OPPORTUNITIES FOR THE MANUFACTURE OF FARM TRACTORS IN CANADA

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PLEASE NOTE

This report has been edited where necessary, to remove comments and data that are classed as confidential. In the interest of efficiency, this has been done by simply removing small sections of the report. As a consequence, there are some blank spots which, we hope, will not interfere with the readability of the report.

Department of Regional Economic Expansion

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Table of Contents

Table of Contents

EXHIBITS

STUDY PREPARED BY:

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I - SUMMARY

In this section we briefly summarize the main findings, conclusions and recommendations resulting from the study of the Canadian market for farm tractors.

MARKET ANALYSIS

Our analysis of trends in the farm tractor market are described in detail in Sections II and III. Below, we summarize the findings:

- Canadian sales of tractors in 1971 totalled 18,200 units valued at approximately $102 million

- The average horsepower of tractors sold in both the United States and Canada continues to increase. Average horsepower of tractors sold during 1968-1969 was 72 PTO horsepower. Sales of small-horsepower tractors from 9 to 49 horsepower continue to decline, while sales of tractors 90 horsepower and above are steadily increasing. In 1971, over 27 per cent of unit tractor sales in Canada were above 90 horsepower.

- Canadian farms continue to consolidate in number. Between 1956 and 1966 the number of farms in Canada decreased 25 per cent. Conversely, the average size of farm increased 44 per cent during this period.

- An analysis of sales in Western Canada indicates that:

  - almost 65 per cent of tractors sold in 1971 were in the 80+ horsepower category

  - the 35 to 59 horsepower segment constitutes the smallest horsepower market in Western Canada, and is expected to decrease in size in the long-term

- sales of tractors above 90 horsepower will be widely distributed among the horsepower segments as more tractor products are put on the market.

- The principal market trends in Eastern Canada, including Ontario, Quebec and the Atlantic Provinces indicate that:

  - Eastern Canada accounts for approximately 60 per cent of total unit sales in Canada

  - over 78 per cent of total Canadian unit sales of tractors less than 80 horsepower are made in Eastern Canada

  - sales of tractors in the middle horsepower range (50 to 100 horsepower) will show the greatest increase during the next 10-year period.

- Long-term trends indicate that the number of tractors sold in Canada will gradually decrease at the rate of 3 to 5 per cent per decade. However, due to the recent economic recession unit sales of farm tractors in Canada are expected to show a net increase from 17,500 units in 1970 to 26,000 in 1977. During the period 1970 to 1980 the value of sales in current dollars is expected to grow from $90 million to $155 million.

MANUFACTURING

Section IV describes the manufacturing aspects of farm tractors in detail. Below, we summarize our findings and conclusions:

- Over 54 per cent of tractors sold in Canada in 1971 were imported from the United States. It is estimated that well over 90 per cent of unit sales in Canada were imported, the remainder from Europe and Great Britain.

- The principal opportunities for Canadian-based manufacturing of farm tractors lies in the replacement of import sales. Additional opportunities will be found in export sales to regional United States markets, in light of the absence of tariff barriers.

- The most significant economies of scale in the agricultural equipment business lie in the manufacturing sector which accounts for approximately 61 per cent of the retail price level. Economies of scale are a very significant barrier to market entry of a new company in agricultural equipment manufacturing.

- In the agricultural machinery business, from 18 to 24 per cent of the total retail list price is attributable to costs incurred beyond the manufacturing level. Typically, 15 per cent of this price is discounted at the time of purchase. Any economies of scale in a distribution area related mainly to dealer size, which has increased significantly in recent years in Canada.

LOCATIONAL FACTORS IN MANUFACTURING

The findings are discussed in detail in Section V and summarized below:

- Inbound transportation costs were not significant compared to the total transportation costs of typical North American farm equipment suppliers as reflected in the outbound transportation of finished products.

- Canadian plant locations would be at a slight disadvantage inbound transportation-wise, incurring additional transportation costs relative to U.S. locations. However, Canadian plant locations if situated in Eastern Canada or Western Canada would incur lower outbound transportation costs than plants located in the Central United States, if distribution were limited to regional markets.

Canadian plants would generally incur lower costs relative to U.S. firms in the areas of labour, municipal taxes and the cost of utilities.

OUR CONCLUSIONS

The principal conclusions of the study are outlined below:

- Because of the economies of scale in manufacturing, it will be difficult for a Canadian-based supplier to profitably penetrate the farm tractor market by competing on a price basis, with tractors having no unique product features.

- Smaller manufacturing operations must compete on the basis of supplying a unique product to specific market segments. These farm tractors must distinguish themselves in terms of product features, quality, or dealer service to satisfy the particular needs of Canadian farmers.

- A Prairie location for either a tractor manufacturing or assembly operation has cost advantages over alternative Central U.S. locations even if a portion of the plant output is shipped to U.S. markets. In Western Canada there are opportunities for manufacturers who produce products catering to local needs, such as diesel-powered tractors having more than 80 horsepower, four-wheel drive vehicles, and farm tractors with power takeoff units and hydraulics of higher capacity than those required in Europe.

- A plant located in the Atlantic Provinces should be limited to the assembly of farm tractors based upon sub-assemblies brought in by sea from Europe or less likely from Mid-western United States. Such a plant could realize savings by reducing outbound transportation costs from facilities located in Europe or the United States.

II - THE PRODUCT

Wheel-type farm tractors are available with diesel, gasoline and LPG engines, and in two and four-wheel drive versions. Diesel engines predominate in larger tractors and four-wheel drive becomes significant only above 100 horsepower.

The wheel-type farm tractor market can be divided into three segments, characterized by broad uses of tractors including main field tractors, utility tractors and chore tractors. These segments overlap considerably as to product characteristics and tractor size but are useful for discussion purposes.

MAIN FIELD TRACTOR

Large field tractors are used for the bulk of field work in grain and mixed farming activities including seed bed preparation, pull-type swathing, pull-type combining, cultivating and disking.

The horsepower of the main field tractor varies by farm according to the number of acres under cultivation, type of farming (grain, mixed, row crop), and available farm labour. Farms having more than 1,500 acres often have several main field tractors of equal horsepower rating. Alternatively, on farms where a labour shortage exists, a single larger tractor would be utilized.

Typically field tractors, especially those used in Western Canada are in the 90+ PTO horsepower category. Product features which farmers consider desirable include:

- comfortable and quiet cab
- durability and reliability because of the crucial purpose of the tractors used during harvesting
- four-wheel drive, especially for hilly areas, now typical for tractors with greater than 120 horsepower
- high-capacity fuel tank for efficient farming
- power takeoff only required for pull-type combining and swathing implements
- durable hydraulics with multiple takeoffs.

UTILITY TRACTOR

On larger farms, the utility tractor functions as a back-up to the main field tractor in emergencies, does special field work in situations where a larger tractor is unsuitable, and performs assorted farming tasks. On smaller farms, the utility tractor doubles as a main field tractor.

The utility tractor is utilized in field work for which implements are "sectioned down" as a result of unusual soil conditions. Under wet soil conditions a farmer might use a utility tractor with a sectioned-down cultivator. Should the tractor become high-centred, a larger field tractor would be used for freeing the utility vehicle. During cultivation, wet spots requiring additional cultivation are often worked using a small utility tractor having greater flexibility and economy of operation.

Utility tractors range in horsepower from 50 to 90 PTO horsepower. In the West the utility tractor typically is the former main

field tractor, having been replaced in this function by a new, more powerful machine. The trend towards higher horsepower farm tractors stems from farm labour shortages, farm consolidation and the resulting growth in the average number of acres under cultivation. Therefore, it is unusual for a farmer to purchase a new tractor for use as a utility vehicle although this trend may change in the future as the population of used tractors increasingly becomes obsolete. However, on small farms more prevalent in Eastern Canada, this type of tractor is normally bought new to function in the dual role of main field and utility tractor.

The usage and stress placed on the utility tractor is less than that for the main field tractor. Repairs are less urgent because of the availability of a larger tractor for field work. On most farms the utility vehicle is maintained and repaired by the farmer himself. Utility tractors up to 20 years old are not uncommon.

CHORE TRACTOR

Chore tractors are usually found in mixed farming areas. Mixed farming requires a number of chores ideally suited to a smaller, more flexible tractor. These activities include:

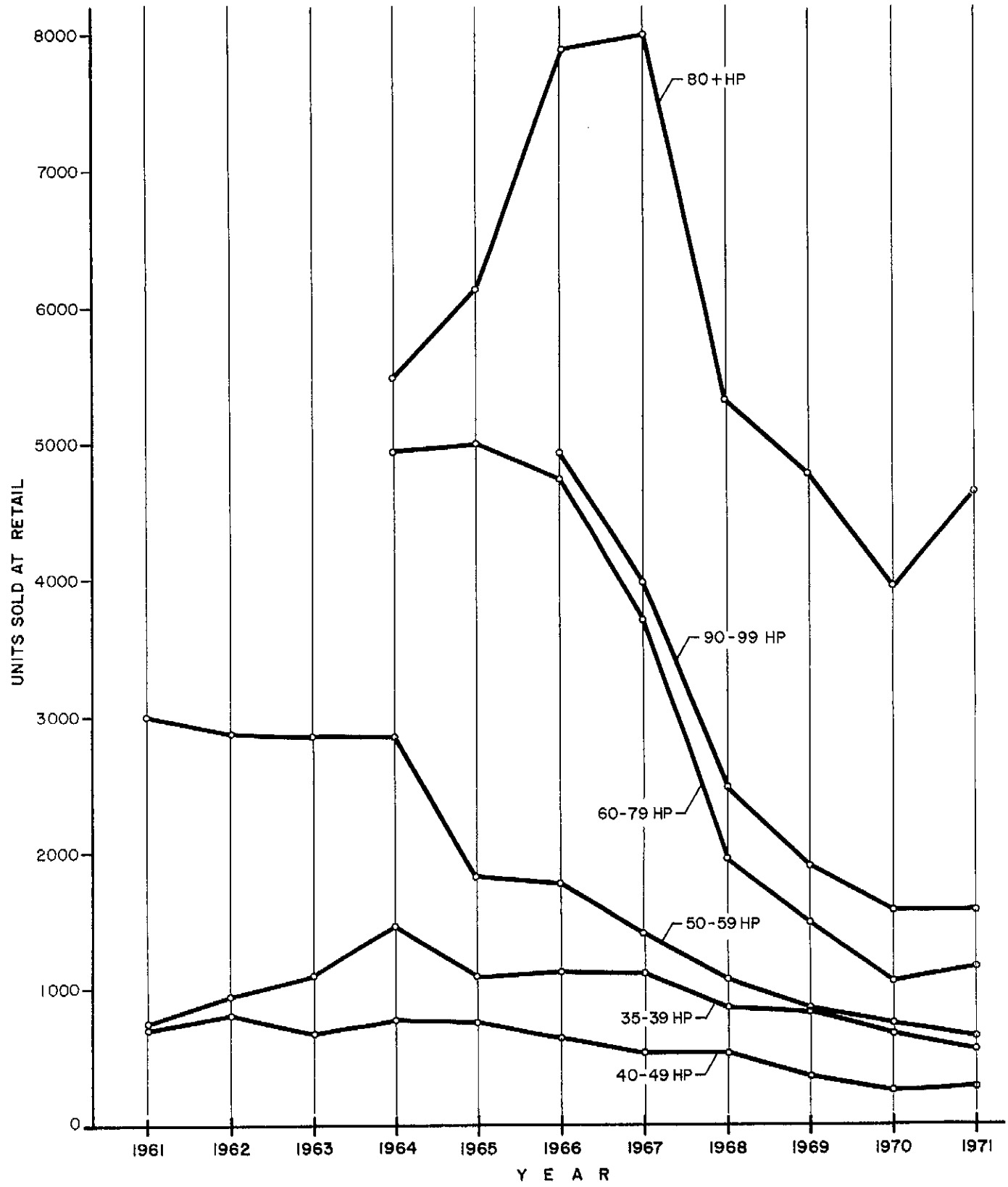
- cattle feeding from silos
- cleaning of cattle stalls
- snow-ploughing
- hauling and transport
- occasional field work.

Chore tractors range from 15 to 50 PTO horsepower. These vehicles require good hydraulics with multiple hydraulic takeoffs suitable for use with front-end loaders. Though chore tractors will be used on a year-round basis, the stress placed on them is minimal. Thus, many are more than 20 years old. These smaller vehicles are invariably maintained by the farmer himself, even to a greater extent than with the utility tractor. The urgency for quick repairs is minimal. Thus, a newer vehicle less susceptible to breakdowns is not necessary.

However, on very small farms, frequently found in the Maritimes, a tractor in this horsepower range will be the only one owned by a typical farmer. Thus he is in fact completely dependent upon it for the whole range of farming activities and thus durability and reliability are extremely important. On larger farms, the chore tractor will be the second or even the third tractor on the farm, hence the long average lifetime.

EXHIBIT 2

TRACTOR SALES BY PTO HP FOR COMBINED PROVINCES OF B.C., ALBERTA, SASKATCHEWAN AND MANITOBA



SOURCE : STATISTICS CANADA

EXHIBIT 1

IMPORTS OF WHEEL-TYPE FARM TRACTORS

Country	UNITS IMPORTED PER YEAR						Percentage Imported by Country in 1971
	1962	1967	1968	1969	1970	1971	
United Kingdom	8,372	7,444	5,641	4,579	4,234	5,421	23.9%
Iceland	-	-	-	29	3	5	-
Belgium	-	-	-	-	-	116	0.5
France	26	136	100	277	30	52	0.2
West Germany	318	3,259	1,598	993	1,592	1,842	8.1
Italy	200	281	376	280	918	1,976	8.7
Sweden	25	61	530	102	128	182	0.8
Poland	-	-	-	-	-	3	-
Roumania	-	-	-	-	9	794	3.5
USSR	-	-	8	-	52	65	0.3
Japan	-	1	1	2	60	30	0.1
United States	21,679	22,789	15,457	10,677	7,556	12,244	53.9
Czechoslovakia	-	-	-	4	12	-	-
Australia	-	2	-	-	1	-	-
TOTAL:	30,620	33,973	23,711	16,943	14,595	22,730	100.0%
TOTAL CANADIAN UNIT SALES PER YEAR:	23,763	29,814	23,098	20,396	17,536	18,193	

SOURCE: Statistics Canada

III - THE MARKET

Sales of wheel-type farm tractors in Canada in 1971 were 18,193 units valued at over $102 million. Only a few hundred tractors were manufactured or even partially assembled in Canada. Market demand was met almost totally by imported tractors, as can be seen in Exhibit 1 opposite.

The percentage of tractors imported into Canada originating in the United States has declined in recent years from 70 per cent in 1962 to only 54 per cent in 1971. A portion of these vehicles may in turn have originated in Europe or the United Kingdom prior to their final assembly in the United States. The diversification of imports from countries such as Japan, Romania, Russia and Italy indicates the competitive advantage these countries have in low labour costs.

Although exports of tractors from Canada, mainly to the United States average about 1,300 units a year, these are primarily tractors originating in the U.S., which prove slow sellers in Canada and are therefore re-exported to the U.S. for sale there.

GEOGRAPHIC SEGMENTATION

Prairie Provinces and British Columbia

Combined tractor sales for the Prairie Provinces and British Columbia are shown in Exhibit 2 opposite. The marked downward trend

from 1966 through 1970 in all horsepower categories stems from a combination of a depressed wheat market and generally decreased tractor sales. Historical data regarding Canadian tractor sales is limited to a six-year period in which a meaningful breakdown by horsepower class is available. Unfortunately, this period represents three years of inflationary growth in tractor sales, followed by severe recession in the agricultural equipment business. These factors make interpretation and sales forecasting extremely difficult.

An analysis of the historical sales trends in Western Canada gives rise to the following conclusions:

1. The majority of unit sales lie in the 80+ horsepower category which will increasingly dominate the market.

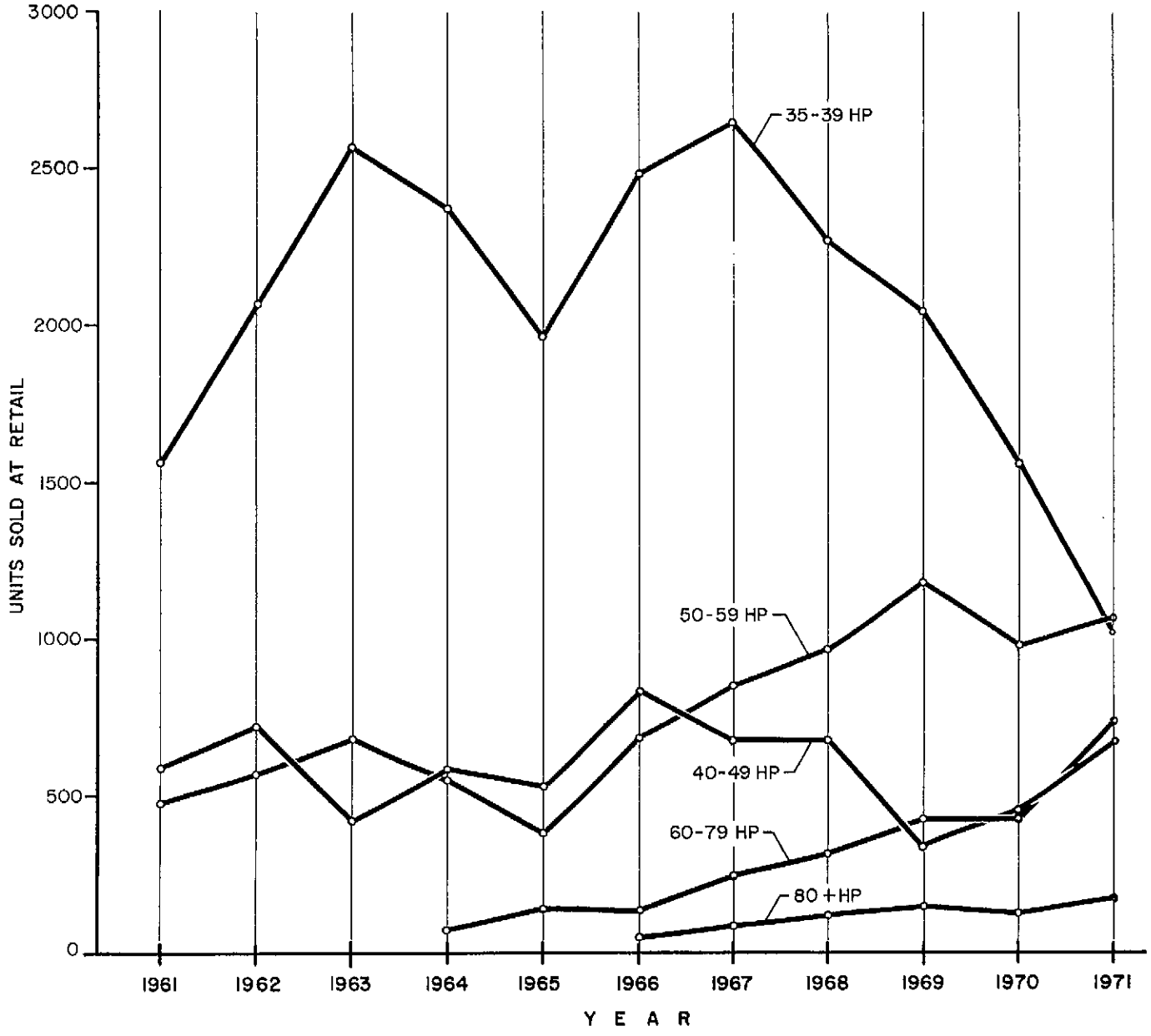
2. The 35 to 59 horsepower class constitutes the smallest market segment in Western Canada. We would expect unit sales of these smaller horsepower tractors to gradually decrease in the long-term, until some residual market is reached. Sales of new small tractors as utility and chore tractors would then serve to replace obsolescent vehicles. Sales of tractors in the 35 to 59 horsepower class might be stimulated by any increased trend towards mixed farming, requiring chore and utility type tractors.

3. Sales of tractors above 90 horsepower will be widely distributed among horsepower categories ranging from 90 to 300 horsepower on the basis of farm size and labour availability. Sales by horsepower class are highly dependent upon the breadth of products available per horsepower segment.

4. Four-wheel drive tractors are becoming common for tractors having greater than 120 BHP. In 1971 3.3 per cent of the tractors sold in Canada were four-wheel drive. Over 85 per cent of the four-wheel drive tractors sold were in the Prairie Provinces.

EXHIBIT 4

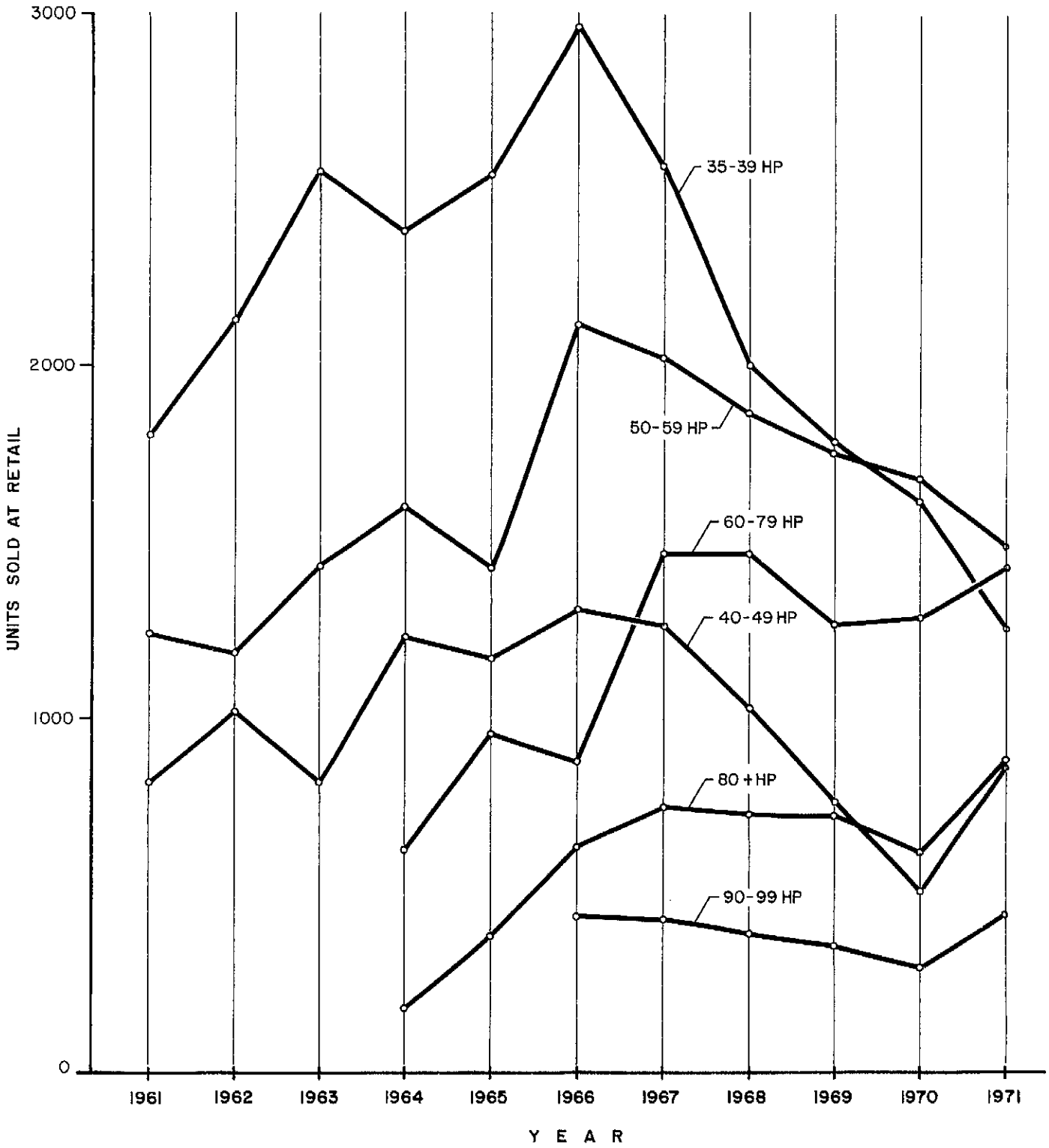
TRACTOR SALES BY PTO HP FOR QUEBEC



SOURCE : STATISTICS CANADA

EXHIBIT 3

TRACTOR SALES BY PTO HP CLASS FOR ONTARIO



SOURCE: STATISTICS CANADA

Ontario

The Province of Ontario is dominated by smaller row crop farms. In 1971, on the average, there were 115 improved acres per census farm compared with an average farm size of over 500 acres in Western Canada. An analysis of historical sales trends shown in Exhibit 3 opposite, leads to the following conclusions regarding trends in the Ontario market:

1. The 35 to 39 horsepower class has traditionally dominated the Ontario market but will decrease in importance in the future as farms consolidate and the average number of acres per farm increases.

2. Sales of tractors in the 40 to 49 horsepower class showed a dramatic decrease from 1967 to 1970 relative to other horsepower segments. We expect this market segment to show a moderate increase in importance in the future as farmers upgrade from the smaller horsepower classes.

3. Larger horsepower tractors such as those ranging from 50 to 59 horsepower, 60 to 79 horsepower, and 80 to 100 horsepower will show the greatest increase in sales in the Ontario market during the next five-year period.

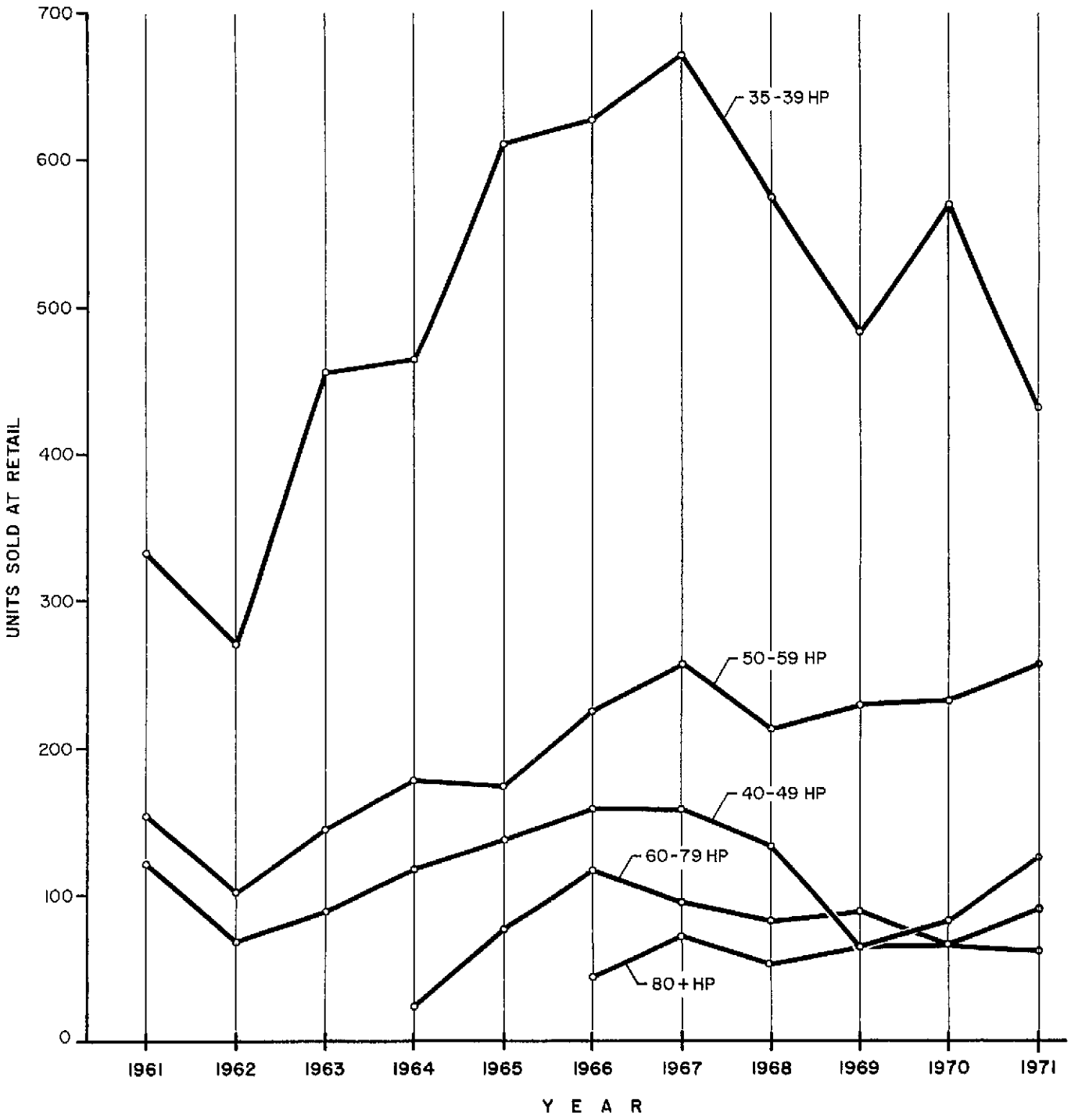
Quebec

The Quebec market is analogous to Ontario in that it is comprised of small row crop farms. In fact, the average number of improved acres per census farm in Quebec in 1971 was only 105 acres compared with an all-Canada average of 295 acres.

As shown in Exhibit 4 opposite, tractor sales in Quebec are dominated by smaller horsepower tractors. In 1971, over 27 per cent of tractor units sold were in the 35 to 39 horsepower class. However,

EXHIBIT 5

TRACTOR SALES BY PTO HP FOR ATLANTIC PROVINCES



SOURCE : STATISTICS CANADA

this was a sharp decrease from 1967 when 60 per cent of tractors sold ranged from 35 to 39 horsepower. The following trends are apparent in Quebec:

1. The sale of small tractors in the 35 to 49 horsepower market segment will continue to decrease in importance as farm consolidation occurs.

2. The most dramatic growth in unit sales will occur in the 50 to 59 horsepower and 60 to 79 horsepower classes. The 40 to 49 horsepower segment may show a short-term increase in importance as farmers upgrade from the under-39 horsepower class.

3. Sales of tractors 80 horsepower and above will increase but will not constitute a significant portion of the market for several years to come.

Atlantic Provinces

The Atlantic Provinces' market is also comprised of row crop farms. The Maritimes have the smallest average farm size in all of Canada. Here, the trend towards consolidation of farms is more gradual compared to the Prairie Provinces, Quebec and Ontario.

The historical sales data for the Atlantic Provinces presented in Exhibit 5 opposite, indicates that sales are dominated by tractors in the 35 to 39 horsepower class. Less than 60 tractors of more than 80 horsepower were sold in 1971. The second largest horsepower class, 50 to 59 horsepower, accounted for only 255 unit sales in 1971. As with the rest of Canada, higher horsepower tractors will increase their share of the market, although this trend will not be as pronounced in the Atlantic Provinces.

EXHIBIT 8

CANADIAN SALES BY FUEL TYPE - 1971

HP Class	Diesel	Regular Gasoline and LP Gas
9 - 34	192	396
35 - 39	2,335	834
40 - 49	1,751	125
50 - 59	3,034	374
60 - 69	2,668	163
70 - 79	556*	35*
80 - 89	762	7
90 - 99	1,921	0
100 - 119	1,583	0
120 - 139	957	0
140 +	500	0
TOTAL:	16,259	1,934

Source: Statistics Canada

* Estimated

EXHIBIT 7

1970 UNIT SALES FOR CANADA BY HP CLASS

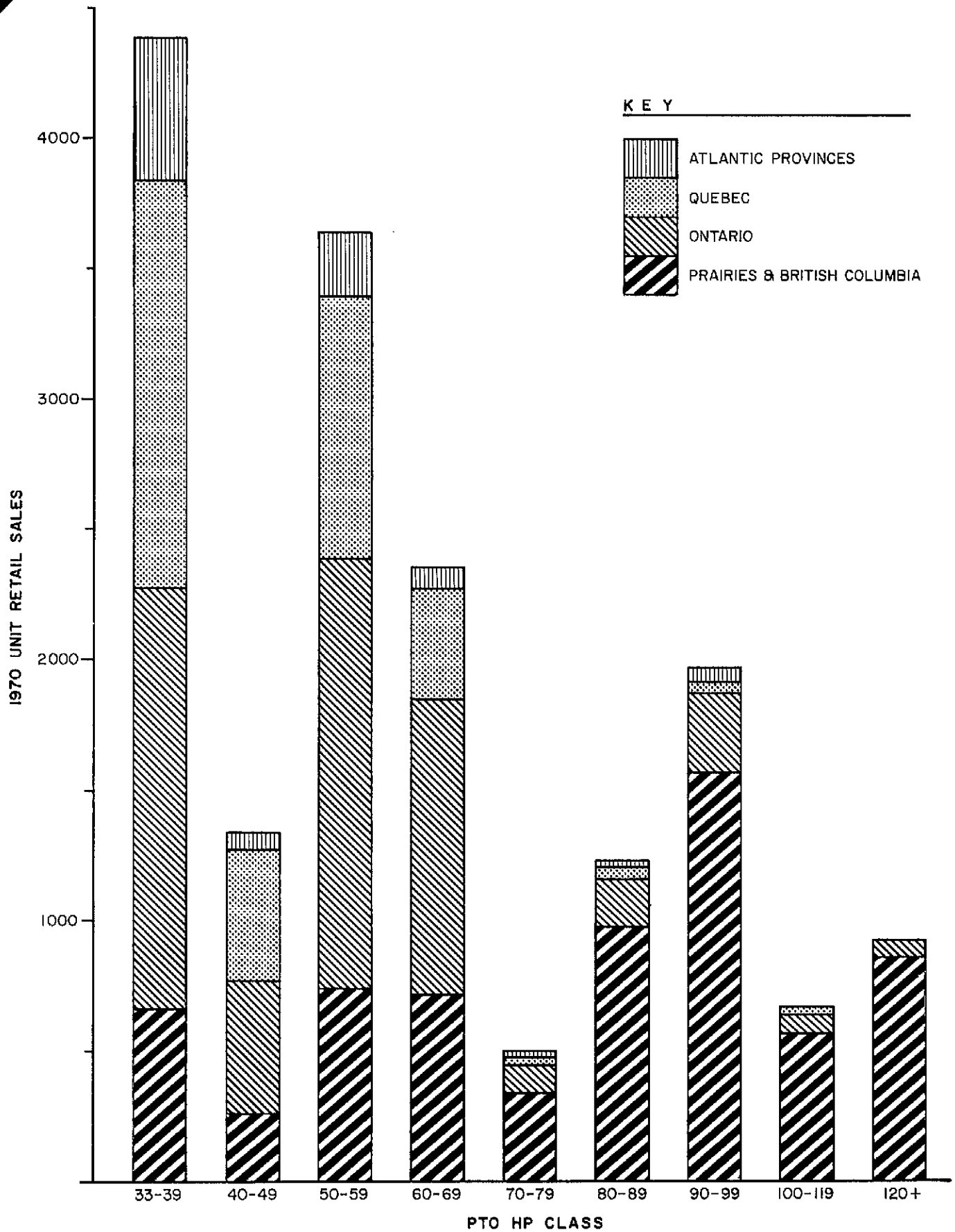
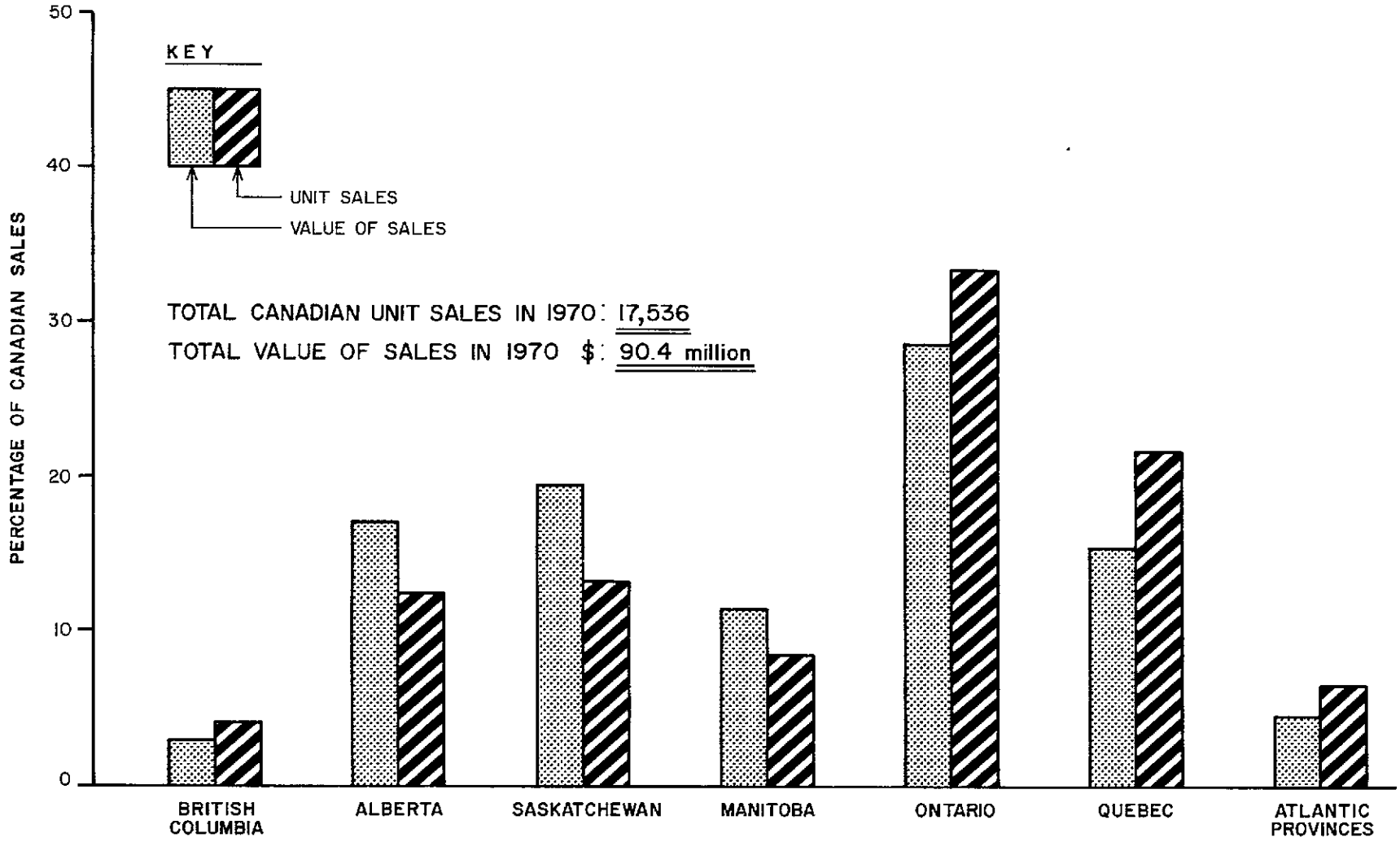


EXHIBIT 6

COMPARISON OF UNIT AND VALUE OF SALES BY PROVINCE IN 1970



SOURCES : STATISTICS CANADA

Diesel engines are popular in Canada for reasons of fuel economy. Rarely does a tractor of more than 60 PTO horsepower have anything but a diesel engine. Therefore, diesel engines will be found all across Canada, while gasoline engines will be concentrated in Eastern Canada, dominated by smaller, row crop farms.

From 1962 through 1967 there was a strong trend towards producing a greater percentage of diesel engine-powered tractors. This trend is expected to continue because of the dominance of diesel engines in larger horsepower vehicles which are increasingly dominating the market.

MARKET TRENDS

Farming

Although the total farm acreage under cultivation remains relatively constant, farm consolidation is resulting in a decline in the number of farms, while the average acreage per farm is increasing.

The average number of acres under cultivation per farm has a direct impact on market demand by horsepower segment. A typical farm with 2,500 acres under cultivation will have five tractors in operating condition with a horsepower range from a high of up to 200 horsepower for the main field tractor, to a low of from 30 to 45 horsepower for the chore tractor. Within this range, there may be utility tractors having ratings of 65, 80 and 95 PTO horsepower. As the number

of acres under cultivation increases, the number of tractors utilized per acre decreases because of the use of higher horsepower tractors for field work. This accounts for the long-term trend of declining unit sales of wheeled farm tractors.

Consumer
Purchase Frequency

Larger farms with high incomes tend to purchase new farm tractors frequently. Three- to five-year purchasing cycles are not uncommon for a number of reasons, including:

- aesthetic and social pressures on farmers to keep up-to-date
- tax incentives (depreciation rates up to 30 per cent a year)
- economics of increased productivity resulting from technical improvements in tractor machinery.

Smaller farmers tend to utilize their main field tractors until the cost of maintenance is prohibitive or mechanical obsolescence occurs.

Trade-Ins

Trade-ins occur in over 90 per cent of new tractor purchases. Depending on the age of the tractor, its condition and terms of the purchase agreement (timing, horsepower, accessories, etc.), the farmer will usually receive a discount from the list price for the value of the trade-in tractor. As the old tractor will have long since been depreciated to zero for tax purposes, this is a windfall for the farmer that is of major importance to him.

It is therefore crucial that the tractor retains a high trade-in value. This value is completely dependent on the history of the tractor with regard to durability, service record, availability of spares and performance. A new tractor will only develop a high trade-in value after it has proven itself over a five- or seven-year period. Thus, even if its initial selling price is attractive, its potentially lower trade value detracts from any initial price advantage that it may have.

CANADIAN SALES FORECASTS

Unit sales of farm tractors in Canada are forecast at 26,000 units in 1977, broken down geographically as follows:

UNIT SALE ESTIMATES FOR 1977

	HP CLASS				
	35 - 49	50 - 59	60 - 79	80 +	Total
Praries and B.C.	900	800	2,100	8,200	12,000
Ontario	1,900	2,050	2,000	1,400	7,350
Quebec	1,950	1,650	1,150	500	5,250
Atlantic Provinces	700	400	200	100	1,400
Total	5,450	4,900	5,450	10,200	26,000

In the longer term, the value of sales of farm tractors for Canada as a whole are expected to increase at least 50 per cent between 1971 and 1980. The value of farm tractor sales are expected to be $153 million in 1980 compared with $102 million in 1971.

Annual unit sales of tractors in the long-term are expected to decrease at a rate of from three to five per cent per decade because of farm consolidation. However, because of the recession of 1970 and resultant poor sales year, unit sales of farm tractors are expected to show a net increase between 1970 and 1980 from a low of approximately 17,500 units in 1970, to 25,000 units in 1980. Nevertheless, the long-term trend is clear, that of gradual decrease in absolute unit sales, and increasing value of sales.

U.S. FARM TRACTOR MARKETS

The lack of tariff barriers on the trade of agricultural equipment between Canada and the U.S. allows a Canadian manufacturer to supply nearby U.S. markets, as well as Canada. The U.S. market is large, and sales fluctuate less dramatically than in Canada due to government farm price supports. Unfortunately, the U.S. market is also more competitive.

There are few significant differences between the major U.S. and Canadian agricultural regions, namely:

- the Prairie Provinces and the Northwestern U.S. wheat belt are similar
- Eastern Canada and the Northeastern U.S. are similar.

The only unique region in the U.S. is comprised of the Northcentral States which are dominated by corn crops.

EXHIBIT 9

UNIT SALES OF FARM TRACTORS, BY REGION AND TRACTOR HORSEPOWER - 1971

	Under 35	35-39	40-49	50-59	60-69	70-79	80-89	90-99	100-120	Over 120	TOTAL
CANADA:											
- B.C.	62	314	101	134	97	5	18	12	11	7	759
- Alberta	34	104	88	235	294	152	216	519	520	608	2,770
- Saskatchewan	6	28	27	152	221	159	213	696	625	517	2,633
- Manitoba	12	77	42	108	160	87	64	251	171	166	1,138
- Ontario	255	1,206	830	1,461	1,291	148	183	358	203	128	6,063
- Quebec	134	1,018	667	1,063	681	37	72	54	37	31	3,794
- Atlantic Provinces	85	422	121	255	87	3	3	31	16	2	1,025
Total:	588	3,169	1,875	3,408	2,831	591	769	1,921	1,583	1,457	18,193
UNITED STATES:											
Northwestern U.S., including Washington, Oregon, Idaho, Montana, Wyoming, N. Dakota, S. Dakota, Nebraska	189	773	313	1,023	1,491	759	680	3,065	2,982	2,429	13,704
Northcentral U.S., including Ohio, Indiana, Illinois, Wisconsin, Michigan, Iowa, Minnesota	871	2,442	1,271	4,156	4,820	3,379	1,778	9,324	7,350	3,947	39,338
Northeastern U.S., including N.York, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, Maine Pennsylvania	558	1,288	628	1,859	1,813	511	379	1,155	667	237	9,095
GRAND TOTAL:	2,206	7,672	4,088	10,446	10,955	5,240	3,606	15,465	12,582	8,070	80,330

In Exhibit 9 opposite, we compare the unit sales by horsepower segment of Canada with the major U.S. regions, including the Northwestern, Northcentral and Northeastern United States markets.

IV - MANUFACTURING

CANADIAN MANUFACTURERS

During the 1960's the percentage of Canadian tractor consumption actually manufactured or assembled in Canada declined, with the transfer of Massey-Ferguson's farm tractor operations to the United States. At the present time, only two companies engage in either the assembly or manufacturing of farm tractors in Canada:

1. Versatile Manufacturing Company which manufactures in Winnipeg tractors over 90 horsepower, with four-wheel drive. These units are sold only in the western regions of Canada and the United States.

2. Co-operative Implements Limited which partially assembles imported Volvo and Deutz tractors and sells in the Prairie Provinces.

Most of the tractors sold in Eastern Canada, especially in the low horsepower ranges, are imported from Europe. They are manufactured in such countries as the U.K., Western Germany and Italy by subsidiaries of the "Big Three" suppliers and others. Almost all tractor manufacturing facilities in the United States are in the mid-West, and as it is uneconomic to ship small tractors east from these locations, the manufacturers rely on importation to supply eastern markets.

SUPPLIERS

The Canadian market is dominated by three suppliers: Massey-Ferguson, John Deere, and International Harvester Company. All these

suppliers have broad product lines, and have historically been strong in certain market segments. For example, Massey-Ferguson has dominated the market for small tractors for many years, although it is now being strongly challenged by John Deere and International Harvester.

MANUFACTURING
COST COMPONENTS

Studies undertaken for the Royal Commission on Farm Machinery identified the cost components involved in manufacturing agricultural

EXHIBIT 12

COST AND PRICE LEVELS FOR
NEW MACHINES IN THE FARM MACHINERY INDUSTRY

Price Element	Percentage of Suggested Retail Price Level	Cumulative
Manufacturing	54%	54%
Manufacturing Profit	7	61
Corporate and Distribution Costs	12	73
Dealer Operations	12	85
Discount from List Price	15	100

Source: Report of the Royal Commission on Farm Machinery

equipment, and assessed the economies of scale in manufacturing operations. Some specific findings of the study are summarized in Exhibit 12 opposite and others are noted below:

1. The economies of scale in tractor manufacturing are substantial. A tractor plant with an annual output of 90,000 units could manufacture at 81 per cent of the cost of a plant producing only 20,000 units. This would entail a unit cost savings of approximately $750. At an output of 60,000, unit costs are 88 per cent of the costs in a 20,000-unit capacity plant.

2. The economies of scale in manufacturing in going from a 20,000 to 90,000 capacity plant are equally attributable to savings on materials, capital and facilities costs and other cost items. In going from a 20,000-unit to 60,000-unit plant capacity, over 30 per cent of the savings are realized on materials and nearly 35 per cent of the savings on capital and facilities costs. In going from 60,000-unit to 90,000-unit capacity 53 per cent of the savings result from increased in-house fabrication of components.

3. Savings on materials stem from economies of packaging and shipping in larger volumes, and through the utilization of specialized buyers.

4. Savings which result when a plant manufactures a larger proportion of the tractors' components in-house reflect a variety of factors, including:

   - inbound transportation costs are reduced, although in the agricultural equipment industry inbound transportation costs are small, and typically amount to less than 1.5 per cent of shipping costs

   - avoid monopoly profits that specialist suppliers earn on components

   - most savings stem from more complete utilization of capital and support facilities.

5. Labour costs represent 11 per cent of the manufacturing cost of a plant with 90,000-unit capacity. However, labour accounts for less than five per cent of the total retail list price of agricultural equipment.

6. Economies of scale are a very significant barrier to market entry of a new company in the agricultural equipment business. This conclusion is valid assuming that consumers are price-sensitive given equivalent products and dealer service.

Conclusions Regarding
Manufacturing Economies of Scale

In evaluating the results of the study conducted by the Royal Commission on Farm Machinery, we are led to the following conclusions:

1. It will be difficult for a new manufacturer to penetrate the Canadian farm tractor market profitably by competing on a price basis with tractors having no unique product features. Significant economies of scale in manufacturing would be required and most likely the supplier would assemble tractors in Canada, while manufacturing the components in a high-volume production plant elsewhere.

2. Smaller manufacturing operations must compete on the basis of supplying a unique product to specific market segments. These farm tractor products must distinguish themselves in terms of needed product features, quality or dealer service. Economies of scale in manufacturing are less relevant when a supplier offers a superior product to a particular market segment. A classic example of this is the success that Versatile and Steiger have had in supplying large four-wheel drive tractors to the grain belt market of North America.

Non-Plant
Economies of Scale

In the agricultural machinery business, 18 to 24 per cent of the total retail list price is attributable to costs incurred beyond the

manufacturing level. These can be broken down as follows:

- general and administrative expenses are three per cent of net sales
- branch-warehouse operating expenses amount to seven per cent
- inventory financing costs five per cent
- research and development amount to three per cent.

Any economies of scale in the distribution area relate mainly to dealer size. The average size of dealer in Canada has increased significantly in recent years as a result of dealerships consolidating and smaller dealers going bankrupt due to the recent recession.

TARIFFS

There are no existing tariffs levied by either the United States or Canada on internal combustion tractors intended for agricultural use. This provision allows both Canadian and United States competitors to supply market areas on both countries.

V - LOCATIONAL CONSIDERATIONS IN FARM-TRACTOR MANUFACTURING

Agricultural machinery products typically are transferred to the distribution function at 61 per cent of the suggested retail list price. This transfer price provides for a 7 per cent margin to cover manufacturing capital investment. Below, we discuss both the manufacturing costs and post-production costs which are affected by location of plant facilities.

MANUFACTURING COSTS AFFECTED BY LOCATION

The plant location impacts on manufacturing costs in several ways, including inbound transportation costs, costs of acquiring materials and components, labour costs, labour productivity, labour supply, and miscellaneous overhead costs. These are discussed below:

1. Inbound transportation and the cost of acquiring materials and components includes both transportation costs and the cost of purchasing raw materials. The closer the plant is to sources of raw materials and suppliers of components, the lower are the costs of inbound transportation. However, it was pointed out in a previous section that inbound transportation costs are not significant compared to the total transportation costs of the company as reflected in outbound transportation of finished products.

   Canadian locations, such as Winnipeg, would be at a disadvantage in acquiring raw materials and components. This can be expressed as a cost of bringing in components as a percentage of the manufacturing cost base and for three typical locations these figures would be:

   - Brantford, Ontario: 1.0 per cent
   - Winnipeg, Manitoba: 2.2 per cent
   - Moline, Illinois: 0.4 per cent.

2. Labour costs as reflected in wages and fringe benefits vary by location and typically, most Canadian locations would have an advantage relative to principal U.S. manufacturing centres. This would be particularly true in the Prairie Provinces and the Atlantic Region of Canada.

3. Labour productivity is difficult to assess and is related to the capital investment per worker as well as labour skill. More importantly, location affects the availability of skilled labour. However, if just a tractor assembly operation is contemplated, then the availability of abundant labour supply rather than skill is the prerequisite to evaluating suitable locations.

4. Miscellaneous overhead costs include municipal taxes and the cost of utilities, such as gas and electricity. These, of course, differ by regional area and municipality.

POST-PRODUCTION COSTS AFFECTED BY LOCATION

Outbound Transportation Costs

If the entire North American market were to be supplied by the tractor manufacturing plant in question, then Canadian locations would be in a disadvantageous position regarding outbound transportation costs. On the average, a plant in Manitoba would incur an additional $40 per tractor outbound transportation costs relative to a plant located in Illinois. However, if the Canadian plant were to sell only to the Canadian market, then these transportation costs would be up to 40 per cent lower than for typical central U.S. locations.

Outbound transportation costs are usually added to the retail list price and do affect the plant location decision. However, these costs do not alter seriously the relative prices of competing tractor products.

Other Factors

Other factors to be considered in the decision regarding plant location would include the following:

- the availability of serviced plant sites
- land cost
- communications
- transportation services for passengers
- shipping services available for emergency parts and components, including such avenues as rail, bus and truck.

POSSIBLE REGIONAL PLANT LOCATIONS

Because of the vast regional differences in market characteristics, the consideration of alternative plant locations should be discussed in terms of locating plant facilities in either Western or Eastern Canada.

Western Canada

The Western Canadian market centres around Saskatchewan. If consideration is given to supplying both the Prairie Provinces as well as the Northwestern United States grain belt, then a Manitoba plant location would compete favourably with one in Saskatchewan. If the market is restricted to the Prairie Provinces, then a Saskatchewan location might be preferred.

The principal weaknesses of a Prairie-centred location include

the cost of inbound transportation of components probably shipped from the Central United States or Europe, and the limited size of the Prairie market. On the other hand, the grain belt market for farm tractors is unique in the world in terms of the horsepower of tractor required and the need for four-wheel drive vehicles.

Prairie-based production as a share of Canadian manufacturing of agricultural equipment has increased significantly in recent years. If wages remain low relative to U.S. cities, then this trend towards manufacturing in the Prairies will continue because of a manufacturing cost advantage. On the other hand, shrinking unit sales which are inherent in the farm tractor market will result in excess plant capacity for most suppliers, thereby limiting new plant construction and the resultant shift to new manufacturing locations.

In conclusion, a Prairie location (either Saskatchewan or Manitoba) has advantages over alternative Central United States locations even if some of the finished goods are shipped to the United States. However the majority of the finished products must be restricted to a 800-mile radius from the manufacturing location. The most serious problem facing manufacturing in the Prairies is economies of scale. Therefore, Prairie plants are best suited to producing specialized tractors catering to local needs such as:

- large diesel-powered tractors having more than 80 horsepower
- four-wheel drive tractors

- farm tractors having power takeoff units and hydraulics of higher capacity and more rugged design than those required for Europe.

Atlantic Provinces

Any facility located in the Maritime Provinces would compete with tractors produced either in Europe or the Mid-western United States. The capital costs involved in a full-scale manufacturing operation are very high, running into millions of dollars. The Eastern Canadian market is growing in demand for larger tractors but the bulk of sales are still in the 35 to 70 horsepower category. This is where the majority of European and world demand lies and accounts for companies rationalizing world production into fewer plants, to realize manufacturing economies of scale.

A plant located in the Atlantic Provinces would supply Eastern Canada and the Northeastern United States in order to realize a sufficiently high volume of sales. This area constituted a market of 9,500 units in the 35 to 69 horsepower class in 1971 and an estimated 8,500 units by 1980. With appropriate marketing effort, a plant would hope to capture 10 per cent of market sales or have a capacity of 750 to 1,000 units per year. We therefore recommend that consideration be given to an assembly operation, based upon sub-assemblies brought in by water from Europe or less likely from mid-Western United States. As the market grows in demand for larger tractors, facilities could be expanded to produce a broader product line.