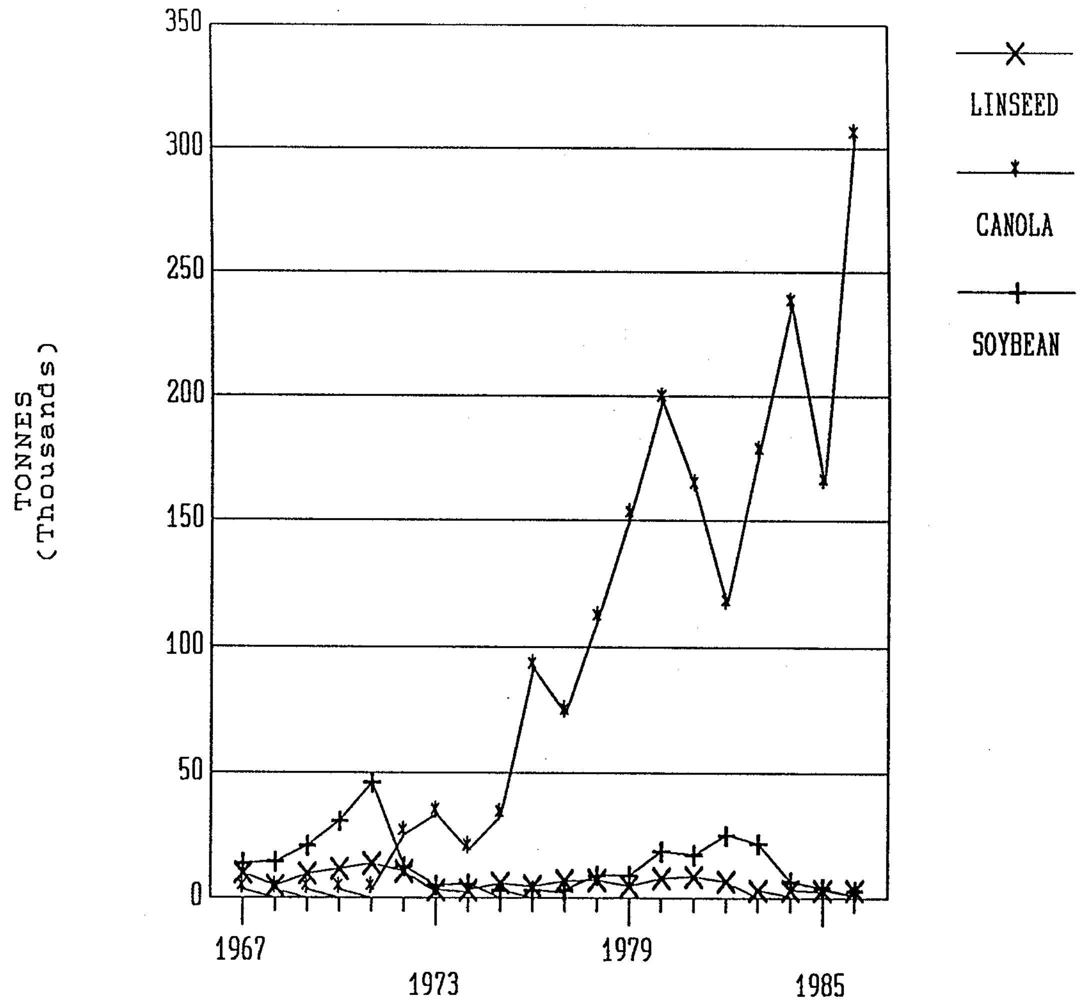
Exports
Canola, Canola Oil, Canola Meal



Source: Canadian Grain Exports, Canadian Grain Commission.

ILLUSTRATION 4

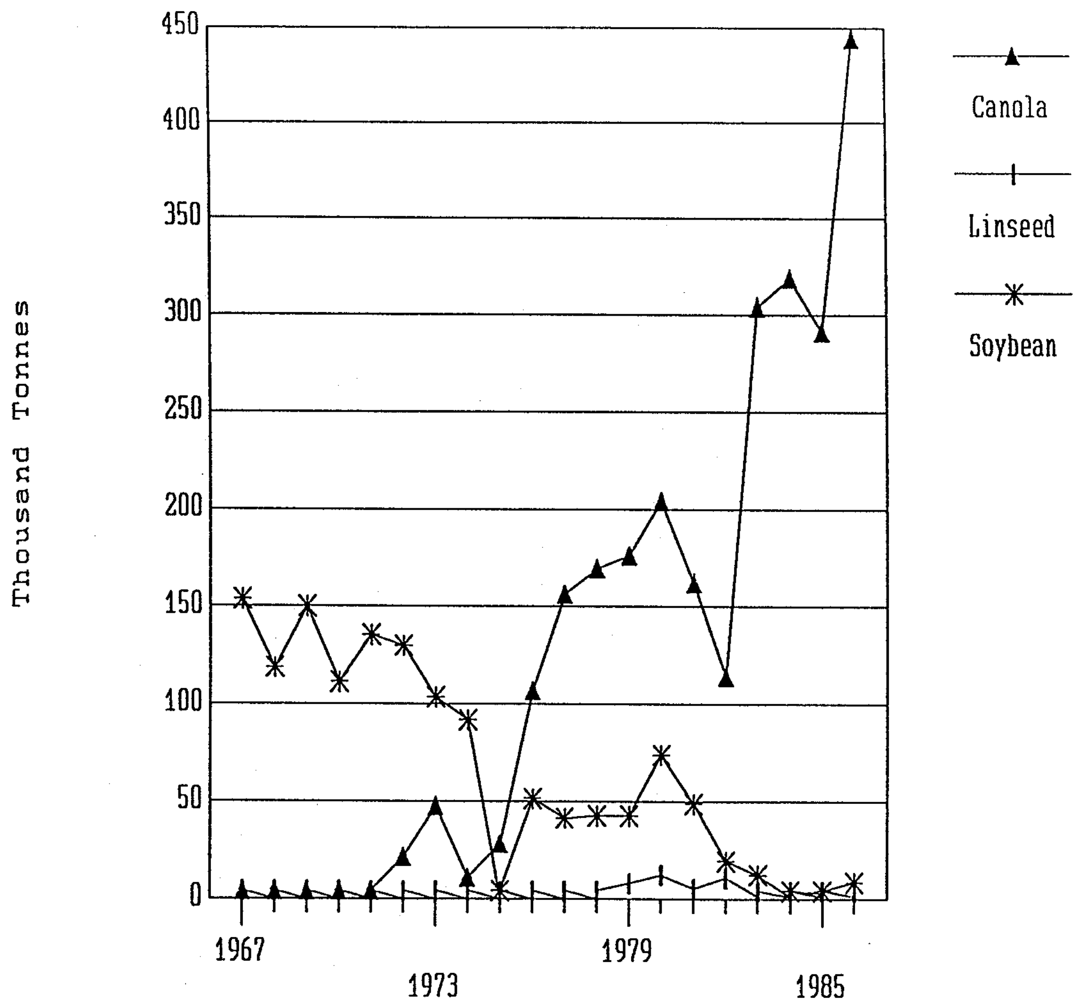
Exports of Oilseed Products: Canada
Oil



Source: Canadian Grain Exports, Canadian Grain Commission.

ILLUSTRATION 5

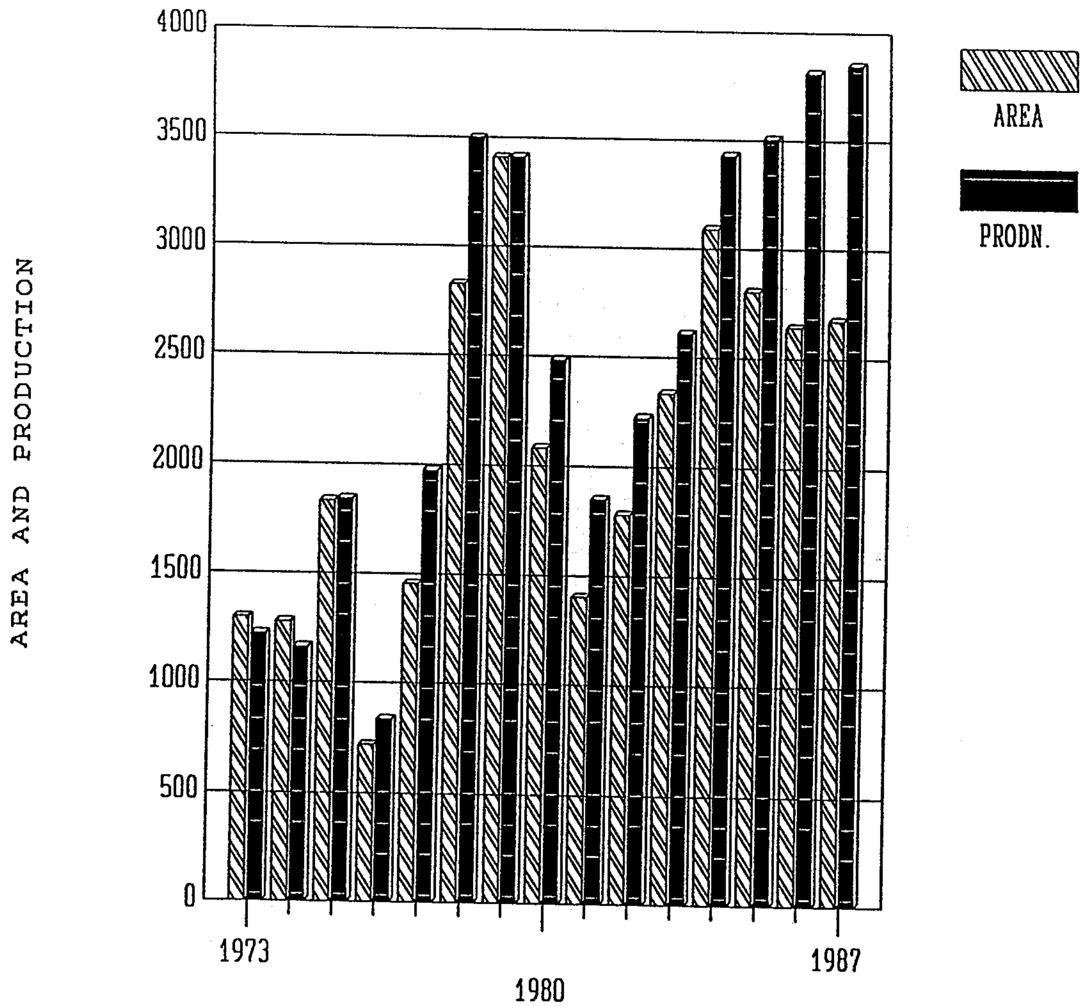
Exports of Oilseed Products: Canada
Meal



Source: Canadian Grain Exports, Canadian Grain Commission.

ILLUSTRATION 6

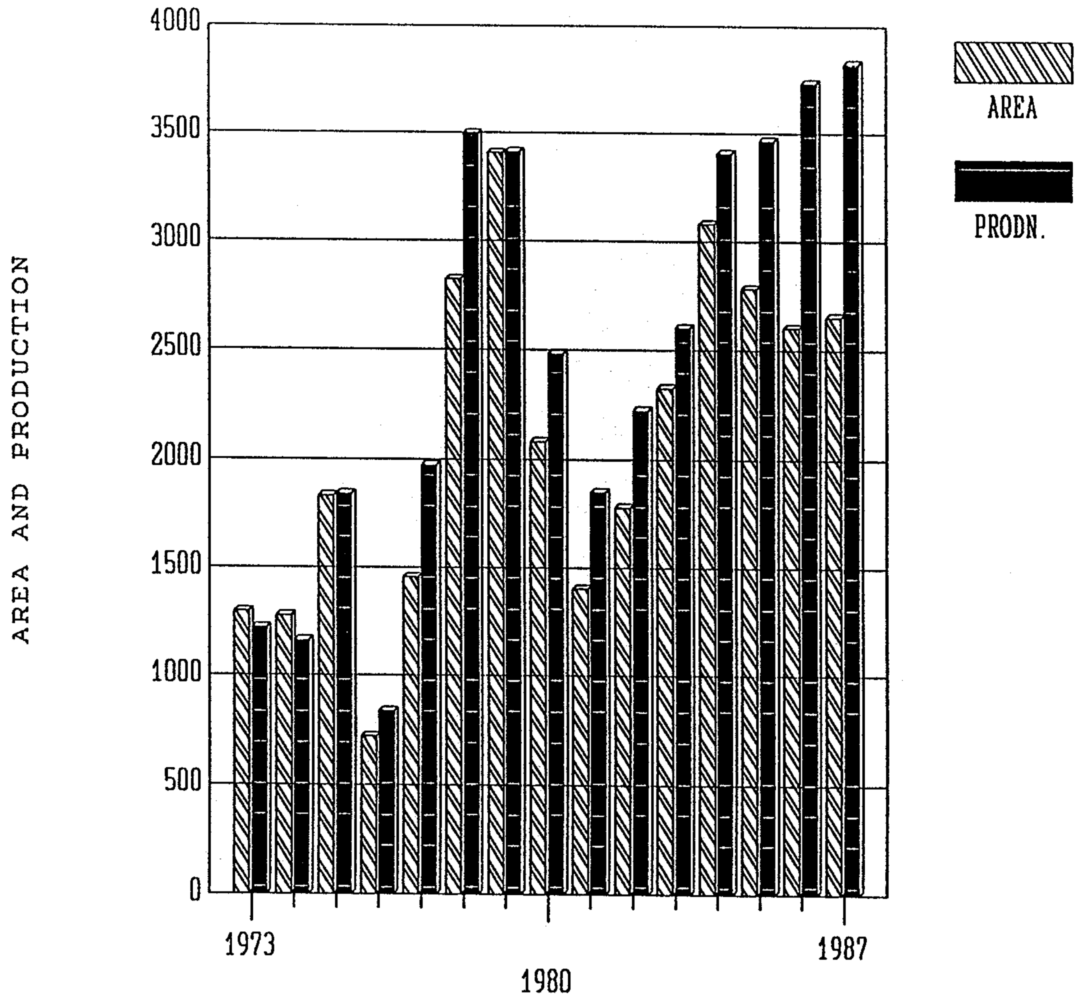
Area and Production of Canola: Canada
in '000 Hectares and '000 Tonnes



Source: Statistics Canada, Publication Number 22-002.

ILLUSTRATION 7

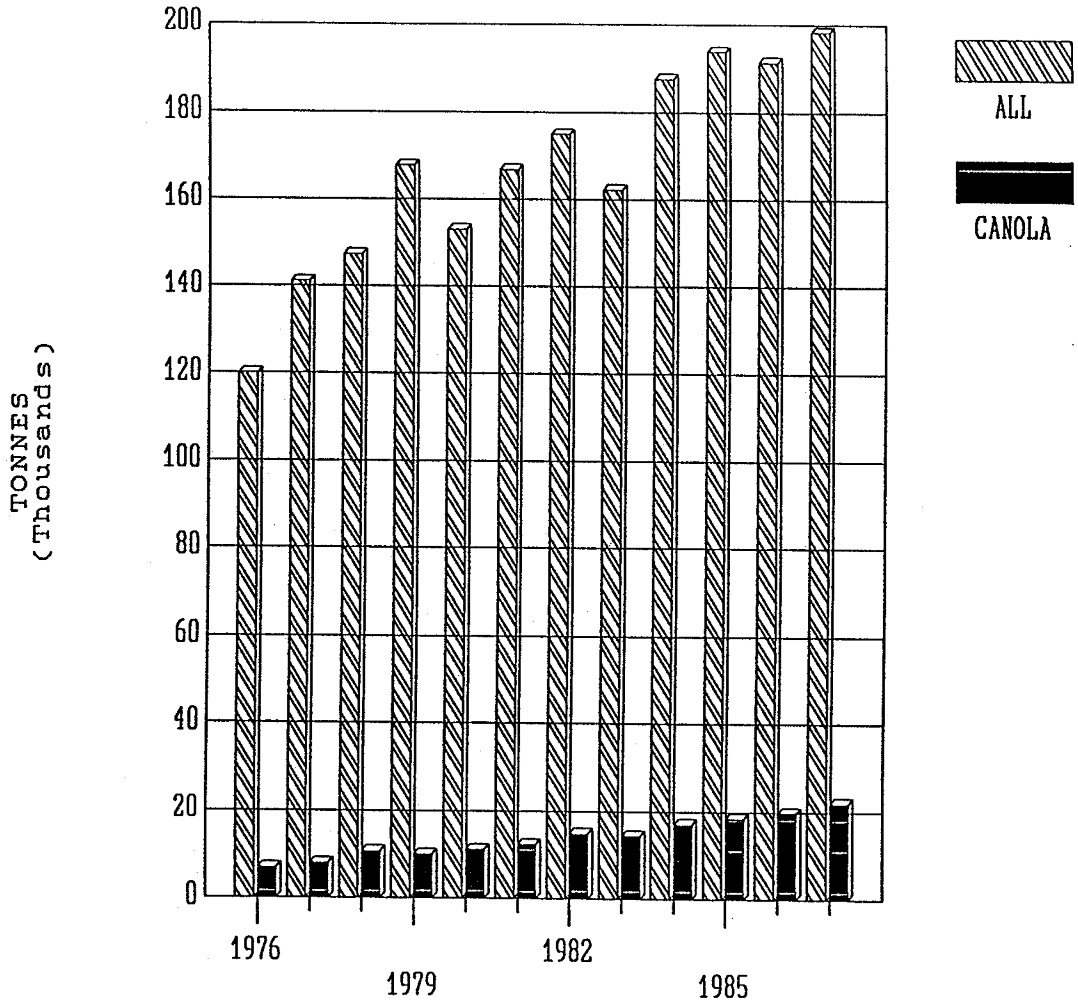
Area and Production of Canola: Western Canada
in '000 Hectares and '000 Tonnes



Source: Statistics Canada, Publication Number 22-002.

ILLUSTRATION 8

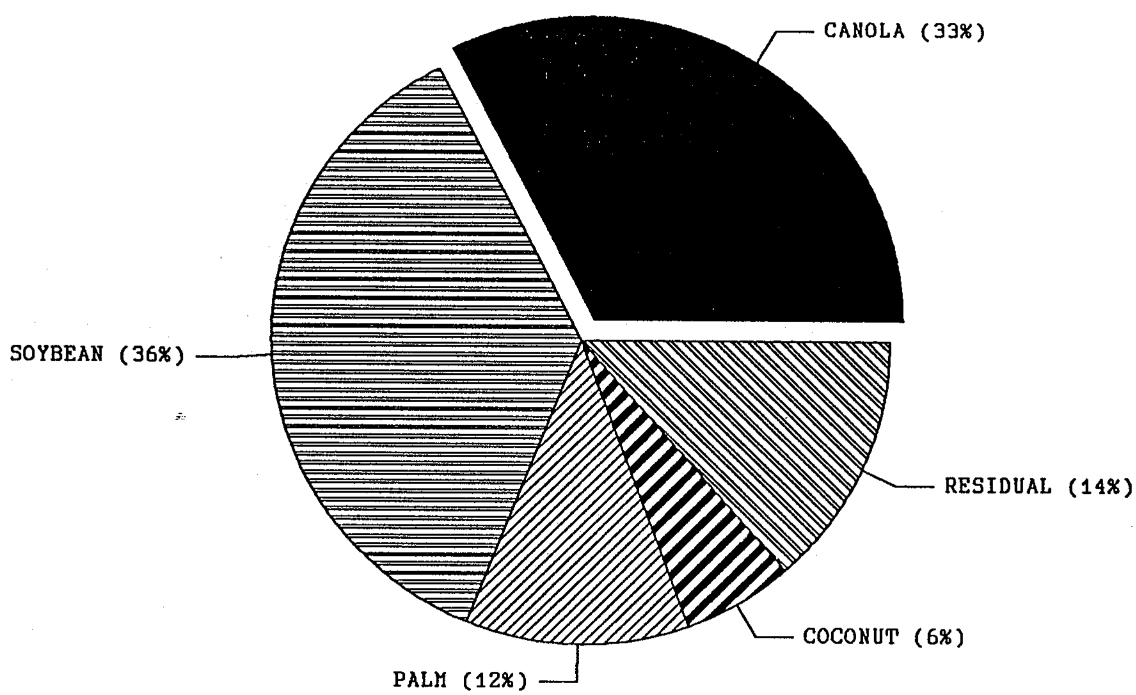
Oilseed Production: World
All Oilseed Crops and Canola



Source: Oilworld, ISTA.

ILLUSTRATION 9

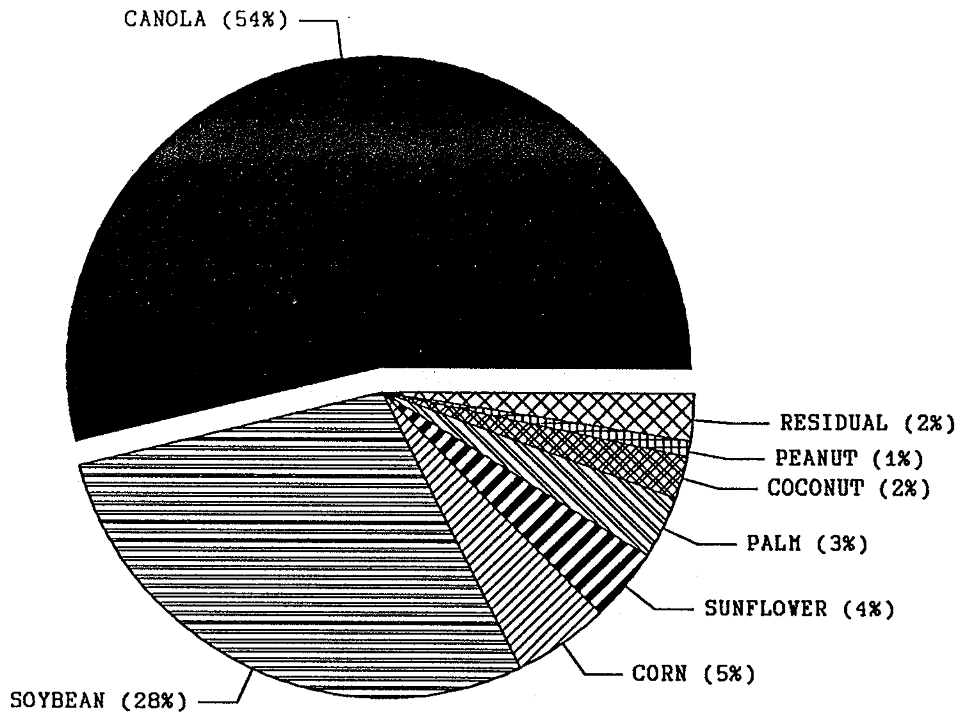
Canadian Market Share Comparison: 1975
Market Shares of Various Vegetable Oils



Source: Canadian Oilseed Crushing Industry, DRIE.

ILLUSTRATION 10

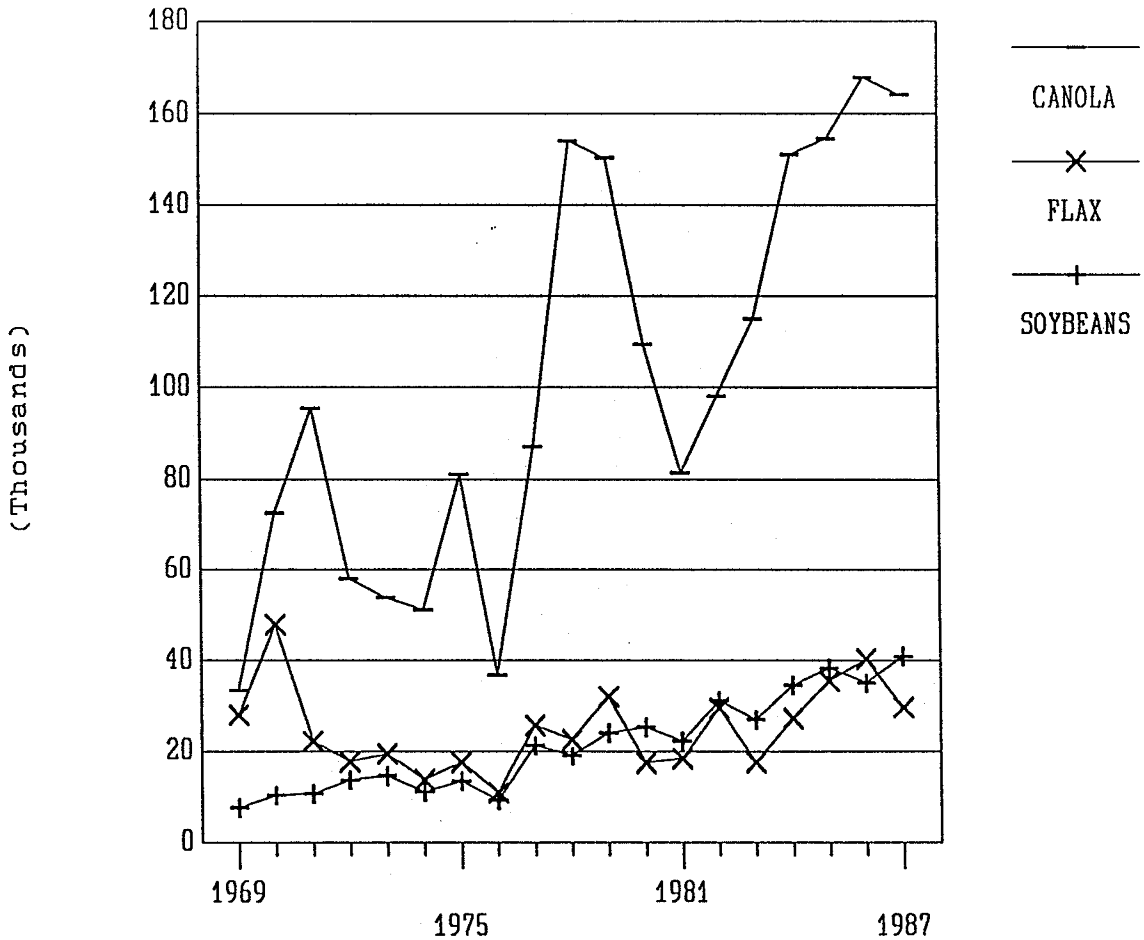
Canadian Market Share Comparison: 1984
Market Shares of Various Vegetable Oils



Source: Canadian Oilseed Crushing Industry, DRIE.

ILLUSTRATION 11

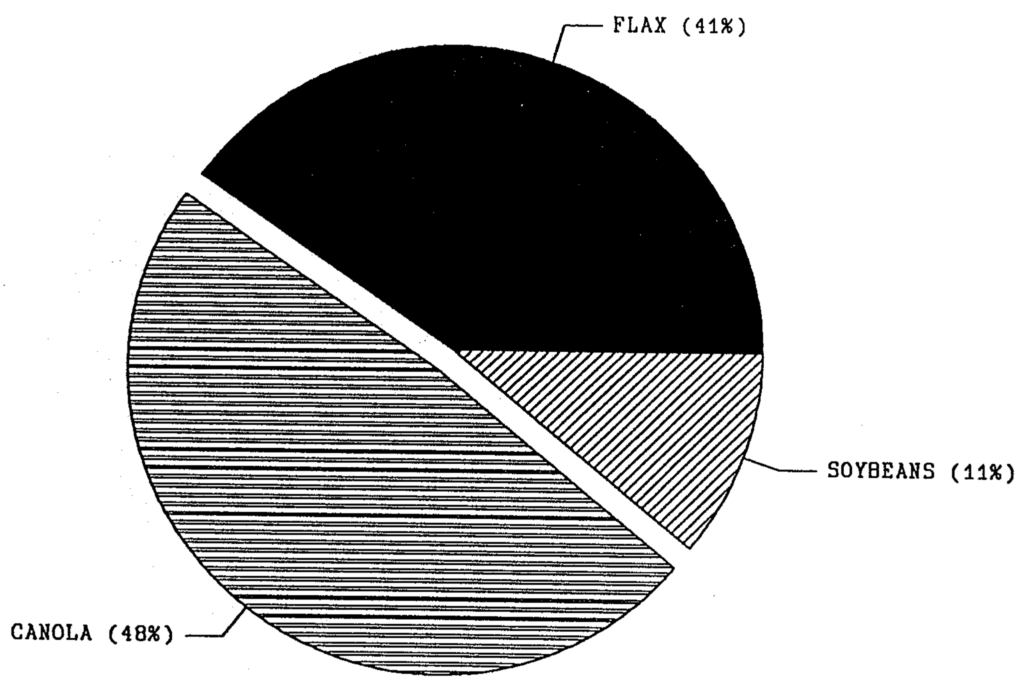
Oilseed Comparison: Canada
Production



Source: Statistics Canada, Publication Number 22-002.

ILLUSTRATION 12

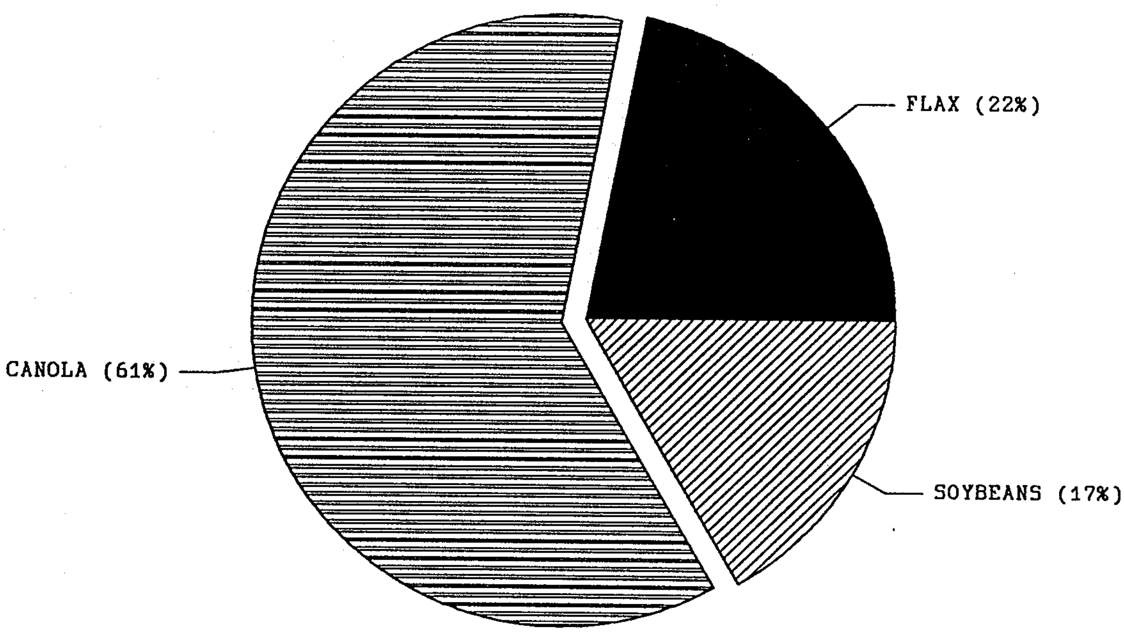
Oilseed Comparison: 1969
Canadian Oilseed Production



Source: Statistics Canada, Publication Number 22-201.

ILLUSTRATION 13

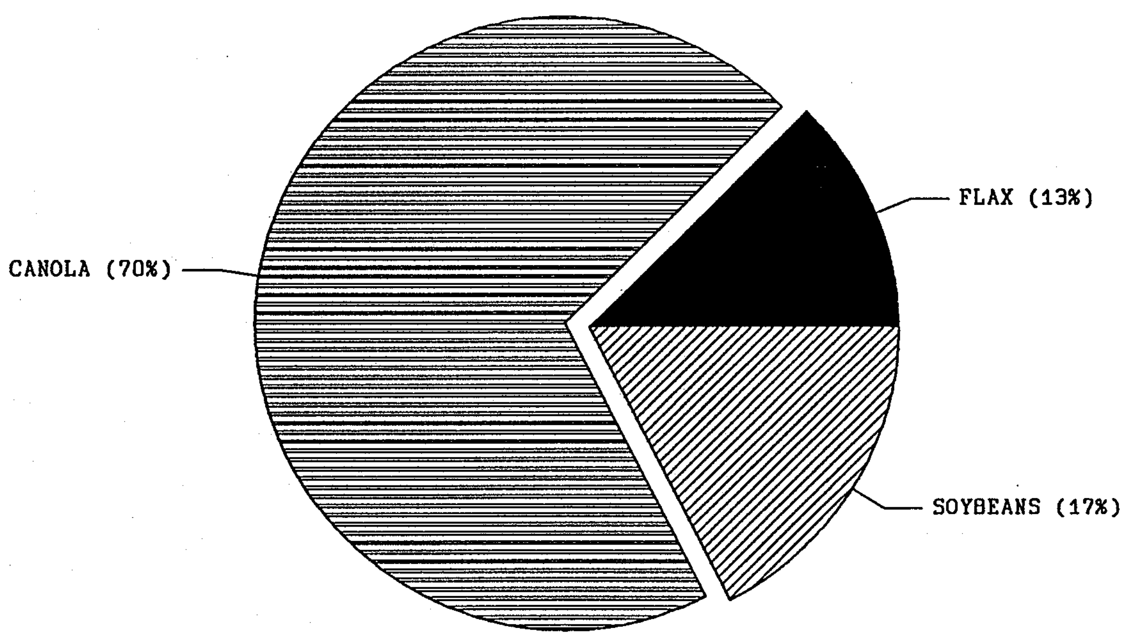
Oilseed Comparison: 1973
Canadian Oilseed Production



Source: Statistics Canada, Publication Number 22-201.

ILLUSTRATION 14

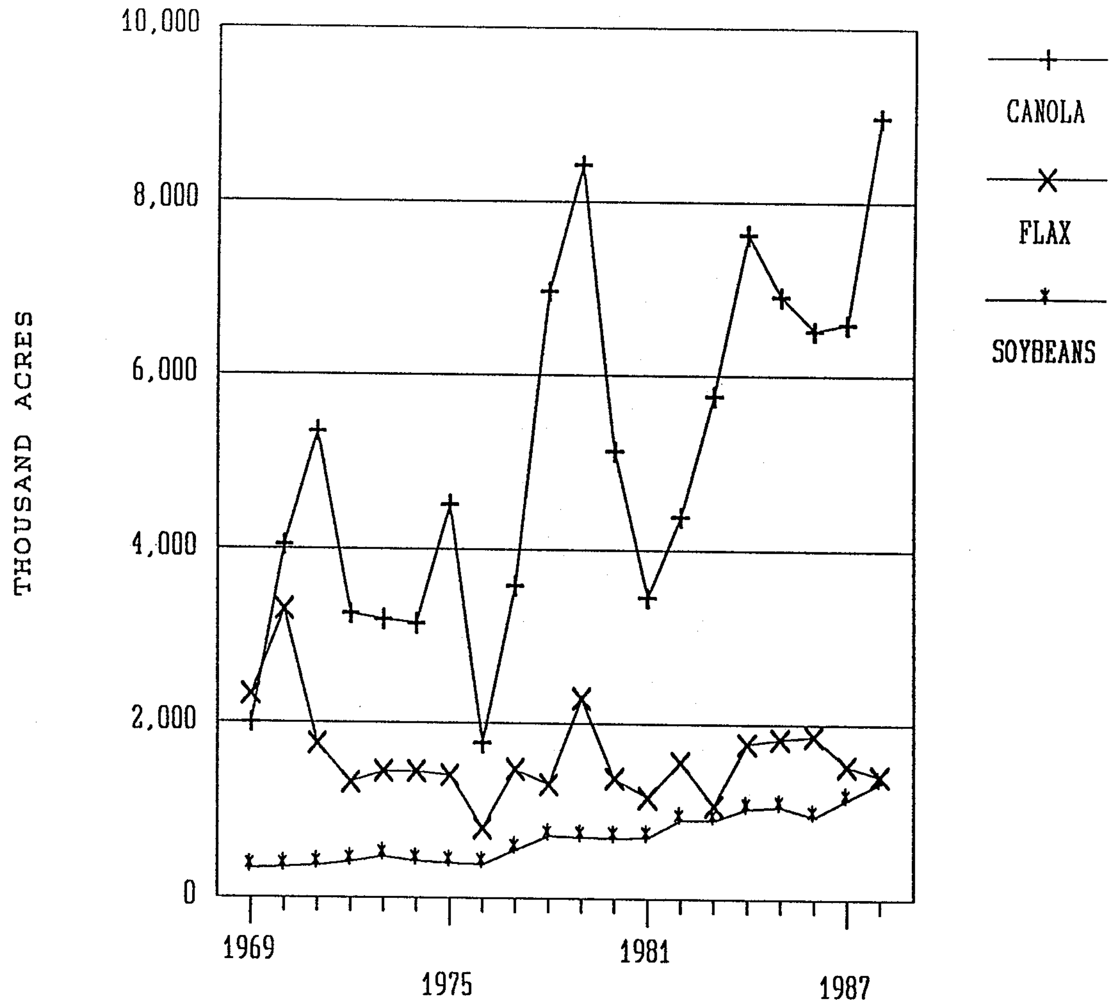
Oilseed Comparison: 1987
Canadian Oilseed Production



Source: Statistics Canada, Publication Number 22-002.

ILLUSTRATION 15

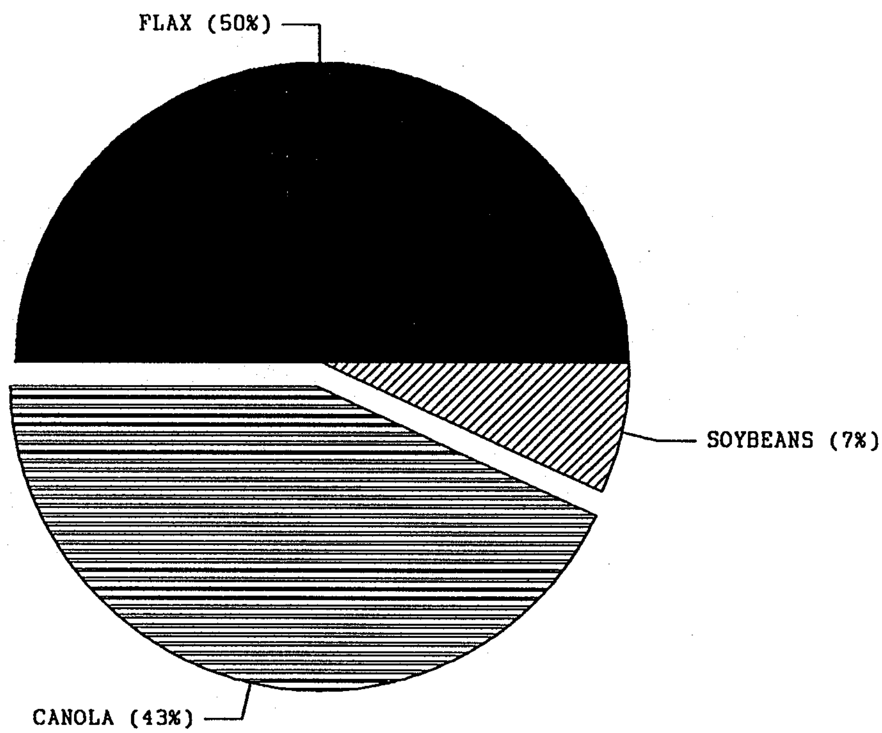
Oilseed Comparison: Canada
Area Seeded



Source: Statistics Canada, Publication Number 22-002.

ILLUSTRATION 16

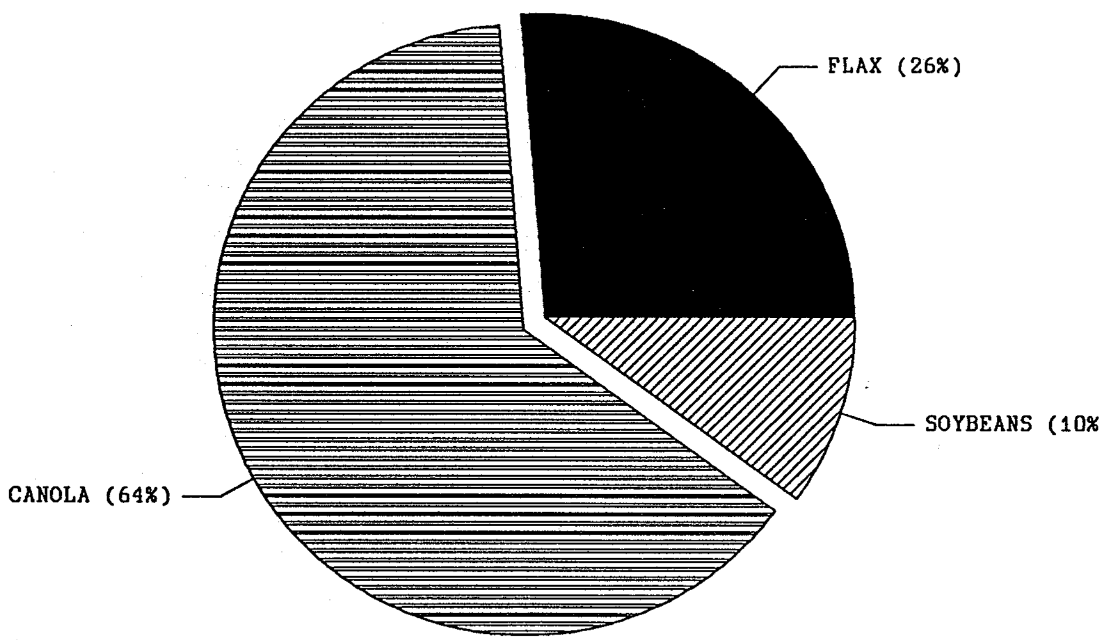
Oilseed Comparison 1969: Canada
Area Seeded



Source: Statistics Canada, Publication Number 22-002.

ILLUSTRATION 17

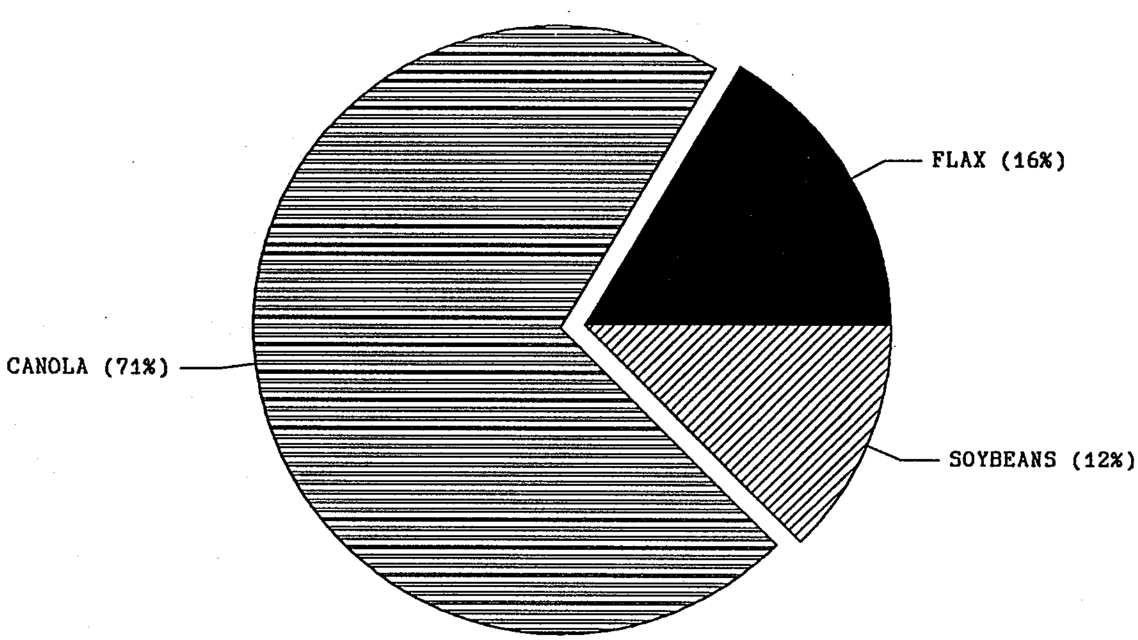
Oilseed Comparison 1977: Canada
Area Seeded



Source: Statistics Canada, Publication Number 22-002.

ILLUSTRATION 18

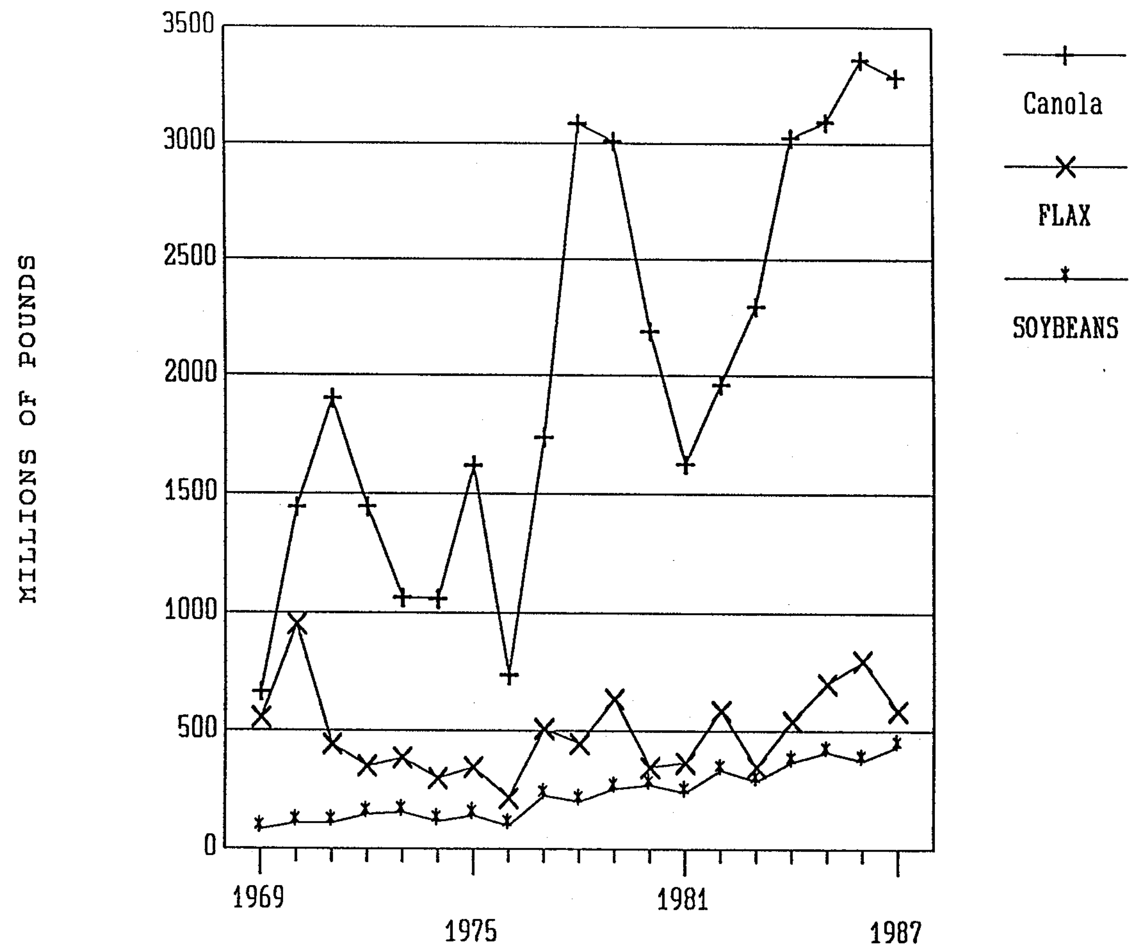
Oilseed Comparison 1987: Canada
Area Seeded



Source: Statistics Canada, Publication Number 22-002.

ILLUSTRATION 19

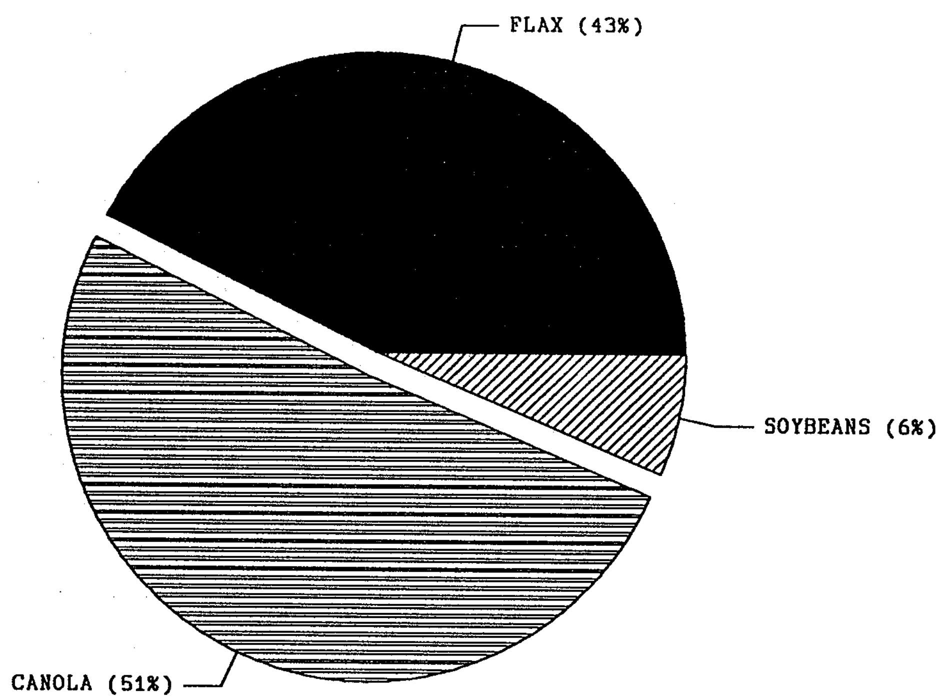
Oilseed Comparisons: Canada
Oil Equivalents



Source: Statistics Canada, Publication Number 22-201.

ILLUSTRATION 20

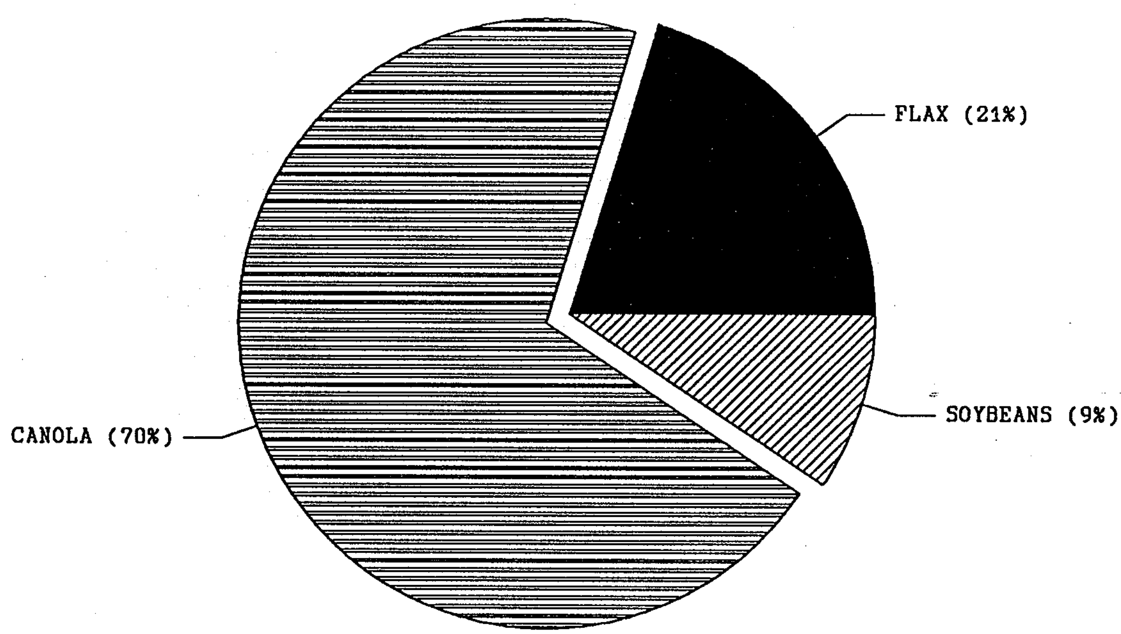
Oilseed Comparisons 1969: Canada
Oil Equivalents



Source: Statistics Canada, Publication Number 22-201.

ILLUSTRATION 21

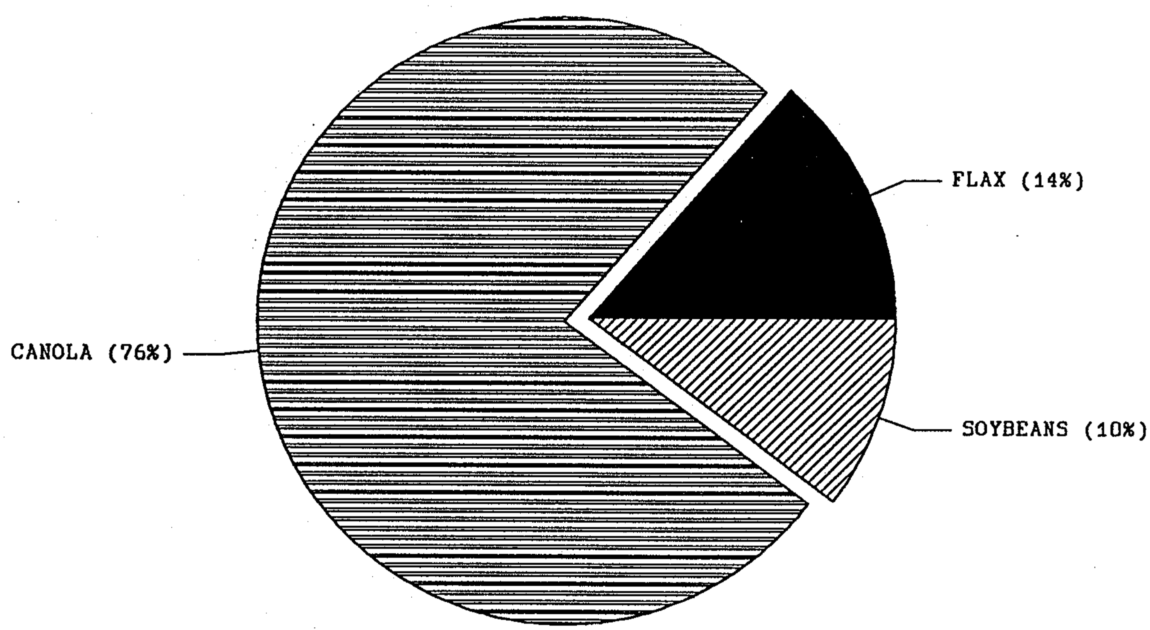
Oilseed Comparisons 1976: Canada
Oil Equivalents



Source: Statistics Canada, Publication Number 22-201.

ILLUSTRATION 22

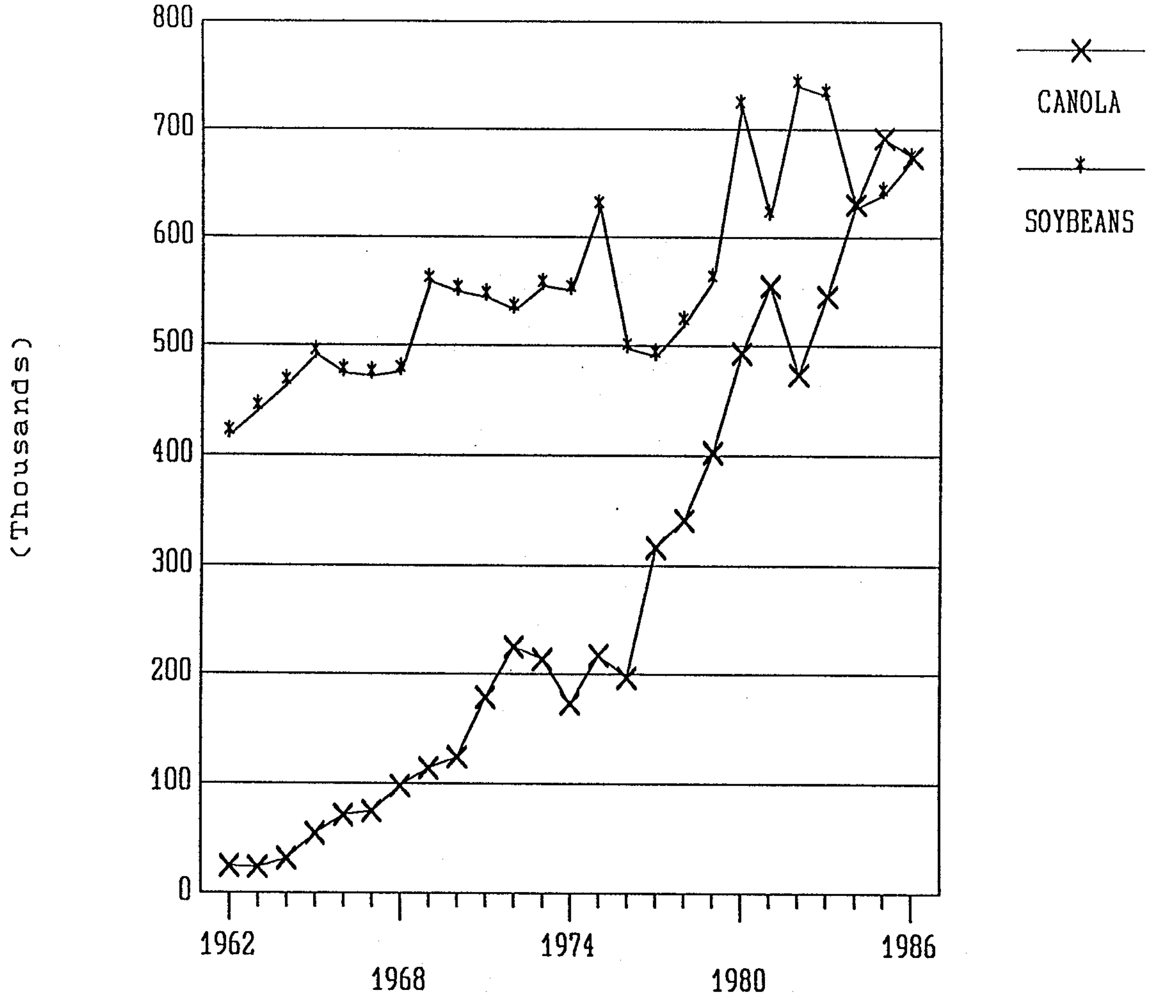
Oilseed Comparisons 1987: Canada
Oil Equivalents



Source: Statistics Canada, Publication Number 22-201.

ILLUSTRATION 23

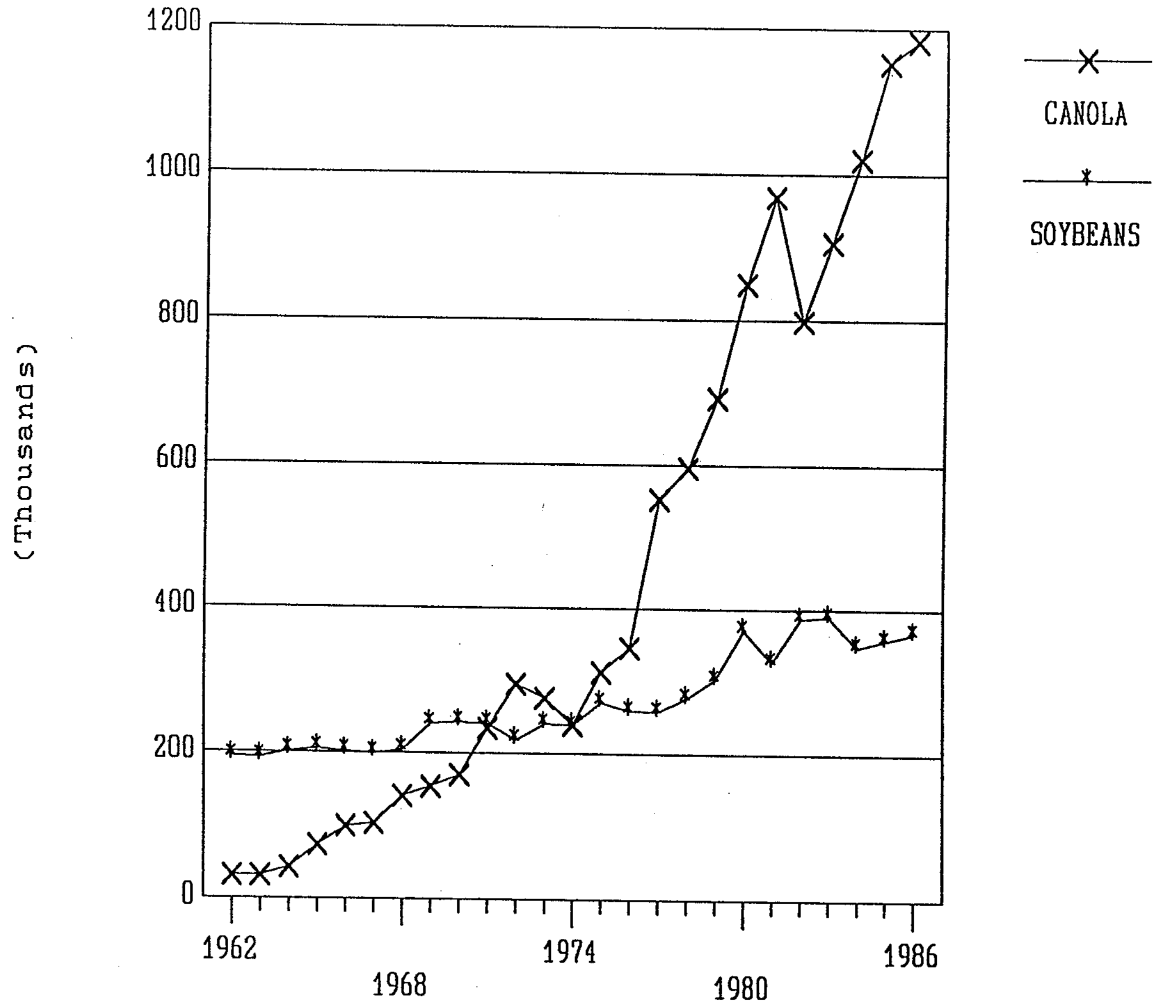
Oilseed Comparison: Canada
Meal Produced



Source: Statistics Canada, Publication Number 22-201.

ILLUSTRATION 24

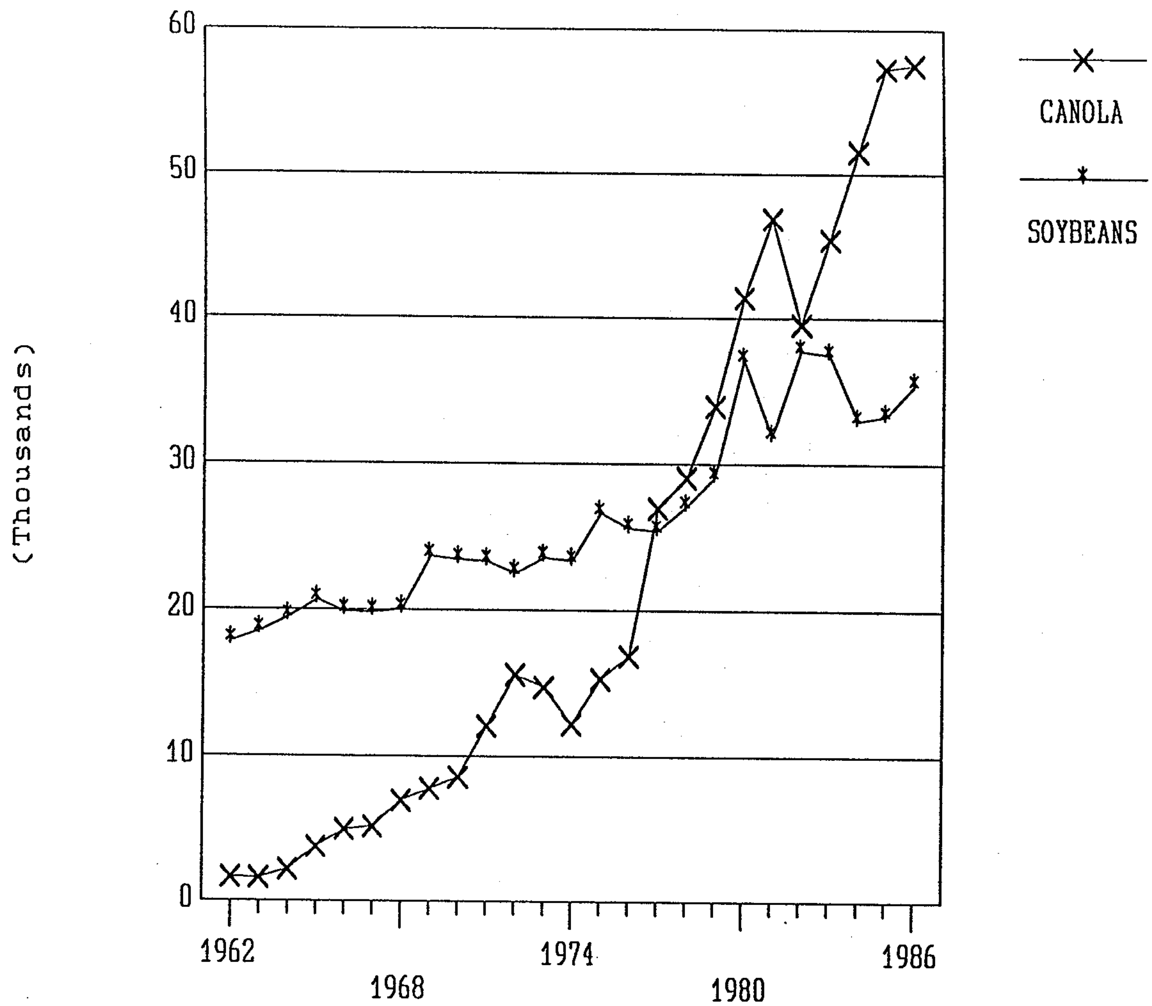
Oilseed Comparison: Canada
Oil Produced



Source: Statistics Canada, Publication Number 22-201.

ILLUSTRATION 25

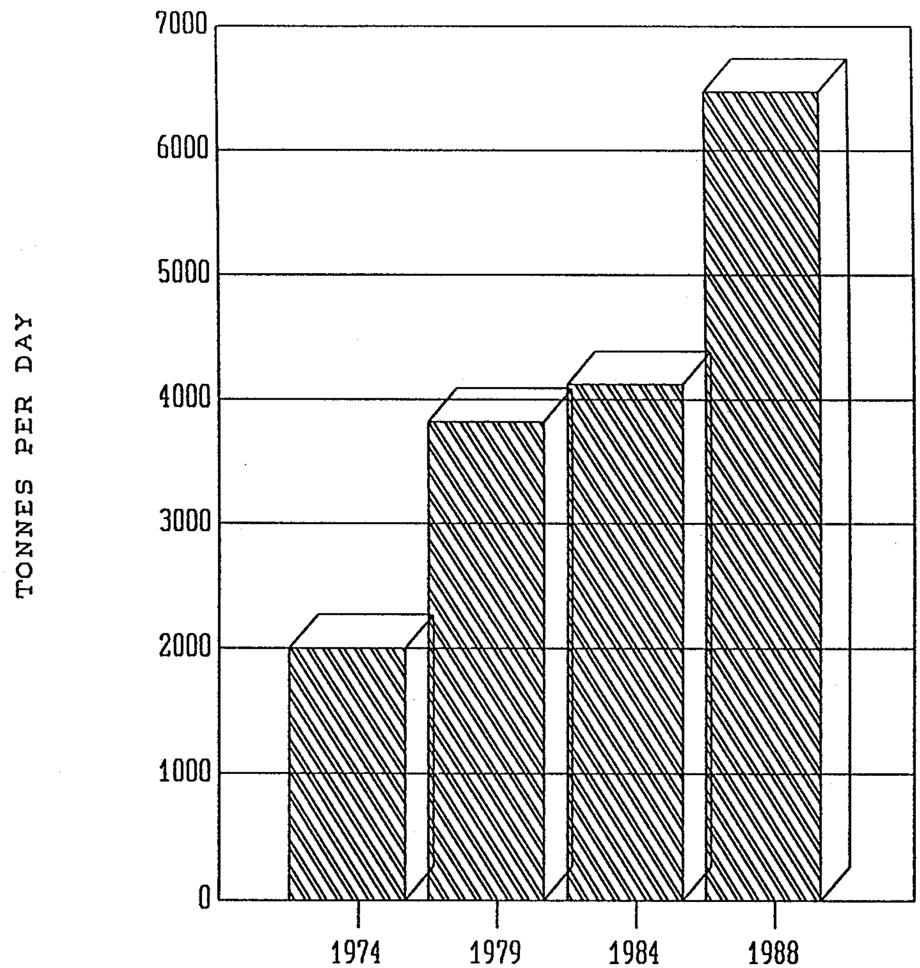
Oilseed Comparison: Canada
Quantity Crushed



Source: Statistics Canada, Publication Number 22-206.

ILLUSTRATION 26

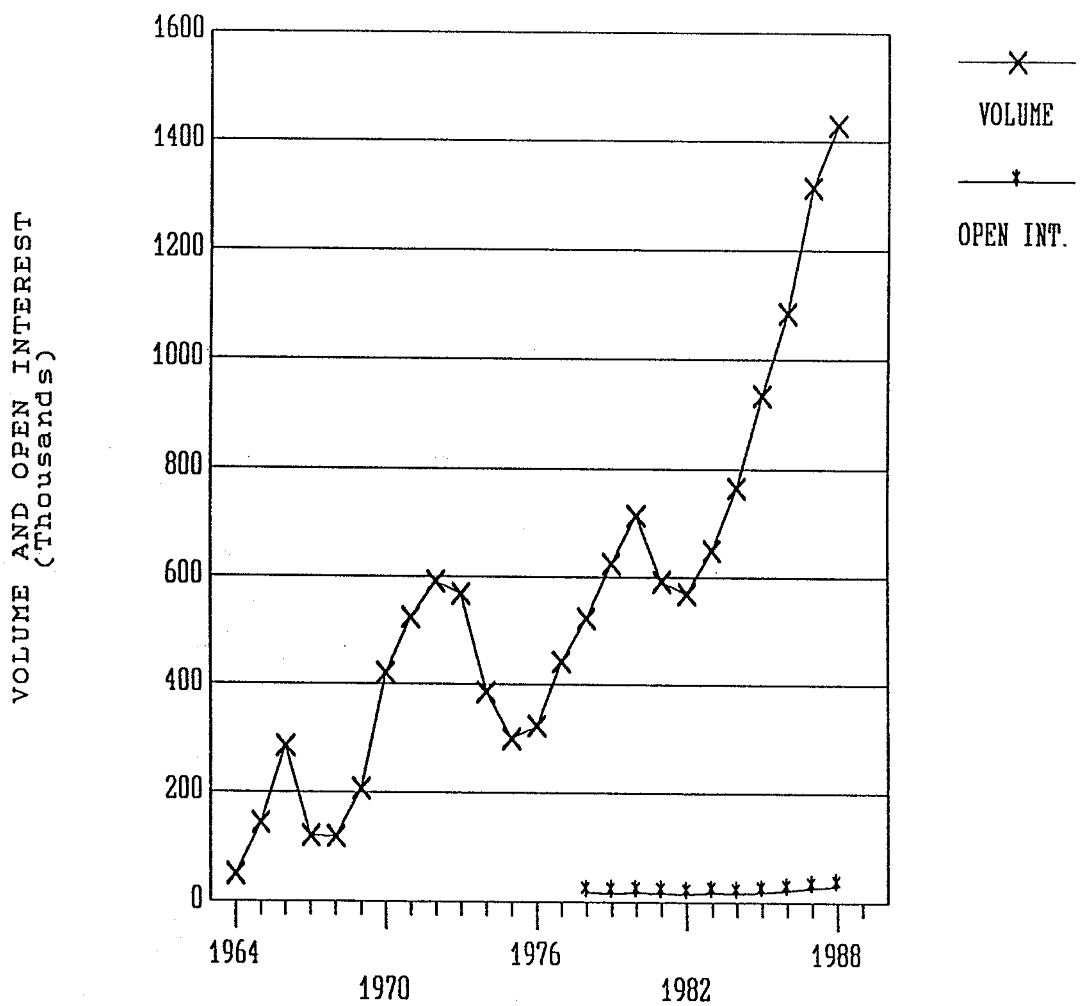
Crush Capacity
Canadian Crushers



Source: Canola Crushers of Western Canada, Task Force.

ILLUSTRATION 27

Winnipeg Commodity Exchange
Trading Volume and Open Interest: Canola



Source: Winnipeg Commodity Exchange Statistical Annually.