

PART V

SPECIAL PROBLEMS AND ISSUES

Chapter 27

THE REPAIR PARTS PROBLEM

During the course of its public hearings, the Commission was impressed by the number and strength of the complaints registered by individual farmers and farm organizations about the difficulties farmers were having in getting a quick and reliable repair parts service. The feeling appeared general that manufacturers should be able to provide a better service than currently existed, especially by stocking more parts at the dealer and branch level. The very great importance attached to this matter by farmers undoubtedly reflects the fact that a few days' delay in getting a major piece of farm equipment back into operation during a busy season can involve the farmer in very serious losses.

To help it assess the nature and dimensions of this problem, the Commission carried out two surveys. The first of these surveys, carried out in November 1967, was confined to four major provinces—Ontario, Manitoba, Saskatchewan, and Alberta—and asked farmers to report any specific problems they had experienced in obtaining repair parts or service for their machinery in the period since April 1966. Farmers who reported specific problems were then asked to report in some detail on the nature of the problem, the machine, dealer, and company involved, and to answer a number of related questions designed to throw some light on how or why the problem had developed. This questionnaire was distributed through the co-operation of farm organizations in each of the provinces. One of the major purposes of the questionnaire was to provide a basis for selecting what appeared to be typical problems which could then be followed up in detail by interviewing the farmer, dealer, and company involved. It was limited to problems occurring since April 1966 in the hope that records about the complaint would be available.

The second survey in January 1968 involved the distribution of a shorter questionnaire to a carefully selected sample of farmers across Canada. This questionnaire was designed to provide an over-all view of the extent and seriousness of the repair part and service problems faced by farmers.

In the first survey, some 50,000 questionnaire forms were distributed and of these 7,259 or about 15 per cent of the total were returned. About 22 per cent of the forms returned reported a repair part or service problem. Although complaints

were made involving some 78 different kinds of equipment, a major part of the complaints, some 43 per cent, involved the tractor. Other machines frequently involved were the combine (24 per cent), the swather (6.5 per cent), the baler (3.8 per cent), the disk (2.3 per cent), and the forage harvester (1.9 per cent). When the number of complaints was compared with the number of implements of each type on farms, it became clear that in terms of numbers in use, the combine was the cause of more trouble than any other machine. This may well reflect the complexity of the machine and its large number of working parts.

In the more detailed follow-up to this survey, 20 typical complaints were chosen for each of the four provinces and an interviewer for the Commission talked to farmers, dealers and, where necessary, company personnel in order to determine the circumstances surrounding each complaint. The interviewers were all provincial residents who had a good background in farming and possessed at least two years of university education in agriculture or agricultural engineering. The farmer interviews were carried out just after harvesting had been completed, when the farmer would have time to discuss his problem, but when it would still be fresh in his mind.

In order to ensure some uniformity, the Commission's representative in each of the four provinces was provided with questionnaire guides to use in his interviews with farmers and dealers. Both farmers and dealers were classified by size and given a rating ranging from excellent to poor. The farm size was considered small if less than 250 acres, medium if it was 250 to 750 acres, and large if over 750 acres. The farmer's rating was based on his attitude, the condition of his repair-shop facilities, and other related indicators. Dealers were rated as small if annual sales were less than \$250,000, medium if sales ranged from \$250,000 to \$500,000, and large if sales exceeded \$500,000. The dealer's rating was based on the quality of his premises, records, order follow-up system, relationship with branch, and similar indicators. In each case, a rating on the dealer was made before the interviewer attempted to assess the circumstances surrounding the specific complaint.

In the 80 cases that were studied in detail, the complaint in a great majority of cases was that the farmer had been unable to get repair parts promptly when he needed them. Although some short-line companies were involved, the great majority of complaints (85 per cent) involved full-line or long-line companies.

Perhaps the most significant finding of this in-depth study was that the dealer was wholly or partly to blame in about one-half of all cases. Typical comments by the interviewer in these instances were: wrong part ordered by dealer, dealer did not follow-up back order, dealer failed to order parts, dealer slow in ordering, dealer failed to notify farmer that parts had been received. Moreover, when the instances of complaints involving dealers were analyzed it was apparent that a significant number of the complaints were caused by dealers who were small or who received a relatively low rating, or both. Thus of the 40 complaints where dealers

were judged by the interviewer as being wholly or partly to blame, some 28 were given over-all ratings of fair or poor and these ratings were made before the complaint was investigated.

Dealers Partly or Solely to Blame

<u>Dealer Ratings</u>		<u>Dealer Size</u>	
A (Excellent)	3	Large	10
B (Good)	9	Medium	10
C (Fair)	18	Small	19
D (Poor)	10	Not stated	1

Some 19 of the dealers at fault were small dealers. Although farmers are generally reluctant to blame dealers for their difficulty in getting adequate repair parts service, it is evident that a general upgrading of dealers would help reduce the incidence of repair parts and other service problems.

In some 44 cases the interviewer assessed the company or its branch to be primarily to blame for the difficulty. In more than one-third of these cases, the reported fault was simply that the part was not available when it was required. The remaining two-thirds covered a wide variety of causes. Aside from parts being out of stock, the most frequent complaint was that the machine was poorly designed or had not been adequately tested. Other comments included: implement was shipped with wrong size parts, poor records kept at branch, company sent wrong machine, branch parts depot closed on weekends, delay of shipment at branch depot, wrong part sent by branch. In five of the 80 cases examined, the farmer was judged to have no valid complaint, and in an additional seven instances he was considered to be partially at fault.

In the national questionnaire survey, some 69,000 survey forms were mailed out and over 55 per cent of these were returned, an extremely high response for a mail survey. Moreover, some 48 per cent of those responding reported that they had experienced some difficulty in securing repair parts during the previous two years. Some 30 per cent of these—or just over 14 per cent of all farmers who returned the form—felt that they had experienced a major repair part problem in this two-year period. An additional 46 per cent, or about 22 per cent of those responding, reported a repair parts problem they considered of moderate severity. Thus the national questionnaire indicated a significantly higher proportion of farmers experiencing repair parts difficulties than was shown on the earlier survey confined to four major provinces. While it has not been possible to reconcile these two results, it seems likely that because the first survey was longer and more difficult to complete, it would only be completed, for the most part, by farmers who considered their problem fairly serious. Thus the 22 per cent of those farmers who reported a repair parts or service problem on the earlier survey can be compared with the 14 per cent who reported a serious repair parts problem in the national survey.

In the latter survey, farmers were also asked to express their views about changes in the quality of machinery, the service provided by dealers, and the frequency of model changes. Some 44 per cent of the farmers who responded felt that the quality of machinery had improved in the last ten years and an additional 25 per cent felt there had been little change. Only 24 per cent felt that quality had declined. In contrast, when asked whether the service provided by farm machinery dealers was better or worse than ten years earlier, only about 20 per cent expressed the view that service today was better, 49 per cent felt there had been little change, and 25 per cent said the service had deteriorated. The great majority of farmers, some 74 per cent, thought that model changes occurred too frequently. In the same survey, 19 per cent of all farmers said they had experienced problems in adjusting their machines to their farm requirements. About 25 per cent reported that a company representative had called at their farm to assist with equipment.

In both surveys, some attempt was made to determine the extent to which the farmers' care and maintenance of their machinery may have contributed to some of their problems, but the results were rather inconclusive. In the national survey, over 70 per cent of the farmers said they normally gave their machines a major pre-season overhaul, and about half of the farmers reporting said they had their own repair shop. Similarly, in the detailed follow-up of a small sample of problems in four provinces, the great majority of these farmers said they had a preventive maintenance program to which they regularly adhered. Further, almost one-half of these farmers said they did part or all of their own repair work (with the exception of major repair or overhaul work on engines or transmissions), yet a majority of these farmers indicated that neither they nor their hired help had had formal training as mechanics. Thus, attempts by farmers to overhaul and repair their own machines without any formal training in mechanics may contribute to the subsequent problems that develop. About 80 per cent of this group of farmers said they stocked at least some fast moving parts on their farm and about 85 per cent felt that they had good relations with their dealer.

Some additional information on the problem of maintaining and repairing farm machinery was provided by a survey of farmers in Saskatchewan carried out by the Saskatchewan Wheat Pool.¹ For the most part this survey was completed by local Pool Committee chairmen. However, about 15 per cent of the returns were from non-Pool farmers contacted by local delegates. The results for these two groups in most instances were not significantly different.

The introduction of diesel engines, the finer tolerances on modern machinery, and rapid changes in models, it was suggested, had increased the farmers' dependence on dealer servicing. In addition, the increasing use of sub-assemblies that had to be replaced as a unit meant that more often a machine had to be shut down until a replacement assembly was available. While over half of the survey

¹Saskatchewan Wheat Pool, *Brief to the Royal Commission on Farm Machinery*, Regina, March 28, 1967.

respondents had no education beyond public school, some 57 per cent said they had received some training in motor mechanics, welding, and similar skills useful in machine repair. Just over half said they had a well-equipped workshop, and about the same proportion reported that they had spent more than \$500 for repairs (including labour costs) during 1966. In a question about the number of days a machine was out of use because of a breakdown during 1966, 37 per cent of all farmers reported they lost one day or less, 54 per cent reported a loss of one to six days, 9 per cent seven days or more, and about 2 per cent fourteen days or more. In many of these longer delays, farmers were able to continue their work with replacement machines borrowed from a dealer or neighbour. Some 72 per cent of all reporting farmers stated that their nearest stock of repair parts was within 20 miles, yet the same percentage stated they would be willing to travel over 20 miles (45 per cent said over 30 miles) for repair parts if reasonably sure of getting them on arrival. Farmers in Saskatchewan may, of course, be used to travelling longer distances than is true in many other parts of Canada. Still, this evidence suggests that farmers would accept larger and fewer dealers than the current pattern of distribution provides.

Numerous suggestions were made to the Commission as to how the companies might improve their parts service. These varied from the simple proposal that more parts be stocked—especially at the dealer and branch level—to the more complex proposal that companies set up on some co-operative basis a central distribution system for machinery parts. This latter proposal was also recommended in the Report of the Special Committee on Farm Income in Ontario.²

Our Committee recommends as a first step, a central warehousing system for machinery parts should be established by these companies themselves. These central warehouses could improve the system of parts distribution by carrying large stocks of parts and making as many parts as possible interchangeable between different types and makes of machine, through cross-indexing these parts. Warehouses should be located at a number of strategic points in the province and they should be open for long hours during the planting and harvest rush periods. Since the warehouses would stock parts for all companies it should be possible to operate a parts service with fewer people than the total number employed by individual machinery companies at present. Regular delivery schedules could also be set up to provide a much improved parts delivery service to both dealers and farmers.

Before attempting to evaluate such a proposal it is useful to examine the nature of the part-distribution problem faced by the major manufacturers.

At the present time each of the major manufacturers faces the necessity of stocking a very large number of different parts, most of which may have very few sales in any one year. Moreover, the number of different parts in stock has been increasing fairly rapidly as new and more complex models and machines are put on the market. Massey-Ferguson reported that the number of different parts in its

²Special Committee on Farm Income, *The Challenge of Abundance*, Report of the Special Committee on Farm Income, Toronto, January 6, 1969.

North American parts stock had increased from about 68,000 in 1958 to more than 100,000 in 1967. Of this total, 30,000 individual parts had no sales whatever in 1966. Similarly, International Harvester of Canada reported that the number of different parts stocked by its parent company had increased from 110,000 to 150,000 over the past decade. Of the 54,000 International Harvester farm machinery parts stocked in Canada, nearly one-half were ordered only once or not at all in the previous year. International also reported that about 60 per cent of the parts numbers in stock were for machines no longer in production. Massey-Ferguson reported that tractor and combine parts are stocked for a minimum of 15 years after the company has stopped manufacturing a machine, and that parts were still available for several machines that had been out of production for more than 20 years.

Some indication of the complexity of the parts supply problem in the farm machinery industry is provided by the data in Table 27.1, showing Massey-Ferguson's inventory and sales of parts in North America during 1966. In that year the company sold some 32 million separate parts for an annual sales value of \$22.6 million, and held in inventory parts valued at \$23 million. Individual parts with annual sales of fifty or more accounted for 91 per cent of the total value of parts sales, but made up only 23 per cent of the total number of parts in inventory. Over half of all the parts in stock either had no sales at all in 1966 or had sales of nine units or less throughout North America.

TABLE 27.1—ANALYSIS OF MASSEY-FERGUSON'S NORTH AMERICAN PARTS OPERATION, 1966

Annual Sales of Each Part	Number of Different Parts Stocked	Annual Sales	Value of Inventory	Annual Carrying Cost ¹	
				Amount	As Percentage of Sales
		(\$'000)	(\$'000)	(\$'000)	
0	30,007	—	1,240	186	—
1 — 9	27,979	497	2,460	369	74.3
10 — 49	18,396	1,470	3,500	525	35.7
50 — 299	13,505	4,226	5,060	759	18.0
300 and over	8,912	16,408	10,695	1,604	9.8
Total	98,799	22,601	22,955	3,443	15.0

¹ Estimated at 15 per cent of value of inventory.

Source: Massey-Ferguson Industries Limited, *Brief to the Royal Commission on Farm Machinery*, Vol. II, Ch. VIII, Toronto, October 6, 1967.

Table 27.1 also provides some indication of the relatively high cost of carrying the slower moving parts. Assuming, as was reported by a number of different companies, that the annual cost of carrying parts amounts to 15 per cent of their inventory value, it can be estimated that carrying charges on parts that sold only one to nine units annually amounted to some 74 per cent of the total value of

annual sales of these parts. Indeed, the annual carrying cost for the 77 per cent of all parts that sold fewer than fifty units in 1966 would amount to some 55 per cent of the value of annual sales.

Nor can it be assumed that the companies are able to carry all their slow moving parts in a central warehouse and confine stocks at their regional branch houses to the faster moving parts. International Harvester reported the following distribution of parts for which no orders were received in 1966:

Depot	Total Number of Part Numbers Stocked	Part Numbers with No Order, 1966	Part Numbers Having No Orders as Percentage of Total Inventory of Part Numbers Stocked	
			In Terms of Value	In Terms of Part Numbers
Burlington	54,314	17,496	13.7	32.2
Edmonton	29,579	8,499	11.7	28.8
Montreal	17,866	3,827	10.0	21.4
Winnipeg	27,501	6,917	11.0	25.2

It is significant that the no-order parts held at the branch depots at Edmonton, Montreal, and Winnipeg in 1966 were not appreciably smaller either as a percentage of the total number of parts in stock or as a percentage of the total value of parts inventory than was true for the central parts depot maintained at Burlington. A number of companies reported that the parts supply problem is complicated by the fact that there is a significant element of unpredictability in the demand pattern for different parts. Unusual weather or crop conditions may suddenly produce a heavy demand for a part whose sales are ordinarily fairly small.

Given the characteristics of the repair parts supply problem faced by the manufacturers, the very large number of different parts that must be stocked, the large number of parts for which annual sales are very small, the substantial cost involved in carrying a parts inventory, and the existence of unpredictable variations in demand for individual parts, it is clear that the companies face a difficult problem in deciding where and in what volume different parts should be stocked. For example, if Massey-Ferguson were to double the stock it carries of all parts which sold less than fifty pieces in 1966, it would require a \$7.2 million addition to the company's total parts inventory. Estimating the annual cost of interest, storage, and maintenance at 15 per cent, the annual carrying charges would amount to about \$1 million. While this is only a little over 4 per cent of the company's total parts sales, it would represent 55 per cent of the annual sales of this category of parts. It is clear that each company has to decide on how best to balance the cost of additional stock against the advantage they derive from their ability to supply emergency parts when needed. Since farmers place a strong emphasis on their ability to get service parts promptly when they need them, all the companies have a competitive interest in meeting this demand.

Evidence presented to the Commission suggests that most or all of the important farm machinery manufacturers have been making a concerted effort to improve the quality of their repair parts service over the past few years. Extensive use now is being made of computers to keep an accurate record of parts availability, and to ensure that parts are reordered promptly when the stock of a particular part begins to decline more rapidly than expected. Aside from difficulties that develop when new systems are being installed, it is predicted that computer control will enable the companies to provide much better service, and in many cases it is already doing so. Massey-Ferguson reported that before it installed computer control in 1958 only about 85 per cent of orders from dealers were filled from the nearest warehouse. By 1966 this level had risen to 94 per cent. During the Commission's hearings a representative of John Deere said that the company's records indicated "a tremendous improvement in the supply and transportation of parts in the last few years". Whether judged by the availability of parts at the factory, the depot, or the dealer level, he contended that the records showed this improvement. This was true, even though at that time Deere's Canadian parts records had not been computerized.

Many of the farm machinery companies have also been making efforts to improve the quality of the parts service their dealers provide. The dealers are individual businessmen and make their own decisions with respect to how many parts to stock. However, the companies can strongly influence these decisions and they apparently have been doing so. A number of companies described in some detail the guidance they provided to their dealers in the way of systematic stock records and formulas to follow in stocking parts. In addition, almost all the companies offer special incentives to dealers to induce them to stock up on fast moving parts in advance of the regular season of use. A number of companies also reported special arrangements for the return of parts designed to reduce the dealer's risk in stocking parts. Despite these efforts, it is clear from the Commission's survey that there is still substantial room for further improvement in the quality and capability of dealers. It would appear that all the companies have a very major interest in eliminating many of their smaller and weaker dealers and in continuing their efforts to improve the service provided by the remainder.

Many farmers and farm organizations have suggested that the dealer should carry more parts. It seems very doubtful that this proposal offers much hope for improving the parts supply problem. Consider for a moment the data provided by Massey-Ferguson on its North American parts operation. In 1966, the company had 2,643 dealers in North America. The company stocked just under 99,000 different parts, but of this total there were only 1,561 parts which had annual sales of 3,000 units or more. Thus, if individual dealers stocked all parts for which on the average annual sales were 1.1 units or more per dealer, they would only stock these 1,561 parts, less than 2 per cent of all the different parts in inventory. On the other hand, where a dealer stocks parts that have average annual sales of one unit or less, he runs the risk that some of these parts will become obsolete and never sell. Overall, this would substantially increase the cost of stocking and supplying repair parts.

Similarly, another company, John Deere Limited, informed the Commission that, if a dealer were to stock sufficient parts to fill his orders on an "over the counter" basis, more than 90 per cent of the time he would need to stock about 6,500 different parts. On the basis of Massey-Ferguson's data this would include about 2,500 parts that had annual sales in 1966 of from 500 to 1,000 units each, or about one sale of each part for each three to five dealers.

For the slower moving parts, this analysis suggests that the most economical approach is to stock parts in a central location and rely on rapid communication and transportation to get the parts to the farmer who needs them. As dealers get larger in size, each one will be able to stock a larger number of parts. For example, if Massey-Ferguson were able to reduce its total number of dealers to 1,000 for all of North America, the rule-of-thumb of having dealers stock all parts where average sales per dealer were one or more would add an additional 2,353 parts to each dealer's inventory. Offsetting this would be the longer distance each farmer had to travel to obtain parts. However, many farmers stated in their briefs or during the Commission's hearings that they were willing to travel further to obtain parts provided they could be sure of obtaining them when they arrived.

On the basis of this assessment of the repair parts problem, what conclusions should be drawn with respect to the proposal that the companies should set up a central parts warehouse? In this Commission's view any possible advantages of such a scheme are greatly outweighed by its disadvantages. Under present arrangements, where each company is responsible for its own parts distribution, it is quite clear where the responsibility for any failure to supply parts must lie. Since each company's reputation depends in part on its ability to offer a prompt and reliable parts service, it has a strong incentive to develop and maintain a good service. If parts were supplied through a central co-operative warehouse, the lines of responsibility would be much less clear. It is at least possible that the service under such an arrangement might deteriorate very seriously. Further, the service now provided by each company is fully integrated with the parent company's entire North American parts operation. Bringing all the company's Canadian central warehouses together under one roof might disrupt the direct lines of communication and responsibility that now exist.

The central and branch depots are already very substantial in size. For example, International Harvester's Parts Depot at Burlington, Ontario, employs 248 people and encompasses an area of 230,000 square feet. There would appear to be no obvious advantages in bringing together a number of warehouses of this size. Moreover, as is true for International Harvester, the parts warehouses of a number of companies may supply parts for automobiles, trucks, and construction equipment as well as for farm machinery.

A greater saving would be available from a central warehousing operation if there were a large degree of inter-changeability among different companies' parts. Except for a few parts such as bearings, where all companies have common suppliers, very little inter-changeability exists. Unless much greater progress towards

standardization between companies can be made in the future, it seems unlikely that this situation will change materially.

It is possible that a central warehouse might offer some savings of personnel, particularly on weekends and holidays. But it is not obvious that these savings would be substantial. The Commission heard many complaints about the difficulty of getting emergency parts service on weekends or holidays. All companies reported that their branches provide dealers with emergency telephone numbers which can be used to order parts when the branch office is closed. Such arrangements may run into a major difficulty at the branch level for some companies and at the main parts warehouse for nearly all companies. Union agreements often contain provisions that greatly increase the cost to the company of providing emergency service. A single request for one part on a weekend can involve a minimum of three people having to be paid straight overtime or double-time rates, with minimum "call-in" hours (generally four) involved. The three people involved would be a stock "picker-packer" to find the part and get it ready to ship, a billing clerk to charge it out and the supervisor to represent the company and see that the job is done. If one takes a minimum-wage cost of \$3.75 an hour, the cost of the first two—at time and a half for four hours—is close to \$45 for handling a single emergency order. It is perhaps not surprising that some companies provide no service at all from their parts warehouses on weekends.

Union regulations of this kind appear to show on the part of the union an almost callous disregard for the welfare of the farmer-customers who have bought the product its members produce or handle. It may, however, simply reflect a lack of understanding of the emergency nature of the problem that often faces a farmer on a weekend in a busy season. In any case, some improvement in this situation must be effected. I would recommend that farm organizations negotiate directly with the unions and companies involved in order to work out more equitable arrangements for providing emergency service on weekends at more reasonable costs, wherever present union regulations impose unreasonable and excessive costs. Provincial governments might well take the initiative in bringing together the parties involved.

Given the fact that the nature of the repair parts problem makes it pretty well inevitable that a large number of parts will be kept in regional and central branch warehouses, the provision of efficient and rapid service in emergencies requires swift communication of the farmer's needs, prompt action on the part of the company in filling the farmer's order, and transport of the part to the farmer with a minimum of delay. Despite the fact that we all live in an age where the speed and efficiency of communication and transportation have improved, difficulties in supplying repair parts to farmers on an emergency basis have arisen in each of these areas. Let us consider each in turn.

At the technical level, communications have greatly improved. With all parts recorded on computers, some companies now claim that they can search and find a

part anywhere in North America, even when only one or two exist, in a matter of hours. Dealers may often be connected with their branch by telex. The breakdown in communications appears to occur more frequently at the human level. The farmer does not make the dealer realize the order is an emergency one. Or the dealer may fail to follow proper company procedures so that the emergency nature of the order goes unrecognized at the branch level. The Commission's survey suggests that mistakes of this kind are more likely to occur with smaller and less efficient dealers. They should become less frequent as the farm machinery companies continue to upgrade their dealers and reduce their number. Occasionally a part ordered on a routine basis during the off-season may turn into a part needed on an emergency basis because the part is out of stock, and a long delay occurs before it becomes available. All companies should develop some method of dealing with this situation. Farmers also frequently complain of their inability to find out when the required part will arrive. If all companies could provide their dealers with a prompt estimate of how long it would require to fill an out-of-stock emergency order, the farmer involved would be better able to deal with his problem. In some situations he might be able to have a substitute part produced in a local machine shop. Some companies report that they already provide this information promptly. However, there appear to be considerable variations from company to company in this regard. All companies should give the matter close attention.

Most companies now can respond quickly to an emergency order, provided the part is in their branch or central warehouse, or even available anywhere in their system. One exception to this would be the extra cost imposed by the union regulations referred to above which may result in parts being unavailable on weekends. If the part is out of stock and is not under current manufacture, the delay may be much longer. In some instances components or raw materials may be unavailable because some plant is on strike. Massey-Ferguson reported that on the basis of an analysis of their parts orders over a period of several weeks in early 1967, one part ordered out of every 2,000 was not in stock anywhere in their North American branch office and central warehouse parts-storage system and therefore not available without an extended delay. This ratio appears rather high and suggests that a significant improvement in parts availability might be created by simply stocking more parts at the central warehouse. This may be partly a question of setting higher minimum inventory levels for parts that are selling with at least a few sales every year. Another company reported that it had one machine shop that did nothing except manufacture out-of-stock parts, mainly for machines that were no longer being sold.

Even where the part is in stock at the branch or central warehouse a substantial delay may occur before it reaches the farmer. Such a delay can arise from a number of different sources. Farmers at more distant points must often rely on truck or bus or express service to obtain their parts. Truck lines do not usually operate on Sundays and express offices are also closed. Bus companies may be unwilling to take parts of awkward sizes or shapes or to drop them at unattended points. In considerable part, these are the kinds of problems that the recently

established Canadian Farm and Industrial Equipment Institute should investigate. At the present time the various means of transport apparently give no more attention to an emergency parts order, or for that matter to any other kind of rush or urgent order, than they do to a routine one. There would seem to be no reason why some kind of red-tag, premium-cost, emergency service could not be organized to improve the present situation. I recommend it to the Institute for their consideration.

A similar difficulty of unexpected delays has apparently arisen in respect to parts sent by air. One company complained to the Commission that parts sent by air sometimes were delayed for several days at the air terminal, having to give way to other types of cargo. Correspondence with Air Canada revealed that the problem arose because the parts were being sent via air freight, which would be delayed in favour of air express if there was a large volume of express shipments. Since air express pays a higher rate, it is understandable that the airline gives it preference. Farm machinery companies that want parts to go promptly in emergency situations should be prepared to pay the extra cost of air express.

Another source of delay arises when parts cross the Canadian-U.S. border. Although parts for farm machinery come into Canada on a duty-free basis, they still require a customs form and must be cleared through customs. Where customs officials are not on duty on the weekend, this requirement may create substantial delays. One company reported that on the average its parts shipments from Chicago to Edmonton for a period in September and early October required from two to five days (the average was about three). Since an aircraft can fly this distance in a matter of four to five hours it is clear that man-made obstacles are creating very considerable extra delays, delays that are more serious for farmers living in areas a long distance from central parts warehouses. A significant saving in time might occur if there were direct air service available between Chicago and Western Canada. More important would be some method of overcoming the time delay created by the federal government's own customs procedures. To the farmer waiting for a part where the time lost may seriously jeopardize his year's income this delay is simply intolerable. There would appear to be no reason why some arrangements could not be made which would allow emergency parts shipments to go through without the necessity of formal customs clearance.

The Commission understands that the Canadian Farm and Industrial Equipment Institute has recently been able to make arrangements with the Department of National Revenue to allow farm machinery parts shipments under their C-9 form. This allows the manufacturer to post a bond ensuring good faith, and to make a temporary entry for the total shipment rather than a line-by-line entry giving duty rates for each item and a duty calculation on its value. The normal entry form is completed within a few days.

While this has improved parts shipments in some degree, the main problem remains untouched. The real bottleneck is that parts have to go through customs

gateways which may be manned only at certain hours. Why should the farm machinery companies not be allowed to post a bond in Ottawa that would enable them to make emergency shipments directly to their Canadian dealers? Most of the parts enter duty-free in any case. The Department of National Revenue could develop a multi-part tear-off form that would be filled out by the shipping company in the United States or other foreign country involved. With this form attached to the parcel, shipment would be given automatic clearance through customs at any point going into Canada by any method of transport—bus, parcel post, air, rail or truck. At the point where the shipment crossed the border the responsible person would simply tear off all but one copy of this special form. This set of copies would now replace the parcel for customs clearance purposes, while the parcel sped on its way.

The package of forms removed from the parcel would have: one copy for the entering port officer, one copy to be mailed to the company for normal customs clearance procedures, and one copy for the port officer in the company's home port so that this officer could ensure that the company provided formal clearance. If the forms were serially numbered and accounted for, no parcel could be in Canada without a customs clearance ultimately being made for it. With a little ingenuity the federal government could easily remove the present long customs clearance delays in emergency parts shipments. The time saved would mean a great deal to the individual farmers who now find themselves waiting for parts in a critical period of their farming operations.

A further step the companies themselves could take to accelerate emergency parts shipments would be to offer the farmer a premium cost type of service with some part of the additional cost being chargeable to the farmer.

Case Histories of Warranty, Machine Performance and Maintaining and Repairing Farm Machines

The Commission received many complaints from individual farmers with respect to the warranty, maintenance, repair or operation of their machinery. The Commission was able to follow up many of these with the company concerned and the farmer. Quite often the problem was solved in this way, indicating the importance of communication in maintaining good relations between the farmer and the machinery company. Other cases appeared insoluble to the satisfaction of both parties. To illustrate the kinds of problems that arise, a number of individual case histories—with the names of farmers and companies deleted—are given below.

Case 1. Saskatchewan, Wheat Farm: Tractor — This Saskatchewan farmer bought a tractor in 1966. Within three years, the sleeves and pistons in the first two cylinders of the engine wore out three times, and the valves and valve guides once. Even though the warranty was for only 12 months, the company had paid all costs of repair and all work was performed during the off-season. Yet the farmer was not satisfied, feeling that the cause of the problem had not been corrected. The dealer

and the company suggested that the farmer trade in the tractor and pay \$2,000 for a larger one, since he had bought more land. The company proposed as an alternative that the farmer could trade the tractor in for a new machine of the same model, paying \$1 an hour rental for the 1,400 hours he had put on the tractor.

From the viewpoint of the company it had been more than fair. It had gone beyond the letter of its warranty commitment, and had incurred repair costs for which it had no legal obligation. The farmer, however, felt that he had never had a satisfactory tractor, that the particular unit he had been sold suffered from some basic defect which would continue to require repair, and that the company would not go on repairing it forever. He did not feel he needed a larger machine, and countered the company's offer with the statement that he would not have been expected to trade a three-year-old tractor that worked properly.

The Commission suggested, and the company agreed, that the situation was exceptional. Something had been wrong with the motor and it might or might not have been cured with the last replacement. The company therefore agreed that, if the engine failed again, it would completely replace it with a new engine.

Conclusion: The company and the farmer had not been in direct communication. The company headquarters, at least, was not fully aware of the farmer's position and feelings. What should have happened (the company now agreed) was that a new engine should have been supplied as soon as it was evident that the first rebuilding job was not satisfactory.

Case 2. Quebec, Mixed Farm: Tractor — A farmer who had purchased in 1967 a tractor of European manufacture from a North American full-line company, wrote to the Commission to record his position before the expiration of his one-year warranty, enclosing a report by a certified diesel expert backing up his claims that his tractor was not working properly. He was dissatisfied with the machine for a number of reasons. A front wheel seemed to be out of line (an axle had been changed by the company), the motor discharged white smoke, and the farmer felt that it used too much diesel fuel. He noted that the coolant level was down at the end of each day's work and assumed that coolant was getting into the combustion chambers of the engine to cause the white smoke. The tractor vibrated badly.

The company provided the Commission with a copy of its service file on the tractor, which indicated that the company was fully aware of the problems raised by the farmer and had taken steps to correct them. First of all, the farmer was using No. 2 diesel fuel, instead of No. 1, as recommended in the Owner's Manual. This had clogged the injectors. Injectors had been replaced a number of times and the farmer warned about using the wrong fuel. The coolant level was lower because it had expanded against the pressure cap and the surplus had drained off. When the liquid had cooled off, it contracted and appeared to be too low to someone not accustomed to a pressurized cooling system. The farmer kept adding water which was lost by expansion each day.

The white smoke was caused not by coolant in the combustion chamber but by the use of the wrong fuel. The vibration was considered by the company's representative to be normal, occurring at only one engine speed related to its natural vibration frequency.

All parts that were possibly faulty were replaced under warranty, and the farmer's son stated in writing that he was satisfied that the tractor was in good shape after the last visit of the service representative.

Conclusion: In this case, the customer evidently did not follow instructions and created at least some of his own difficulties. The company gave good, quick service and detailed consideration to each problem. In the end, the farmer was not satisfied and traded in the relatively new tractor for a much older tractor at a considerable financial loss.

Case 3. Ontario, Mixed Farm: Forage Harvester — In September 1967, a farmer purchased a self-propelled forage harvester with attachments on the basis of its being able to cut material to a very short length. The farmer alleged that the machine did not cut to the short length claimed in the advertising for the machine. Because it did not work, he submitted that he had lost close to \$10,000. It would not cut the shortest length for which there were sprockets, and the company's field representatives had not succeeded in fixing it. The farmer was also concerned about the way in which the service representatives had treated the machine.

From the company's viewpoint, the Commission was told, the crop was too old and dry to be harvested properly when they were called in to inspect the machine. Even so, they claimed to be able to cut down to 3/16 inch, when the cutting width was eight to nine feet. The company stated it was confident that there would be no difficulty with the 1969 crop.

In the event, however, it turned out that the forage harvester was not used to cut green material in the 1969 season (the farmer claimed to have had enough left over from the previous year). The chopping mechanism had therefore not received further testing.

Conclusion: It would seem possible that the farmer may have been misled by advertising literature that promised more than the machine could do under certain field and crop conditions. Farmers often claim that advertising exaggerates capacity and performance, or relates capacity and performance only to optimum working conditions. On the other hand, the company appears to have attempted to correct the situation identified by the farmer. The fact that the machine was not used to cut green material in 1969, even on a test basis, weakens the farmer's position.

Case 4. Ontario, Mixed Farm: Tractor — The farmer reported that he had had continuous trouble with his tractor: wiring system burnt out, oil seal failure, injector failure, front axle bolts sheared, hydraulic system failure, clutch plate failure (related to low transmission pressure found to be only 175 p.s.i., instead of 205 p.s.i., a situation that had been the cause of a flashing transmission warning

light which the dealer had claimed to be normal), gasket failure, need for overhaul of starter, input shaft ruined, battery failure. The farmer drew attention to the replacement of the input shaft and clutch plate. He felt the company had admitted that these parts had been inadequately designed by replacing them with improved ones at no cost for the parts even after warranty had expired. Why should the farmer have had to pay even the charge for labour?

In the case of a component with a completely new design (the clutch plate for the power shift transmission, for example) should a company be allowed to market the product without full and rigorous testing over an extended operating period? Although the company claimed its testing effective, it failed to pick up the weaknesses of this particular component in this machine. The farmer suggested that testing should be supervised by outside personnel.

The company concerned based its case on the fact that it had gone well beyond its legal position with regard to warranty on parts. It had noted that it reserved the right to change designs as it saw fit; the clutch plate had simply been improved.

Conclusion: In this case, the farmer appeared to have purchased a particular unit of a machine whose design was defective. The particular clutch plate appeared to have been under-designed. The company may not have done all that it could have to retain the customer's confidence in itself and its products, but this is a judgement which each company must make on its own reading of the particular situation.

Case 5. Alberta, Large Wheat Farm Plus Custom Operation: Combines — Two large combines were purchased in March 1966. During the first year, a raker chain and two feeder chains failed and four front feeder-chain drums had to be replaced. All this work was done at the company's expense. In the winter of 1967, the farm was visited twice by service representatives. During the 1967 harvest the farmer replaced at his own expense two feed chains, three drive belts, and one governor belt. One machine was put aside due to failure of one front feeder-chain drum.

The farmer claimed to have lost 160 acres of flax because the company could not supply sufficient parts in time. The farmer refused to pay the first two instalments due at that time (the end of the free season of use) on the grounds of unsatisfactory service. The company claimed that the farmer did not request service assistance often enough to maintain the machines well. The service representative stated that the farmer was running the pick-up attachment almost into the ground and picking up vast amounts of dirt. Nevertheless each machine worked 2,000 acres in two seasons of use. The Commission suggested that companies try and build in mechanisms to detect and prevent abuse of machines. Warranties could thus be extended further. The company replied that all such mechanisms they had tried could be "shorted out" by a farmer who was trying to get as much production as possible.

Conclusion: Generally, the company does not appear to be at fault in this case. The dealer may be at fault for not ordering parts needed by the farmer quickly enough. The farmer may be at fault for not maintaining and operating his machines better.

Case 6. Saskatchewan, Wheat Farm: Combine — The farmer purchased a combine from the authorized dealer, but did not want the roller-type pick-up which was standard equipment. He reported that the dealer then suggested a short-line brand, drum-type pick-up. According to the farmer, the combination did not work well in the field. After two hours of use, the farmer asked the dealer to exchange the pick-up. The dealer refused to do so on the grounds that it had been ordered especially for the farmer. In the course of a telephone conversation, the company refused to take the combine back. The farmer traded it for another make while the company was still considering the problem.

The Commission then wrote the company concerned and received confirmation of the same points, but with a completely different connotation. The company reported that the dealer purchased and installed the special drum-type pick-up only at the farmer's insistence, but it was not recommended by company engineers.

Conclusion: It is difficult to correlate the different statements. Certainly, the farmer and the dealer saw the incident from diametrically opposed viewpoints, one of which must cancel out the other. No one gained from the situation and no solution was possible.

Case 7. Ontario, Mixed Farm: Pull-Type Combine — The farmer purchased a used pull-type combine, ordering with it a new, special type pick-up. The pick-up was not delivered in time and the farmer sued the dealer and the company. The suit was lost because the order had not been placed soon enough to allow for delivery, even under the best conditions.

The farmer then advertised for owners of the same model of machine to make known their operational problems, that were then passed on to the Commission. The Commission then analyzed the complaints and noted that although five of the twelve farmers reporting had indicated that they had no problems with their machines, others reported problems pointing to the basic question of machine capacity. The company responded to the Commission's inquiry with the answer that this was a small machine, intended to be available for small farms which otherwise would not have been able to afford their own grain harvesting equipment. To the Commission's question as to what tests had been carried out to identify the capacity and durability of the machine, no answer was forthcoming, despite repeated requests.

Conclusion: It would appear that this model of combine was really of marginal utility to a farmer. It had been apparently built to a price, with sleeve-type bearings, for example, being substituted for the roller bearings in the main shaft of the same model in the self-propelled version. The lack of durability of these bearings was a major complaint of several of the farmers.

Chapter 28

WARRANTIES ON FARM MACHINERY

During the Commission's hearings, numerous farmers and farm organizations lodged complaints about the warranties currently provided on farm machinery. It was argued that a one-year warranty was not long enough for machines such as combines and hay-balers, which might only be used a few weeks each year. Many proposed that, wherever possible, hour meters be attached to machines so that warranties could be based on number of hours used. The longer warranties currently being provided on automobiles were cited as an example of the kind of warranty farmers would like to see applied to the machines they buy. In some areas, complaints were made about delays and difficulties in securing service for machines still under warranty. A few also stressed the need for extending the warranty on machines that were still not performing properly at the time the normal warranty expired. At least one organization proposed that the farm machinery companies should be liable for crop losses suffered by a farmer where a machine broke down under warranty.

The farm machinery companies argued that there was often a misunderstanding about the scope and purpose of the warranty they provide on farm machinery. It is normal practice in the industry to warrant a new machine "to be free from defects in material and workmanship which may cause failure under normal usage and service when used for the purpose intended". If such failure occurs within the warranty period the machine will be repaired at the company's expense. The repaired machine may carry a warranty for a further period. Massey-Ferguson, for example, warrants all repair or replacement parts "for 90 days from the date of replacement or the unexpired 12 months period, whichever is longer". However, some farmers may expect warranty to cover ordinary wear and tear as well. The longer the warranty period, it was argued, the greater the misunderstanding about the scope of the warranty was likely to be. In any case, they argued, most defects of material and workmanship would show up during the first few hours of use. If genuine defects developed after the warranty period had expired, most companies, it was claimed, would repair the machine free of charge.

Warranties for 50,000 miles or five years of the type provided on automobiles would be difficult to implement for farm machinery. Unlike the automobile which

usually travels on a smooth cement highway, the tractor, the self-propelled combine, and other farm machines make use of many different mechanical and hydraulic components, must work under a variety of field conditions, and have to withstand the stresses and strains of rough terrain, and the repeated imposition of extreme loads. While designed and engineered to withstand these loads, if the machine is to operate properly it must have conscientious maintenance. The extended warranties on automobiles, it was noted, usually require the certification of regular maintenance having been performed. Given the dispersed character of the farm machinery in use, it would be administratively more difficult and expensive to provide the same kind of warranty arrangement on farm machines. Regular maintenance service on automobiles is usually performed on a dealer's premises and regular certification involves little additional trouble or expense. A farmer usually provides his own maintenance service on tractors, combines, and other machines and for this reason certification that regular maintenance had been performed would be difficult to provide.

It was also stressed that tractors and other machinery can more easily be overloaded and abused than is true for automobiles, so that companies must be on guard that they are not being asked to pay for machine failures that are not the result of ordinary expected usage.

In many instances, the warranties of the farm machinery companies are warranties from the dealer to his customer. The farm machinery company in turn agrees to reimburse the dealer on some basis or other for the costs involved. While the form of reimbursement varies from one company to another, a common practice is for the farm machinery company to replace the parts provided under warranty at their normal cost to the dealer and to pay the dealer for his repair services at some percentage of his normal labour rate for that job. For major companies this latter payment is often at 75 or 100 per cent of his regular charge for that job. For smaller short-line companies it may be only 50 per cent or less.

Some information on warranty arrangements from the dealers' viewpoint was provided to the Commission in the course of its detailed follow-up of a selected sample of farmers' complaints. Close to 90 per cent of the dealers interviewed reported that they were reimbursed for parts used in warranty work at dealer cost. In effect, if they used a part from stock to make a repair, it would eventually be replaced for them free of charge by the company. The only cost to them would be the administrative cost of ordering and receiving it. If the part came in a normal stocking order, the company would absorb shipping costs as well. This treatment is somewhat less favourable than that in the automobile industry, where the dealer receives the full retail price for parts, less a fleet discount of about 15 per cent.

In fact, many parts required for warranty repairs will have to be ordered from the branch or central parts depot of the company. Under these circumstances, the dealer will still be allowed his invoice cost of the part but in almost 90 per cent of the cases interviewed he would have to absorb the transportation costs himself. This would be true even in an emergency situation where premium transportation may be needed to get the part to the dealer quickly.

The group of dealers interviewed reported that they had to absorb some 37 per cent of what they considered their normal shop costs in handling warranty work. The hourly rate allowed by the company would cover the direct hourly rate of the employees making the repair, but would not cover the overhead cost of the building, the tools, the specialized machines and the consumed supplies required to do the job. Again, this treatment is less favourable to the dealer than that provided in the automobile industry.

Thus it is clear that the implementation of warranty imposes some cost on the dealer. The dealer may have to absorb freight and telephone costs if the required repair parts are not in stock. He also incurs the expense of picking up and returning the implement to the field. If the machine breaks down in a busy season the dealer may feel obliged to provide a substitute machine until the implement in question can be repaired. The farm machinery companies undoubtedly find it desirable to impose some warranty cost on the dealer in order to deter dealers from pressing dubious warranty claims on behalf of their customers. However, if the cost imposed on him is too great, he may not provide the farmer with the warranty service that the company warranty arrangement is intended to provide.

The cost to the dealer of implementing warranty arrangements undoubtedly becomes part of the accepted cost of a dealer's operation. Still, it is important that the way in which warranty is implemented should not be allowed to impede the provision of a reliable repair parts service in time of emergency. For this reason it is recommended that when a machine under warranty breaks down during a busy season, the farm machinery companies should agree to absorb some percentage—say, 75 per cent—of the cost of obtaining any required parts. This might well cover the cost of long distance telephone calls and premium transportation charges.

For the farm machinery company the problem of warranty relates to the question of machine reliability. Machine reliability, in turn, depends on the way that the machine is designed and tested and the quality control maintained during the manufacturing process. To the degree that the machine does not break down because of better design or higher-quality control standards, warranty claims will be less frequent and will cause fewer problems for the dealer and the machinery company.

The performance reliability of a complex machine made up of numerous component parts is really only as good as the weakest part in terms of design or quality. Thus reliability is a characteristic which is only possible to achieve if, component by component and sub-assembly by sub-assembly, the machine is designed for certain reliability goals. "A properly designed component will fail only at some point in time beyond the life span for which the part is designed. This point in time is conceptually the mean life for the whole population. To assure that the required life for which a component may be designed can be stated with sufficient confidence, . . . only a relatively small scatter of failure data is permissible."¹

¹H. R. Jaeckel and S. R. Swanson, "Predicting Service Life of Automotive Parts Calls for Random Load Test", *The SAE Journal*, November 1969, p. 42.

This definition of component (and therefore machine) reliability simply states that an average reliability for a part of 5,000 hours of use must be achieved by performances of the total population of such parts very close to the average. To achieve this standard only a few can be allowed to fail many hours below the average.

If this level of predictable consistent performance is achieved, the company can offer a warranty at an acceptable cost level. Such performance predictability requires extensive design testing and production quality controls, and the company that does not or is not able to support such a program will not be able to offer a warranty of equal value to the customer. Warranty is too costly to a manufacturer for him to accept it as a substitute for design and manufacturing quality. Ideally, warranty should be accepted as the residual cost for the very few undiscovered flaws in design or manufacturing. The cost of eliminating these flaws would be much greater than the cost of the warranty itself.

In visiting the plants of various farm machinery companies, the Commission was shown numerous testing and quality-control centres where components of various machines were undergoing tests to measure their strength and durability. Some instances where failure had occurred were also brought to its attention. Two instances may be cited.

In one tractor plant the Commission was told of a series of changes in design which had been found necessary in a certain area of a new type of power shift transmission. Later, the Commission received a letter from an Ontario farmer explaining how his tractor had broken down and that the original transmission design had been replaced with the later design in the process of warranty work. He wondered whether the company could have effectively tested the original design if it had failed so soon in service and had to be replaced. The Commission tried to obtain information on the extent of the testing that had been carried out but the Canadian subsidiary of the company could not supply it.

In another tractor plant the Commission was shown a differential gear on which the company had experienced complaints of broken teeth. The gear in question had been purchased from an outside supplier whose quality control had slipped, producing gears that were too brittle. The result was broken teeth on the gears. The company had no reliable information as to how many tractors might be involved with this defect. More than two years later, the Commission received a farmer's report of how his tractor had been out of service for several months waiting for replacement gears because the original had developed broken teeth. The Commission wrote the company and, possibly fortuitously, the farmer received the missing repair parts within a few days. The company agreed that this was one of the instances of improperly hardened teeth of the type the Commission had seen on its visit some 33 months earlier. This illustrates the length of period over which lapses in quality control may affect machine reliability and a company's warranty problems.

No complete data are available on warranty costs. One firm, International Harvester of Canada, reported during the public hearings that its warranty costs amounted to about 1.1 per cent of its net sales, and said these costs had declined significantly since the firm had begun to assemble its machines to a greater extent at the factory. This suggests that in the past, problems giving rise to warranty claims have often been due to improperly assembled machines. In the Commission's financial questionnaire the machinery companies were asked to report expenditures on quality control. Under this heading a variety of expenditures was included such as warranty costs, the cost of defective work, and scrappage. The results of this survey for firms manufacturing in Canada were as follows:

Quality-Control Expenditures as a Percentage
of Manufacturing Cost, 1960-66

	<u>All Firms</u>	<u>Major Companies</u>	<u>Smaller Companies</u>
1960	3.1	3.1	—
1961	1.4	1.4	—
1962	1.4	1.4	0.6
1963	1.5	1.5	1.2
1964	1.1	1.1	0.3
1965	1.2	1.3	0.5
1966	1.4	1.5	0.3

In respect to warranty based on number of hours of use, a recommendation made by many farmers or farm organizations, it would be noted that one company, John Deere Limited, already provides an extended warranty of 24 months or 1,500 hours on engines. In modified form, this extended 24-month warranty also applies to certain parts of the power train.

Summing up this discussion, it is clear that warranty can be considered from the viewpoint of the three different interested groups. The farmer is concerned to have the maximum degree of warranty protection for major machines. He is also deeply concerned about the continuing reliability of his machines, and warranty is just one facet of this question. The farm machinery company is concerned with warranty as an expression of quality—of legitimate pride in the products it makes and sells—but must always be on guard to detect cases of warranty abuse either by dealers or farmers. The dealer is very much the man in the middle, caught between his farmer-customer and the farm machinery company he represents.

Given these different interest groups, the Commission has a number of suggestions which could, it believes, improve the situation:

1. Companies should be encouraged to differentiate more clearly in their warranties among different classes of parts and to extend the warranty to a specific number of hours of use on such machines as tractors and combines where an hour meter (which could be sealed against tampering) is generally included. Not all parts of the machine need be covered by the extended warranty. Certain parts deteriorate with time whether they are used or not, and others such as belts may have different

life expectancies depending on whether they are properly adjusted and maintained. Hours-of-use warranties are already appearing in advertisements for some machines imported into North America from Europe, and it may be that competitive pressures alone will be sufficient to bring about this logical extension of warranties.

2. Companies should be asked to make public the terms of their warranty payments to the dealer. In addition, they should make sure that their warranty terms are clearly explained to the farmer-customer. The farmer would then understand more fully the responsibility of the company and the dealer in warranty settlements. Some of the past difficulties with warranty, and the source of farmer complaints about it, have been due to a lack of understanding of what warranty does and what it is intended to cover.

3. Requiring companies to publish data on their warranty experience and warranty costs would probably be unwise because of the difficulty of ensuring data comparability from one company to another. Nevertheless, it is recommended that the evaluation or testing authority, proposed elsewhere in this Report, should be authorized to collect such data on warranty costs and experience as it finds useful in helping evaluate different farm machines.

4. Finally, some carefully controlled approach to the problem of consequential damages should be undertaken. The Commission has been advised that the liability for damages that takes the form of a loss in a farmer's income as a result of the failure of a machine in the warranty period is already pretty clearly established under the Common Law. However, the Commission is not aware of any such case having been successfully prosecuted. Individual farmers are usually reluctant to seek legal redress for their losses, especially against a large corporation. The matter appears to fall outside the clear area of responsibility of the federal government. It is recommended therefore that provincial governments explore this matter on behalf of farmers, perhaps in consultation with the federal government. One solution might be a requirement that any distributor of farm machinery post a bond to cover consequential damages as a result of a machine failure during a warranty period. Payments could be limited to cases where the amount and cause of the loss could be clearly established. It might also be desirable to set a limit on the amount of loss payable with respect to any one machine and to develop a measure of co-insurance by the farmer so that the loss would not be covered until it exceeds a certain limit, to avoid nuisance claims.

Chapter 29

PARTS STANDARDIZATION

The standardization of parts for farm machines was strongly recommended to the Commission by farm groups appearing before it. In particular, the Saskatchewan Farmers' Union stated:

We believe standardization of many parts, both within and between companies, would result in savings and better service to all concerned . . .

Dealers would save a considerable amount in overhead on stock to say nothing of the mental anguish of maintaining inventory cards and frustration when parts are not available.

One central bearing distributor would be able to provide the needs of the whole province, with sub-distributors in strategic points in the province.¹

While acknowledging that certain items such as screw threads had been standardized in the past, "at considerable savings to manufacturers, distributors, dealers and farmers" the brief continued:

No attempt appears to have been made to even standardize parts within each company for its various machines—such simple items as guards, ledger plates and knife sections are seldom interchangeable between different models made by the same company. Shaft sizes, bearings, belts, chains, hydraulic couplings, oil filters, pulleys, wheels, tires, universal joints, electrical equipment are items which could be standard.

Farmers feel a code could be agreed upon that would provide for a minimum size shaft and/or bearing to withstand a certain stress or strain. Minimum requirements for belts and chains, wheels, tires, hydraulic hose, and couplings, the same.

Of equal importance is a method of identifying belts and bearings. Belts could be numbered A, B, C, etc., for certain widths; 1, 2, 3, etc. for length; and A1, A2, etc., for certain minimum strength. Bearings should be numbered by a standard number by all manufacturers. A code could be agreed upon or established by regulation as to size, both inside and out, as width, etc. If machine companies use the manufacturer's number rather than a part number, considerable savings would accrue.

In the first place machine companies themselves would not require the complicated reference and parts books. Nor would they have to place

¹Saskatchewan Farmers' Union, *Brief to the Royal Commission on Farm Machinery*, Saskatoon, March 1967, pp. 26 and 27.

identical bearings into boxes with different part numbers. Warehousing space would be reduced.²

The presentation of the Alberta Wheat Pool noted:

Although some steps have been taken in the acceptance of standards by different manufacturers in such things as power take-off attachments, three-point hitches, etc., many other items could, it is felt, also be standardized. Bearings, belts, chains, cultivator shovels, knife sections, guards, draw pins, to name a few, could be standardized and made to fit most any make or model of machine. Standardized parts are usually available at a lower price for similar quality.³

Similarly, the United Farmers of Alberta Co-operative Limited, strongly endorsed more standardization in its brief to the Commission:

One of the areas where it would appear that substantial savings might be made is in the standardization of parts. For example, the essential design of a cutter bar has not changed for many, many years. It is true that the drive has been improved, the bracings and the quality of the materials are better but we still have knife sections and guards with ledger plates that break or wear out. We have dozens of them varying slightly in shape, size and in the size of the hole that attaches them to the knife standard. Almost every new combine, swather, mower or forage harvester had an engineer back of it who somehow managed to change something so nothing else will now fit. Every dealer has shelves full of these replacement parts—that is all except the one you broke. Certainly you need different knives for cutting different crops but it seems doubtful if you need ten different kinds to cut ripe wheat. To a lesser extent, the same complaint can be made about sprockets, pulleys, belts and other parts. Any improvement in the situation would have to come from the manufacturers. We oppose laws telling anyone how to build a machine. In that way progress is lost. What we think would be worth considering is having the American Society of Agricultural Engineers set up standards where it is practical to do so for farm machine parts. Machines manufactured to these standards would be entitled to put a decal on the machine stating that they met A.S.A.E. standards. This sort of thing has been done with power take-offs and A.S.A.E. specifications for tractor drawbars are used by most, if not all, manufacturers.

Related to this is the matter of standard parts produced by specialized manufacturers. Bearings and belts are examples. Replacements can be secured from establishments dealing in these products. The problem is that the farmer does not know the part number or even the original manufacturer. It would save everyone a good deal of time and trouble if manufacturers placed in the instruction book accompanying the machine, the original manufacturer's name and part number, along with their own.⁴

These quotations underline the seriousness with which farmers view the question of repair parts standardization.

Three levels of standardization can be identified. The first, the standardization of parts within a company, has been going on at an accelerating pace, the

² *Ibid.*, p. 26.

³ Alberta Wheat Pool, *Brief to the Royal Commission on Farm Machinery*, Calgary, March 1967, p. 6.

⁴ United Farmers of Alberta Co-operative Limited, *Brief to the Royal Commission on Farm Machinery*, Calgary, March 1967, pp. 14 and 15.

comments of the Saskatchewan Farmers' Union notwithstanding. All companies emphasized, before the Commission and privately in correspondence, how seriously the addition of one more different part was regarded in their total parts line-up. They fully recognize the cost of introducing additional repair parts into their warehousing system and try to avoid doing so by making each new part functionally replace another, by making parts interchangeable between models and by using modular design approaches by which large areas of different machines are constructed with the same building blocks.

A good example is provided by the new line of Ford tractors that were introduced in 1965.⁵ The seven engine types involved required only three different cylinder heads. Only two starter motors are required, one for the gas and the other for diesel models. Two-ring gears match the two starters. Injectors are common on the diesel engines except for a different hole size for the four-cylinder model. And two oil filters cover all seven engines. Even on something as critical as a piston, five types cover seven engines. Complete interchangeability exists among all engines in 20 other areas, ranging from water pump assembly through gears and idlers for the crankshaft, camshaft, hydraulic pump and idler-gear adapter, to head bolts, thermostats and valve-seat inserts. Such standardization is achieved at some increase in manufacturing cost since it requires the use of a much heavier crankshaft, pistons and other components in the smaller tractors, but this is offset by reduced costs in stocking and handling repair parts.

The second type, standardization between companies in the form of inter-machine compatibility, is increasingly common. Power take-off shaft diameters, spline dimensions and speeds are standardized, as are three-point hitches and drawbar dimensions. Major areas of hydraulics are also standardized. This form of standardization which allows the interchangeability of the tractors and implements of different companies is advantageous to both the industry and the farmer.

However, it is a third type of standardization on which the farmers have placed the greatest stress, and in which there has been the least progress. This involves the standardization of components and parts of farm machines manufactured by different companies. The farmer sees two advantages in having parts interchangeable as between different brands. The larger volume of parts manufactured and distributed would foster competition and reduce parts prices. In addition, the interchangeability of parts would reduce the risk that the farmer would be unable to obtain a part when he had a machine breakdown in a busy season. On large volume parts the "will fit" manufacturers are already providing parts that will fit the machines of different companies. But only a small number of the total parts required by different machines are involved.

A study carried out for the Commission in the summer of 1967 investigated the differences that exist from company to company in a selected number of fast

⁵ P. A. Martel, "The 1965 Ford Tractor Engine Family", *Society of Automotive Engineers, Paper 984A*, January 1965.

moving parts.⁶ Parts were selected from ten different machines widely used on the Prairies—the chisel plow, disk harrow, moldboard plow, grain drill, mower, rake, baler, forage harvester, swather, and combine. One model of each machine was selected and parts for 11 different companies were examined. The parts examined included ledger plates, knife sections, wear plates, knife guards, knife clips, V-belts (100 different belts were examined), roller chains, cultivator sweeps and points, concave disks, wheels, rake and pick-up teeth, bearings, and idlers. Where possible, comparison was made with ASAE (American Society of Agricultural Engineers) standards.

In general this study showed that although there was very little interchangeability of parts between companies, the differences in certain dimensions of otherwise identical parts were often small. There were no significant engineering reasons for these differences in measurement and many of them appeared almost random, as though their primary purpose were to prevent interchangeability. For example, the differences in ledger plates, knife sections, and guards appeared to have little to do with machine performance. They were not functional differences. If the dimensions of a part of a different make could have been substituted, the machine would have performed equally well.

The study also collected data on the volume of sales of different parts recorded for the various companies from their Alberta branch houses in 1965 and 1966. Wide variations in sales volume were shown, with some companies having a large volume and others a very small one. In 1966, John Deere sold 32,205 ledger plates (of one type), Allis-Chalmers sold 785, and Ford 73. It is evident that more interchangeability would improve not only parts availability but presumably also the competitive position of the brands with a smaller volume of sales. This latter factor may explain why major companies resist parts standardization. Even where ASAE standards had been established they were often not followed. For example, although nominal cross-section dimensions for V-belts were followed very closely, belt lengths and methods of measuring belt lengths differ widely from those proposed in the ASAE standard. Again, it was found that a large proportion of the cultivator sweeps examined differed in one or more dimensions from the ASAE standard. Similarly, all wheels in the 5-bolt group were found to differ from the ASAE recommendation in at least two dimensions.

Many of these differences may be accidental. They reflect the fact that design engineers working independently for different companies are almost bound to arrive at different results. But why have the companies not made a greater effort to achieve standardization of parts from one company to another? No precise answer can be given to this question. In some degree, once a company has pursued a given design pattern for a number of years there will be reluctance to change, since the company will still have to stock parts for all its earlier models. Then, too, there may be manufacturing constraints. A company may have followed a particular design

⁶R. G. Cessford, *A Field Study on Parts Standardization*, unpublished Commission study, 1967.

pattern because of the machine tools it has available. A change to a new design might require new investment in machine tools and almost certainly would require additional tooling expense. In addition, companies like to keep their customers coming back to their dealers for parts. Not only are parts sales profitable to both the company and its dealers, but a returning customer is also more likely to buy other products sold by the company.

Most of the suggestions for parts standardization by farmers involve relatively fast moving parts. In fact, fast moving parts make up only a small proportion of all the parts carried by the industry. As pointed out in Chapter 27, in North America the Massey-Ferguson company currently stocks some 100,000 different parts. Yet only some 1,500 of these were parts for which a MF dealer would sell, on the average, one or more per year. If standardization is intended to go beyond fast moving wearing parts and reach into the heart of the machine to cover individually designed shafts, gears, and pulleys, it becomes almost impossible to achieve. The matter was expressed very well by a prominent agricultural engineer in correspondence with the Commission:

... when it comes to the question of persuading combine manufacturers, for example, to standardize major parts of the machine then I think you will always run into difficulties. A design of a combine or any other sophisticated machine for that matter, is based on technical knowledge, but requires considerable creativeness on the part of the designer; all men who are creative tend to regard their own efforts as superior to those of others. Furthermore, a design involves a very large number of compromises and it is frequently well nigh impossible to accommodate major parts of another design in one's own concept. I believe, therefore, that in the agricultural engineering industry we should press on with our efforts to get individual components standardized. For major parts of a machine I just do not think that the results likely to be achieved would be worth the trouble and time taken.

Thus, once we recognize that the farmer has an interest in having a choice for his major items of machinery among the competitive designs of different companies, it is clear that we must also recognize that standardization among companies will never be carried beyond certain limits. However, even for fast moving parts, progress has been extremely slow. What can be done about this?

Responsibility for standardization has been largely in the hands of the Farm and Industrial Equipment Institute (FIEI), the Society of Automotive Engineers (SAE), and the American Society of Agricultural Engineers (ASAE), all U.S. organizations. Proposals for standards are usually formulated by an engineering committee of the FIEI and submitted for approval to the SAE for tractors or to the ASAE for other implements. In some instances both associations may be involved. If acceptable to all the associations consulted, the standard will usually be published. No method is provided to enforce or even encourage the standard's adoption by individual manufacturers.

Since 1965 greater progress in processing and adopting proposals for standardization has been achieved, largely as a result of the establishment of the

Co-operative Standards Program (CSP) on the initiative of the ASAE. The CSP has succeeded in getting manufacturers of tractors and farm machinery as well as suppliers of materials and components to contribute funds and, in some cases, the time of engineers for the development of standards. In the two years following the establishment of the CSP, 17 new standardization documents were adopted and 37 documents were revised. Prior to CSP, standardization efforts were financed almost entirely out of the ASAE membership dues paid by individual engineers. Evidence of this increased activity is provided by the number of ASAE standards, recommendations and data officially adopted through the standardization procedures of the American Society of Agricultural Engineers. The official *Agricultural Engineers Yearbook* listed 51 of these in 1960, 80 in 1965, and 99 in 1967.

Other organizations concerned with standardization include the International Standardization Organization (ISO), sponsored by the United Nations Economic and Social Council (ECOSOC), the Organization for Economic Co-operation and Development (OECD) and the European Committee of Associations of Manufacturers of Agricultural Machinery (CEMA). In Canada, an agricultural implements committee of the Canadian Standards Association was active at one stage, but it was discontinued in 1964 because of lack of interest.

An examination of the work of these various organizations makes it clear that progress in the field of standardization depends very largely on the funds available for the support of activities in this field. The various farm machinery companies obviously have very mixed motivations in this field.⁷ In so far as standardization among different models of their own machines is concerned, they have a strong interest in achieving results and make very considerable efforts to do so. Massey-Ferguson reported that in its North American operations it employs ten engineers and technicians whose sole responsibility is the development of production and design standards. Similarly, Deere & Company reported that it maintains a standards committee made up of 26 members of its organization, including vice-presidents and material and production engineers. In addition, for standards which involve the compatibility of the tractors and machinery of different companies, very considerable progress has been made. It is in the area of standardization of parts among the various machine models of different companies where both the effort and progress has been minimal.

This analysis of past experience strongly suggests that no progress is likely to be made in this area, in the future, unless there is a larger effort. One way of achieving this would be through a modest expenditure of public funds designed to encourage more research into the possibilities of standardization and to provide some of the leadership required to achieve it. A recommendation along these lines is

⁷ A good instance of this mixed motivation is the following. As far back as 1930 the hole spacing in knife sections was raised for discussion in various standards associations. About the same time the matter of power take-off standardization was placed on the agenda for discussion. Agreement on standards for power take-offs was easily reached, for it is clearly to the industry's advantage. Hole spacing is still under discussion. See E. W. Tanquary, "Standardization: World-Wide", *Agricultural Engineering*, September 1963.

made elsewhere as part of a proposal for a government-sponsored and -financed research and testing organization. It is also recommended that the standards committee established by this organization consider the creation of some form of standards approval, such as a decal which could be displayed on machines meeting certain approved standards for interchangeability of parts.

Related to the question of standardization has been the complaint by farmers that components such as belts and bearings, which are provided to most farm machinery companies by common suppliers, can often be identified in the machinery manufacturing company's parts catalogue only under that company's brand name. What farmers would like to see would be a parts list that provided alternative sources for the part in question. For bearings, it was stated that a further advantage was available in that bearing manufacturers had available a cross-classified parts list which provided the parts numbers for identical bearings manufactured by different firms.

The Commission investigated the situation in correspondence with the Anti-Friction Bearing Manufacturers' Association. It found that the common coding system did identify bearings of the same dimensions, but that there was no guarantee that the internal structure of the bearings manufactured by different firms was the same. One bearing might have one more or one less ball or roller in its make-up, and the hardness and finish of the metals might differ between bearing brands. Thus there is no guarantee that one bearing will last as long as another. Being dimensionally identical, the substitute bearing would fit. But the farmer buying it would be taking some risk that it might not perform as well as the original bearing.

Some companies already provided references in their parts list as to where an identical part can be obtained from another firm. The Commission strongly recommends that all firms who manufacture equipment where a cross-classified parts list is likely to be a significant service to farmers should do likewise.

In concluding this section, it is important to recognize that while more progress is possible in the area of standardization, it would be unwise to expect too much. The sheer number of different parts used by the various manufacturers makes it unlikely that much progress can be expected outside a limited number of functional parts which sell in large volume. Manufacturers are constantly attempting to improve their products. These improvements may at times involve changes that require the abandonment of parts on which standardization agreements had been reached. Thus over time old standards will have to be abandoned and new ones established. With a constantly moving target, effort will have to be continuous, and success can never be complete.

Chapter 30

FARM MACHINERY PROBLEMS AT THE DEALER LEVEL

A number of the farm machinery problems drawn to the Commission's attention come into focus most sharply at the dealer level. Dealer organizations expressed concern about a wide range of problems involving their relationship to the manufacturer from which they hold a franchise. Farm organizations expressed concern about the quality of the service personnel employed by dealers. This chapter will discuss a number of these problems. Some attention will also be given to the Farm Machinery Acts that have been passed in a number of provinces.

Dealer complaints were summarized by the Canadian Federation of Farm Equipment Dealers in the following way:

The wholesaler, usually a wholly owned affiliate of the manufacturer working on a fixed markup, appears to shift most of the risk and uncertainty of doing business to the retail dealer. The dealer contract does not appear adequate. Some of the reasons for this are as follows. [The companies' policies on buying back] repair parts upon closing out [a dealership] discriminates against the dealer The wholesaler is interested only in fast moving stock and the balance becomes a complete liability to the retail dealer upon cancellation of his sales contract, as he no longer has a dealership outlet. A franchise cannot be sold by the dealer. Thus it is virtually impossible for [him to receive] compensation for goodwill which he may have built up in the community Warranty arrangements are less than satisfactory to the dealer. Although warranty parts are supplied without cost to the dealer, he absorbs freight, telephone costs, expenses of picking up and returning the farmer's implement to the field and up to 50 per cent of the shop service costs. Furthermore the dealer has little protection against poorly-designed and -tested equipment in most cases. . . . Upon cancellation of a franchise by the wholesaler, the latter is in no way obligated to assume responsibility for a portion of the lease or building costs which may be still unexpired. . . . The dealer bears the risk and uncertainty of poor crops through the required advance ordering of new machinery almost one crop prior to delivery of new equipment from the wholesaler. The dealer not only bears the burden of extra financing in case of machinery carry-overs due to poor crop conditions, but he also bears a large amount of the depreciation on this unsold new machinery stock. Main-line equipment wholesalers frequently resist organization of the retail dealers and they also resist short-line franchises which the dealer may undertake in order to increase his profits.¹

¹ Taken, with some editing, from *The Canadian Federation of Farm Equipment Dealers, Brief to the Royal Commission on Farm Machinery*, Calgary, October 1967, pp. 35, 38, and 39.

A number of the points raised in the above paragraph have been examined elsewhere in this Report and will not be considered further here.² Consideration will be given to the nature of and provision for termination of the franchise agreement and provisions made for the return of wholegoods and repair parts upon termination.

It was noted earlier that the number of franchises granted by ten major farm machinery companies had fallen from around 5,000 at the beginning of the sixties to about 3,000 today. It is evident that within the past few years a large number of dealers have had their franchises terminated and have had to retire or seek employment elsewhere. Some of them may have taken on other short-line franchises. There can be no doubt that this decline in dealer numbers is part of a general rationalization of the pattern of distribution which will reduce costs and provide the farmer with a better service. It parallels the trend towards smaller and fewer farms. Both are symptomatic of the rapid progress that characterizes some sectors of our society. While the progress reduces costs and increases productivity, it may adversely affect many groups in the process. Often these will be the older, the less well-educated and, in general, the less fortunate members of our society.

In the long run all society benefits from progress that raises productivity. But society should also be prepared to alleviate the costs this progress imposes on the less fortunate. Applying this principle to the dealership problem, there is a strong case for requiring a longer period of notice prior to the cancellation of a franchise. Cancellation for legitimate cause would be an exception. Longer notice would give the dealer affected more time to dispose of machines and repair parts he has accumulated, and to make arrangements for some alternative employment. Accordingly, it is recommended that legislation be passed requiring 12 months' notice before any farm machinery franchise is cancelled. This should not impose any significant hardship on the companies. Some companies have told me informally that they usually warn dealers well in advance of an impending cancellation.

The problem of disposing of new machines and repair parts in the hands of the dealer when a franchise is cancelled poses a more complex problem. The Province of Saskatchewan has recently passed legislation requiring that, for new machines, the farm machinery company should take the machine back at its invoice price plus 100 per cent of the costs of return transportation. For repair parts, the supplier must take back any unused parts that are clearly identifiable at 85 per cent of the current net price. Both provisions apply only to parts and machines that are listed in the supplier's current price list.

This provision should not create any difficulty with respect to new machines. For parts, however, much will depend on how the "current" price list is defined. Given the fact that a great many parts have a very low turnover even at the national or continental level, it is not difficult for a dealer over the course of time to acquire

²See Chapter 10.

an inventory of parts which he may have little prospect of selling. Some machinery companies advise their dealers to stock a part only if they have sold one or more in the past year, and even then only if it appears on the company's guide list of higher-turnover parts. It would be unfair to require companies to acquire parts for which they already have adequate lifetime stocks, or parts that were ordered against the company's advice. Moreover, many of the companies have policies allowing dealers to return parts ordered by mistake, or parts not suited to their area. A parts-return policy that was too restrictive to the companies would have the effect of increasing the price of parts to farmers, and this should be avoided. Nevertheless, some provision along the lines of the current provision in the Saskatchewan Act would be desirable, if it were limited to faster moving parts and did not include parts the dealer had been warned against stocking. The recommendations made elsewhere with respect to an initial limitation and possible outright ban on interest-free floor-planning of wholegoods will reduce the risk now assumed by the dealer in the form of a heavy inventory of new machines.

It is useful to compare the position of the farm machinery dealer to that of the automotive dealer in relation to their franchising companies. Three companies in the farm machinery field (Ford, International Harvester and White Motor) are also in the automotive field. Dealer representatives have claimed to the Commission that the farm machinery dealer was worse off than the automotive dealer.

As far as it seems practicable to do so, the status of the two dealer groups is set out in tabular form on Table 30.1. While many other aspects of the contracts are substantially identical, the farm machinery dealer generally seems to be at a disadvantage in five of the six areas shown on the table. His security of tenure is less in all but one case than the standard of the automotive companies. Company obligations on termination and in the obligation to assist in the disposal of premises are much less advantageous to him. He is also at a disadvantage in selling wholegoods back to the company and in the return of repair parts. The automotive companies generally reimburse their dealers for warranty work so that it is not less profitable to them than commercial work; in the farm machinery industry, however, the dealer is obliged to support part of the cost of warranty from his own pocket. All automotive companies have dealer councils; three of the farm machinery companies do not. One of these expressed real reluctance to seeing such a form of dealer pressure being developed; another, which already had an automotive dealers' council, said that its experience on the automotive side indicated that really positive results were attainable. The single company that had a dealer council for some time was enthusiastic about it. No farm machinery company had a formal program to assist new dealers with capital until they were established; all automotive companies do this regularly, taking an equity position in the dealer's company which the latter can buy back out of profits. One place where the farm machinery dealer has an advantage is that the farm machinery company provides his wholegoods inventory on an interest-free basis. While each difference noted is in itself small, the cumulative effect of all the differences may be to weaken the farm machinery dealer body in relation to what it could be potentially.

TABLE 30.1—COMPARISON BETWEEN DEALER FRANCHISE AGREEMENTS OF SIX FARM MACHINERY AND THREE AUTOMOTIVE COMPANIES

Typical Farm Machinery Franchise Agreements (six companies reviewed)		Typical Automotive Franchise Agreements (three companies reviewed)	
TENURE			
- Termination by dealer	- no provision in agreement (1 company only) ¹	- on 30 days notice (3 companies) ¹	- Termination by dealer
	- on 30 days notice (3)		
	- at will (1)		
	- on 90 days notice (1)		
- Termination by company	- immediately for cause ² (1)	- immediately for cause ² or after 90 days notice for dealer failure to meet company standard. Termination may be deferred for up to one year in the case of death or incapacity of the dealer, provided dealer or his executor or administrator applies for special consideration (3)	- Termination by company
	- immediately for cause ² or 30 days without cause (2)		
	- immediately for cause ² or mutually agreed time without cause (1)		
	- immediately for cause ² or 90 days without cause (1)		
COMPANY OBLIGATIONS ON TERMINATION	- Wholegoods (complete machines and accessories)	- all new and unused motor vehicles of the current model on hand. . . at dealer's net cost, including destination charge paid therein (1)	- Wholegoods (complete machines and accessories)
	- if termination because of death of dealer, company will buy back dealer interest. If through dealer fault, company has no obligation (1)	- as above, but limited to those purchased within the 180 days immediately prior to termination (1)	- COMPANY OBLIGATIONS ON TERMINATION
	- dealer will deliver free and clear of all encumbrances to the company branch all new, current, unused and salable complete machines and attachments. . . at net prices charged to dealer, less all discounts, but no more than the current prices; no allowance for transportation costs (2)	- at dealer's net invoice price, current at the effective date of termination, unless cancellation was because dealer took on new line of motor vehicles, other than those manufactured by company (1)	
	- company will pay net prices plus transportation costs (1)		

<ul style="list-style-type: none"> - if termination without cause, company will repurchase each new, unused and undamaged. . . [machine] . . . listed in the current price and data book at the current model price therefor paid by dealer to company, exclusive of costs of distribution, delivery, handling, advertising, etc. If termination for cause, company has option to repurchase (1) - if termination initiated by company, it will pay net charges plus transportation costs; if by dealer, or company because of dealer fault, company will pay 90% of net prices plus transportation costs (1) 	<ul style="list-style-type: none"> - on the same basis as wholegoods (2) - in accordance with current return policy (1) - at current dealer net price, less 15% (1) - as listed in current price list (except for slow-moving parts) at current Net Price less 15%. Dealer pays transportation costs (2) - special tools not mentioned (6) - no arrangements (5) - signs will be repurchased (1) - interest-free floor-planning, up to 12 months on tractors, up to 23 months on other products (6) 	<ul style="list-style-type: none"> - prices in the current parts price list (2) - purchased from company at prices agreed to; dealer's current buying prices in effect at date of termination plus 5% (2) - purchased within last 12 months at wholesale price less all discounts; company pays transportation costs, if any (1) - special tools repurchased at mutually agreed price (3) - companies will assist in finding purchaser or lessee, or will lease, or will also arrange sublease (3) - signs will be repurchased at mutually agreed price (3) - no interest-free floor-planning provided (3) 	<ul style="list-style-type: none"> - Parts - Tools - Premises - Floor-Planning
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TABLE 30.1—COMPARISON BETWEEN DEALER FRANCHISE AGREEMENTS OF SIX FARM MACHINERY AND THREE AUTOMOTIVE COMPANIES—*Concluded*

Typical Farm Machinery Franchise Agreements (six companies reviewed)	Typical Automotive Franchise Agreements (three companies reviewed)
WARRANTY POLICY — machines or parts — company credits dealer account with his net purchase price for parts (but not transportation charges) (1) — provide working capital to cover dealer's warranty and policy expense (1) — dealer receives retail labour rate plus 5% of dealer parts cost to cover handling costs (1) — dealer receives retail labour rate plus 10% and cost of parts plus 15% on all warranty work (1) — repair f.o.b. supplier's factory, or furnish without charge f.o.b. its supplier's factory, same or similar part. (No allowance for transportation or labour costs) (1)	— dealers are reimbursed for warranty labour at retail rates in accordance with allowances shown in standard time service schedule (1) — varies by dealer and market, derived from a formula which includes dealer base cost for part plus established markup and additional amounts as incentive for maximum efficiency in warranty service to consumers (1) — on approved warranty adjustments company pays flat rates for operation performed (as recommended by company) at 100% of labour rates (as agreed upon with company) (1) — all companies have operating Dealer Councils (3)
DEALER COUNCILS No Dealer Council. Example of reply: "Should there be support from broad segment of dealers, no reluctance to establish such" (3) — does have conference of dealers (1) — have had one for 6-7 years (1)	— DEALER COUNCILS — various plans to assist dealers in expanding their facilities and adding needed equipment (1) — dealer invests 25% and company 75%, with dealer buying back company interest out of profits (2)
ASSISTANCE FOR EXPANSION — no policies to assist dealers in these circumstances (6)	— ASSISTANCE FOR EXPANSION — various plans to assist dealers in expanding their facilities and adding needed equipment (1) — dealer invests 25% and company 75%, with dealer buying back company interest out of profits (2)

¹Numbers in parentheses refer to number of companies whose franchise arrangements contained provision noted.

²"Cause" in company terms refers to a number of events. Basic among these are dealer bankruptcy, breach of agreement, action adverse to company, death of dealer if an individual, death of a principal if a partnership, etc.

As farm machinery has become larger and more complex in design—with added power and capacity, new transmissions and hydraulic systems, and many new features for operating ease and comfort—the problems faced by the dealer in providing proper repair and maintenance service for these machines have become much more difficult. Not only does the dealer need a substantial investment in tools and specialized testing and repair equipment, but in addition a high degree of mechanical ability on the part of the dealer's servicemen is required. Yet many of the farm organizations appearing before the Commission expressed a lack of confidence in the calibre of the servicemen employed by the dealers. It was reported that "much of the farm machinery is serviced by men who gain their training as they service or repair the machine on which they work". Or, again, it was stated that "most of the mechanics in farm implement servicing are men who have left the farm and have no other qualifications except some personal experience in this field. Their wages are low and their work is inferior. However, the cost to the farmer is high." Certainly it is true that, although a competent farm machinery mechanic needs higher levels of skill than an automobile mechanic, no province today requires for farm machinery mechanics the type of certification demanded for automobile mechanics. Automobile mechanics must undergo a combined technical training and apprenticeship course.

The need for more highly trained farm machinery mechanics appears obvious. Why are there not more servicemen being trained?

The difficulty may lie in a lack of understanding as to who is and who should be responsible. All the major farm machinery companies have extensive training facilities and provide regular courses for their dealers' employees. They have well-equipped laboratories and classrooms and provide the training at no cost to the dealer. The dealer is required to pay his employee's transportation to the site of the course, his subsistence while on the course, and presumably his regular salary during the training. However, a careful examination of these courses clearly indicates that they are not intended to provide basic training for dealer mechanics and employees. Instead, they are designed as refresher or improvement courses for employees who have already acquired basic skills. As such, they serve a very useful purpose. They keep dealer mechanics up to date on the latest developments in the farm machinery companies' equipment, and undoubtedly also help dealer mechanics to maintain their basic knowledge. But the courses rarely last more than a week or two, and cannot possibly provide the basic training that a good dealer mechanic requires.

Recently, three provinces—Ontario, Manitoba, and Saskatchewan—have established special courses to train farm machinery mechanics. The courses have been well designed and appear to provide good training. Yet at the time the Commission was in touch with those responsible (1967), the course at Guelph appeared in danger of being discontinued because of lack of interest. This experience suggests another lack of understanding of the training problem. It was apparently anticipated that the course at Guelph would be attended by employees sponsored by farm machinery dealers. The failure of more dealers to take advantage

of the course is understandable. Even where a dealer sponsors one of his employees as a trainee, he has no assurance that the employee will subsequently return and work for the dealer for any length of time. The newly trained employee may be lured away by a better-paying job in the construction equipment field or elsewhere. Further, with the farm machinery companies all engaged in a program of reducing the number of franchises they offer, many dealers may feel too insecure to sponsor an employee on the course.

Thus it seems clear that someone else should take the responsibility for ensuring that farm machinery dealers are able to obtain a good supply of well-trained mechanics. Not only would the availability of such a supply benefit the dealers themselves, it would also provide a very broad-range benefit to the farm community as a whole. The benefit would take the form of better and faster repairs on farm machinery and less risk of subsequent breakdown. To the farmer, there would be the saving of the crop losses he now suffers because of unnecessary breakdowns from improperly repaired machines or through delays in getting his machinery repaired. These economic losses are quite apart from the worry a farmer undergoes when these breakdowns occur.

For these reasons, it is recommended that the Department of Agriculture in each province carefully examine how the supply of trained farm machinery mechanics can best be increased. The Department of Manpower and Immigration now sponsors many training programs. It may be that a plan for better training can be worked out in co-operation with one of the federal programs now in existence. Perhaps an apprenticeship program with a provision for certification is what is required. Clearly a moderate subsidy to ensure that the improved supply takes place would be fully justified on the basis of the benefit it would provide in terms of a saving in crop loss to agriculture as a whole.

Farm Machinery Acts

Four Canadian provinces—Alberta, Manitoba, Prince Edward Island, and Saskatchewan—now have Farm Machinery Acts designed to regulate or temper the relationship between the three parties involved in the purchase and use of farm machinery, the company, the dealer, and the farmer. A primary purpose of these Acts appears to be that of protecting the interests of the farmer in his relationships with suppliers of farm machinery. Typically, this protection takes three forms. The farmer is allowed to reject the machine he has purchased, after having had an opportunity to test it in his own working environment, if he feels that it has failed to perform satisfactorily the job for which he purchased it, and if the company is unable to make it work to his satisfaction. Dealerships may be licensed so that minimum performance standards can be established and maintained. And an attempt is made to guarantee the availability of repair parts for the machines the farmer buys. In the case of Saskatchewan and more recently Alberta, the Acts provide for inspectors who have the dual responsibility of checking on dealer performance and using their good offices to find solutions for conflicts that develop between farmers and their suppliers.

How have the farm machinery acts worked in practice? Although it is not easy to assess the situation accurately, it is my impression that they have improved relationships between the three parties involved. Undoubtedly, the requirement that a standard sales contract be used (Manitoba and Saskatchewan) or that the sales contract in whatever form contain certain standard provisions (Alberta and P.E.I.) gives the farmer a guarantee that the form of the contract is not weighted in some way in favour of the other party. The rejection clause gives the farmer some protection against high pressure salesmanship and, even for the companies, probably helps ensure that they have satisfied customers.

In principle, the licensing of farm machinery dealerships gives the government an opportunity to ensure minimum standards, and protects the farmers in their direct contact with the company. In fact, provincial governments do not appear to have used this power to upgrade the quality of dealerships.

The problem of ensuring the availability of parts presents a more difficult problem. The earlier Acts required that parts should be maintained within the province for a period of ten years after the date the machine was purchased, and that the purchaser should be able to obtain them within a reasonable time. This requirement has been dropped from more recent legislation but there remains a requirement that the company selling the implement warrant that a sufficient supply of repair parts be made available for a period of ten years from the date of the machine's purchase and that they be available within a reasonable time. It is clear that this change is desirable. Prompt and effective repair parts supply may be provided most economically by one central warehouse serving several provinces. To require that all parts for every machine sold be kept in every province would add greatly to the total cost of repair parts. All of the major companies recognize that they have a vital interest in organizing and maintaining an efficient repair parts service.

A more difficult problem arises in respect to smaller short-line companies. Some of these may begin selling in some part of Canada and organize dealer facilities. Later they may decide that the business in the area is not sufficiently profitable, and discontinue their dealerships. The farmer may be left without any simple or effective way of obtaining parts for his machine. While there is no easy way to solve this problem, one approach would be for the provinces to license distributors of farm machinery. In instances where there was doubt about the future continuance of the company, a requirement could be made that the company post a bond ensuring that a repair parts supply would be maintained for a minimum length of time.

Although many provinces do not have a farm machinery act at the present time, such legislation appears to fulfil a useful purpose and I would recommend to all provinces that they review the legislation now in effect in the four provinces and consider whether it would not be in the interest of their own farmers and dealers to introduce such legislation. For convenience in carrying out this review, the *Farm Machinery Act* for the Province of Alberta, which was completely revised in 1967, is appended to this chapter.

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**1967****CHAPTER 20****An Act respecting the Sale of Farm Implements***(Assented to April 11, 1967)*

HER MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Alberta, enacts as follows:

Short title **1.** This Act may be cited as *The Farm Implement Act*.

**Interpre-
tation**

2. In this Act,

- (a) "dealer" means a person operating in the ordinary course of business a retail establishment for the sale or resale of farm implements, repair parts and implement services and who is required to be licensed as a farm implement dealer under *The Licensing of Trades and Businesses Act*;
- (b) "farm implement" means any implement or machine having the retail sale price of \$200 or more and used or intended for use in farming operations, but does not include a motor vehicle as defined in *The Highway Traffic Act*;
- (c) "inspector" means an inspector appointed under this Act;
- (d) "purchaser" means a farmer who purchases a farm implement for his own use;
- (e) "vendor" means a manufacturer or supplier of farm implements who sells, consigns or delivers farm implements to a dealer for sale or resale in the ordinary course of business or who sells or leases farm implements.

**Exemption
from Act**

3. (1) This Act does not apply to sales of farm implements

- (a) by farmers
 - (i) by auction sale, or
 - (ii) in the ordinary course of their farming operations,
- or
- (b) by executors or administrators, or
- (c) by public officials acting under judicial process, or
- (d) to vendors or dealers.

Chap. 20

FARM IMPLEMENT

1967

(2) *The Direct Sales Cancellation Act* does not apply to sales of farm implements made by vendors or dealers in accordance with this Act.

Form of
agreement

4. (1) Every sale agreement of a farm implement, whether new or used,

- (a) shall be in writing,
- (b) shall state the address of the principal office of the vendor in Alberta,
- (c) shall set out the nature and duration of all warranties given in connection with the farm implement.

(2) Notwithstanding clause (c) of subsection (1), any warranty may be stated elsewhere than in the sale agreement if the statement

- (a) is in writing and identifies the implement to which the warranty applies, and
- (b) is delivered to the purchaser at the time of the sale.

Implied
warranty

5. Notwithstanding anything contained in an agreement, every new farm implement sold shall be deemed to be warranted to be

- (a) made of good material,
- (b) properly constructed, both as to design and workmanship,
- (c) in good working order,
- (d) capable of performing in a satisfactory manner the work for which it is intended, subject to reasonable operating conditions and proper use and maintenance, and
- (e) designed and constructed in every way so as with proper care and use, to ensure reasonable durability.

Notice of
failure on
performance

6. (1) Where a new farm implement used under reasonable operating conditions and with proper use and maintenance fails to perform the work for which it is intended in a satisfactory manner, the purchaser may within seven days from the date the implement is first used give notice, by registered mail, to the vendor of the failure to perform and the dealer or vendor shall endeavour to make the implement perform in a satisfactory manner

- (a) not later than the seventh day after receiving the notice, given reasonable operating conditions, or
- (b) if reasonable operating conditions do not exist following the receipt of the notice, then not later than the seventh day of reasonable operating conditions after receipt of the notice,

and if the dealer or vendor fails to make the implement perform in a satisfactory manner by the end of those seven days the dealer or vendor shall, within 24 hours provide

1967

FARM IMPLEMENT

Chap. 20

the purchaser with a satisfactory substitute implement for the purchaser's use until his implement is made to perform in a satisfactory manner.

(2) If, within a reasonable time after providing the substitute implement to the purchaser, the dealer or vendor fails to make the purchaser's implement perform in a satisfactory manner, the dealer or vendor shall replace the purchaser's implement with an implement which is acceptable to the purchaser or terminate the sale agreement and refund to the purchaser all moneys paid by him in connection therewith.

(3) A purchaser is not obliged to follow the procedure set out in subsection (1) and the fact that he does not follow it in no way reduces the liability of the dealer or vendor for a breach of warranty.

Repair
parts

7. (1) Notwithstanding anything contained in the agreement, every sale agreement of a new farm implement shall be deemed to contain a warranty that a sufficient supply of repair parts for the implement will be made available by the vendor for a period of 10 years from the date of the agreement.

(2) Repair parts shall be made available to the purchaser within a reasonable length of time after a request therefor is made to the vendor but the vendor is not responsible for any delay in delivering a required part that is due to circumstances beyond his control.

Time limit
on war-
ranties

8. Where a sale agreement of a new farm implement sets a time limit on the duration of any warranty given therein, that time shall be deemed to run from the date the implement is first used within the first normal season of use by the purchaser for its intended purpose and not from any earlier date, notwithstanding anything contained in the sale agreement.

Waiver
prohibited

9. (1) Any statement in a sale agreement, order, security instrument or statement of warranties made, taken or given in connection with the sale of a farm implement to the effect that the liability of the vendor as provided in this Act is limited or modified in any way is void.

(2) Subsection (1) does not apply to any statement in so far as it

(a) limits the duration of any warranty, or

(b) limits the liability of the vendor or dealer for consequential damages arising out of a breach of warranty,

if the limitation is clearly set out in the document setting out the warranty.

Chap. 20

FARM IMPLEMENT

1967

(3) Subsection (1) does not affect the validity of the remaining provisions of the agreement, order, instrument or statement.

Effective
date of sale
agreement

10. A person who signs an agreement to purchase a farm implement is not bound by the agreement until

- (a) the agreement is signed by the vendor or his dealer or by a representative authorized to bind the vendor or dealer, or
- (b) he has taken delivery of the machine under the agreement,

whichever first occurs.

Copies of
agreements

11. A vendor or his dealer shall

- (a) keep a copy of every sale agreement of a farm implement entered into by him for at least two years, and
- (b) upon the request of an inspector, produce the copy and allow the inspector to make copies thereof.

Inspection of
vendors'
repair parts

12. An inspector may inspect the stock of repair parts maintained in Alberta by vendors and their dealers and for that purpose every vendor and every dealer shall give an inspector admission and free access to his premises during usual business hours.

Return of
defective
part

13. Any defective part of a farm implement for which the purchaser claims a replacement under a warranty shall be returned within 30 days after the failure

- (a) to the dealer at the address stated in the sale agreement, or
- (b) if no address is stated therein, to the vendor or nearest dealer of the vendor,

and if a defective part is returned to the vendor or to a dealer, who was not the dealer who sold the implement to the purchaser, the part shall be accompanied by a written statement containing sufficient particulars of the sale transaction to enable the vendor or dealer to reasonably identify the transaction.

Breach of
warranty

14. (1) The vendor of a farm implement and the dealer who sold it to the purchaser are liable to the purchaser for a breach of any of the warranties mentioned in sections 5 and 7 and the purchaser may maintain an action against any one or both of them for the breach.

(2) In any action commenced by a purchaser pursuant to this section, the party against whom the action is brought may as a matter of right add as third parties all persons involved, including the dealer or the vendor and any party to whom any note given in connection with the sale of the

1967

FARM IMPLEMENT

Chap. 20

farm implement, or the moneys payable thereunder, has been assigned or delivered, to the end that the rights of all parties may be determined, including any or all counter-claims of the parties against the purchaser.

Arbitration
of dispute

15. (1) Any dispute between a purchaser and a vendor or dealer, or both, with respect to any obligation imposed on the vendor or dealer by this Act may, at the option of either party, be submitted to two arbitrators for arbitration under *The Arbitration Act* instead of being settled by action.

(2) Without restricting any other remedies available to a purchaser, an inspector may, on the request of a purchaser, inquire into and attempt to resolve any dispute between the purchaser and a vendor or dealer, or both, with respect to any obligation imposed upon the vendor or dealer by this Act.

Information
to Minister
of Agriculture

16. Upon the request of the Minister of Agriculture, any vendor selling or offering for sale farm implements in Alberta shall provide the Minister with

- (a) lists of all types of farm implements offered for sale,
- (b) lists by category or group of parts maintained in stock by them in Alberta,
- (c) a statement or true copy of the current published suggested retail prices for those implements and parts, and
- (d) copies of specific sale agreements of farm implements.

Administra-
tion of
Act

17. (1) The Minister of Agriculture is charged with the administration of this Act.

(2) Subject to *The Public Service Act, 1962* there may be appointed such inspectors and other employees as are required for the administration of this Act.

Offence
and penalty

18. A person who contravenes this Act is guilty of an offence and liable on summary conviction to a fine of not more than \$100.

Regulations

19. The Lieutenant Governor in Council may make regulations to give effect to the purposes of this Act,

- (a) governing the form of sale agreements of farm implements,
- (b) governing the contents of sale agreements of farm implements, and
- (c) respecting any other matter necessary for carrying out this Act according to its intent.

Repeal

20. *The Farm Machinery Act*, being chapter 110 of the Revised Statutes is repealed.

Coming
into force

21. This Act comes into force on the first day of November, 1967.

Chapter 31

POSTWAR CHANGES IN PRICES AND COSTS

This chapter examines the postwar increase in the price of farm machinery and parts. It assesses this against the background of changes in wage costs, prices of raw materials, and productivity experienced by the industry. Comparisons are made with the experience of other industries and with data from other countries.

Accurate measurement of the change in the price of a modern farm machine over any extended period of time is extremely difficult. Farm machines have steadily become more complex and sophisticated. The average size of tractor sold in Canada has increased from around 19 HP at the end of the war to about 63 HP today. On the Prairies the corresponding increase has been from less than 20 HP to over 83 HP. In addition, the tractor, which in 1945 was often little more than an engine, four wheels, a transmission, and a simple hitch, has had hydraulics added, now normally includes the three-point hitch and may have more complex weight-transfer devices. It has changed from predominantly gasoline-powered to diesel engine models, and often has power steering, an automatic transmission, and other improvements. Similar but less extreme changes have occurred for many other farm machines. Yet the price index which measures the change in price over time must somehow comprehend and incorporate these differences. In the main, the method used in conventional price indexes is to measure price changes for essentially identical machines a few years at a time, linking these changes together over longer periods. When a new machine appears, incorporating a new feature such as hydraulics, the new feature will often be optional in the first few years. Thus, a price for the machine without the new feature can be obtained for comparison with an identical machine in the previous year. After a few years, the new option may become standard equipment. Comparison then can be made for a machine incorporating the new feature in adjacent years. Thus, a continuous measure of price change over time in what is essentially an identical machine can be maintained. If a major model change occurs, price comparison becomes more difficult. Here the company may be asked to estimate the price at which the new model would have sold if it had been available in the previous year. Or the price increase may be estimated on the basis of the change for companies that did not make a model change in that year. Thus, in principle, an attempt is being made to

measure what is in some sense the pure price increase—that is, the price change that does not incorporate any change in quality. The result is at best a rather rough approximation.

It is also clear that the official price indexes do not attempt to measure many changes that may add significantly to the value of a machine to a farmer. Improvements in metallurgy, better lubrication methods, or improvement in air filters, may increase the durability and effective life of a tractor. The Dominion Bureau of Statistics does not have staff available to evaluate such changes, and in fact does not attempt to measure quality changes of this kind. The addition of sealed bearings to a combine may reduce the time the farmer must spend lubricating his machine, and thus extend the effective length of his working day during the harvest season, so that the capacity of his combine is increased. Self-propelled machines may reduce the grain lost in opening up fields. Many other examples could be given. The Commission had hoped to measure the effects of these improvements for a number of basic machines. Unfortunately, the research it initiated in this area did not yield results that could be published. Thus, while there can be little doubt that important improvements have been made in almost all the machinery used by farmers, it is not possible for the Commission to provide a quantitative measure of how large these improvements have been.

In brief, official price indexes set out to measure a complement of machinery of constant quality. Because machines are constantly changing it is difficult in practice to isolate with accuracy the pure price change. Both improvements and deterioration in quality may go unmeasured. Overall, it is the Commission's view that there has been a substantial but not easily quantifiable improvement in quality.

In theory, it would be possible to measure the change in prices of farm machinery in an even more fundamental sense. An attempt could be made to measure the cost of performing certain farm operations on the assumption that non-machinery technology—such as the varieties of seed, use of fertilizer, and farming methods—had been kept fixed. Such a measure would include the effects of the change from a binder-thresher method of grain harvesting to combining, the substitution of the tractor for the horse, the change from small unsophisticated tractors to the large complex machines in use today, the substitution of the forage harvester for the mower and dump rake, and many other changes. A very substantial part of the contribution made by advances in farm machine technology has taken the form of the substitution of new machines for old. A price index that measures the change in the prices of a given number of machines of constant quality leaves this type of improvement entirely to one side.

While no attempt has been made to measure the effects on farm cost of this type of change, a rough indication of its importance is provided by Table 31.1, showing the change in man-hour requirements for a number of crop and livestock products in the United States over the period since 1910-14. The data are shown in terms of man-hours required per acre or per unit of livestock in terms of numbers. While not all of this reduction in man-hour requirements is due to improved

TABLE 31.1—MAN-HOURS REQUIRED PER ACRE OR PER UNIT OF LIVESTOCK,
SELECTED CROPS AND LIVESTOCK, UNITED STATES,
SELECTED PERIODS, 1910-14 TO 1963-67

	1910-14	1925-29	1935-39	1945-49	1955-59	1963-67
Man-hours per acre						
Wheat	15.2	10.5	8.8	5.7	3.8	2.9
Corn for grain	35.2	30.3	28.1	19.2	9.9	6.1
Hay	11.9	12.0	11.3	8.4	6.0	5.5
Potatoes	76.0	73.1	69.7	68.5	53.1	45.9
Sugar beets	128.0	109.0	98.0	85.0	51.0	35.0
Soybeans	—	15.9	11.8	8.0	5.2	4.8
Milk cows:						
Man-hours per cow	146	145	148	129	109	84
Chickens: laying flocks						
Man-hours per 100 layers	—	218	221	240	175	107
Chickens: broilers						
Man-hours per 100 birds	—	32	30	29	23	14

Source: U.S. Department of Agriculture, *Agricultural Statistics*, 1968, Tables 665 and 666.

machinery, advances in machinery technology are undoubtedly the source of a major part of it.

The reduction in man-hours required for grains is particularly striking. By 1963-67, wheat was being produced in the United States with an expenditure of less than 3 man-hours per acre compared with over 15 in 1910-14. In the production of corn for grain, the decline has been even more dramatic, from 35 man-hours per acre in 1910-14 to 6.1 in 1963-67. Significant but smaller declines are shown for soybeans, hay, potatoes, and sugar beets. For livestock products, the declines are generally smaller but still substantial. For broilers and laying flocks, the man-hour requirements have fallen to about one-half their level in 1925-29 and for milk cows the decline has been around 40 per cent. It can be assumed that similar changes have occurred in Canada, for the farm machinery in use in the two countries has been broadly comparable.

Official Price Indexes of Farm Machinery

Prices of farm machinery may be measured at a number of different transaction levels. One of the most widely used for index purposes is the *suggested retail list price*, the price which usually appears in the price lists issued by the companies. List prices are used in the farm machinery component of Dominion Bureau of Statistics *Price Index Numbers of Commodities and Services Used by Farmers*. The list price is normally the starting point for bargaining between the farmer and the dealer. In fact, the farmer usually buys at a discount below this price. No direct information is available on the change over time in the prices actually paid by farmers. In fact, the price paid by farmers is extremely difficult to measure because many sales involve trade-ins and the value of any given trade-in is a

matter of judgement. Some approximation of the extent to which dealers actually sell below the list price can be obtained from dealer operating statements which provide information on the margin obtained on their sales of new and used equipment. Such an estimate is given below.

Another price level is the *net wholesale or dealer price*. This is the price the company charges the dealer after various allowances. The price to the dealer is normally quoted in the form of a discount from the list price. In addition, the dealer usually receives an allowance based on the volume of his sales. He may also

TABLE 31.2—DEALER TRADE DISCOUNTS ON FARM MACHINERY (BEFORE VOLUME BONUSES), MAJOR COMPANIES, CANADA, 1948-68

		Percentage Discount	
Allis-Chalmers	1955-60	20 (25 on engines and power units)	
	1960-68	20, 23, 26 (depending on kind of machine-use, 23 for combines and tractors)	
J. I. Case	1948-58	18.8 (average)	
	1959-68	23 (average)	
John Deere	1948-55	16	
	1956-63	20	
	1964-68	23	
Ford	1948-53	20	
	1954-55	25	
	1956-59	20	
	1960-68	20	
International Harvester	1948-59	20	
	1960-68	22	
Massey-Ferguson	1950-51	15	
	1952	16	
	1953-57	17.5	
	1958-68	23	
Oliver, Cockshutt		West	East
	1962	23	23
	1963	20	23
	1964	20	23
	1965	20	23
	1966	20	23
Presently 23% in both East and West.			

Source: Royal Commission on Farm Machinery, Questionnaire #2, re: Distribution Policies and Operations.

receive an added discount for prompt payment. At the present time the price to the dealer averages about 27 per cent below list price, made up of a trade discount of 23 per cent and a volume bonus of around 4 per cent. However, the exact discount allowed varies from company to company and has changed over time. Some information on current discounts and their changes over the postwar period for a number of major companies is given in Table 31.2. There are no price indexes for Canada which show the change in the net dealer price over time. However, the U.S. wholesale price index of farm machinery is essentially a net dealer price index.

Still another level at which price can be measured is the *net selling price at the factory*. Many companies ship farm machinery from the factory to the companies' own branch warehouses or in some instances directly to the dealer. Since this involves a transfer of the machine from one division of the company to another, it is not an arm's length transaction, and thus is not in any sense a market price. Where the machine crosses the Canadian border either as an export or import, the price established will affect the division of company profit between Canada and the other country, and thus the price will be of potential interest to the Department of National Revenue. However, as has been shown elsewhere in this Report, the basis on which transfer prices are set seems to vary substantially from company to company and appears to be fairly arbitrary. The farm machinery component of the Canadian publication *Industry Selling Price Indexes* is apparently a transfer-price index.

In brief, published price indexes in Canada and the United States record either suggested retail list prices, net wholesale prices—that is, the price to the dealer—or industry transfer prices. None of these record the price the farmer actually pays. A Canada-U.S. comparison of price changes since the end of the Second World War shows the following results:

<u>Canada</u>			<u>United States</u>		
<u>List Price to Farmer</u>	<u>Industry Selling Price Index</u>		<u>List Price to Farmer</u>	<u>Net Wholesale Price</u>	
(1945=100)	(1956=100)		(1945=100)	(1945=100)	(1956=100)
1945	100		100	100	
1949	138		153	149	
1952	170		175	167	
1956	181	100	185	175	100
1967	262	123	262	233	133

Although not fully comparable, the two official indexes of the list price to the farmer show about the same increase in both Canada and the United States over the postwar period. The index for 1967 in both countries (on a base of 1945

equalling 100) is at the same level, 262. In both 1945 and 1967, the Canadian dollar was at a substantial discount to the U.S. dollar, the official exchange rate being \$1 U.S. equal to \$1.10 Canadian in 1945 and \$1.08 Canadian in 1967. The U.S. index, a component of the index of prices paid by farmers, is based on a survey of dealers who are asked to quote prices on farm machines typically bought by farmers in that area. Because the machines are not precisely specified from year to year, it is believed that the index may overstate the price rise from machines of constant specifications. Over time, farmers have begun to buy machines with more options and special features. The prices are generally believed to be suggested list prices, but even this is not known for sure. The Canadian index of the price of farm machinery to the farmer is a component of the *DBS Price Index Numbers of Commodities and Services Used by Farmers*. Until very recently it has been explicitly an index of the list price of a fixed complement of machinery of constant specifications. When machines change, an attempt is made to identify the change in quality arising from the addition of new options or special features. However, the index is based on prices supplied directly by the farm machinery companies, and data are collected from only two companies.

Evidence available from surveys of dealer operating margins shows that, on the average, farm machinery now sells at about 15 per cent below list price, whereas immediately after the war it sold at list price or at some premium over list price. If the official index for the price to the farmer in Canada is adjusted for this difference in dealer operating results, the following results are obtained:

	Dealer Margin on New and Used Equipment as Percentage of New Only	Farm Price as Percentage of List ¹	List Price to Farmer	Price to Farmer Adjusted for Dealer Discounts
1945	21.8 ²	102	100	100
1949	19.9	100	138	135
1952	17.4	97	170	162
1956	16.0	95	181	169
1967	10.8	85	262	218

¹ Estimated on the assumption that the dealer trade discount was about 20 per cent from 1945 to 1956 and 23 per cent in 1967.

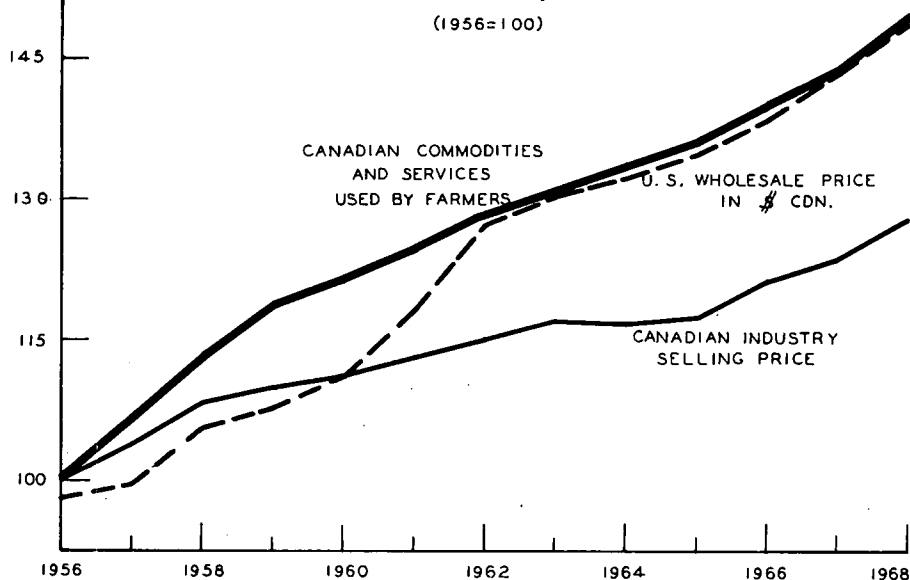
² Data are for 1947. Data for all years are taken from *Cost of Doing Business Study*, National Farm & Power Equipment Dealers Association (St. Louis, Mo.), annual publication.

As the data in the last two columns show, after allowance for the smaller margin taken by the dealer, the increase in the official index of farm machinery prices in Canada over the period from 1945-67 is reduced from 162 per cent to 118 per cent. An increase of 118 per cent is much more in line with the increase over the same period of 133 per cent shown by the U.S. wholesale price index. This latter index is an index of the conventional type, which attempts to measure the change in price of a complement of machinery of constant specifications. New

machines are added to the complement from time to time and old ones are dropped, but this change in components is not allowed to influence the measure of price change. No equivalent wholesale price index is available for Canada.

For the period since 1956, DBS has published an industry selling price index for farm machinery which measures the net price of machinery at the factory. A comparison of this index with the U.S. wholesale price index of farm machinery and equipment, converted to Canadian dollars at official exchange rates, reveals a substantial disparity in the behaviour of the two indexes (see Figure 31.1). Further, this difference cannot be attributed to a difference in the composition of the two indexes. The Canadian index includes only machinery manufactured in Canada and, for this reason, excludes tractors. Tractors have a weight equal to about 35 per cent of the U.S. *Wholesale Prices and Price Indexes* of agricultural machinery and equipment. However, the price rise shown by tractors and other agricultural machinery has been very similar. The price rise from 1956-67 for tractors was 35.9 per cent, and for other agricultural machinery 36.2 per cent. The difference between the two indexes must be due mainly to the fact that one is an index of somewhat arbitrary transfer prices which have no market implications, whereas the other represents prices at which machines are sold in the market to dealers. It will be noted in Figure 31.1 that following the devaluation of the Canadian dollar in 1961 and 1962, the U.S. wholesale price index in Canadian dollars paralleled very closely the Canadian index of the price to the farmer.

FIGURE 31.1-COMPARISON OF FARM MACHINERY
PRICE INDEXES, CANADA AND THE
UNITED STATES, 1956-68



The divergence between these two indexes over the period since 1956 is quite substantial, as the following comparison shows:

	<u>Canadian Dollars</u>	<u>U.S. Dollars</u>
	(1956 = 100)	
U.S. wholesale price index	146.2	133.0
Canadian industry selling price index	123.5	112.8

Thus, whether the comparison is made in Canadian or U.S. dollars, the increase in the U.S. wholesale price index of agricultural machinery and equipment has been two or more times as large as the increase shown by the Canada industry selling price index of agricultural machinery. Since a large part of Canadian production is exported, much of this difference must simply reflect the basis on which the Canadian companies choose to determine transfer prices to their U.S. associated companies.

The Postwar Rise in Tractor and Combine Prices

The U.S. *Wholesale Prices and Price Indexes* of farm and garden tractors increased by about one-third from 1947-56, and by a further 42 per cent from 1956-68. Converted to Canadian dollars at official rates of exchange, this implies a rise of about 30 per cent in Canada from 1947-56 and a further increase of 53 per cent since 1956. The indexes are as follows:

	<u>U.S. Wholesale Price Index of Farm and Garden Tractors</u>	
	<u>Canadian Dollars</u>	<u>U.S. Dollars</u>
1947	77	76
1956	100	100
1968	153	142

In order to provide more detailed information on the recent rise in tractor prices, the Commission estimated changes in tractor prices by major horsepower groups for substantially identical tractors over the period from 1956-68. Since many of the tractor models included in the index changed moderately in horsepower size over the period of the index, prices are shown in terms of price per power take-off horsepower. Where options included in later years were not available in earlier years, the cost of the option in the first year was used for these earlier years. The results for each of the seven size classes of tractors are shown in Table 31.3. An index of all groups, giving each horsepower class equal weight, shows a price increase of just over 34 per cent from 1961-68.

For combines, no convenient standard specification or division among size classes was available. Accordingly, a representative group of eight different combine models sold in 1969 was identified and traced back through company specifications and price data year by year until the introduction of the model in question. At that

TABLE 31.3.—TRACTOR PRICE INDEXES DEVELOPED BY THE COMMISSION FROM COMPANY PRICE LISTS,¹ 1956-68

(1961 = 100)

	1956	1961	1962	1963	1964	1965	1966	1967	1968
Group I (6 models, 4 companies) (30-45 PTO HP)	79.09	100.0	102.91	107.67	109.65	112.72	113.74	116.41	123.72
Group II (4 models, 3 companies) (45-60 PTO HP)	86.85	100.0	106.76	109.28	114.37	115.63	119.15	122.81	130.19
Group III (4 models, 4 companies) (60-75 PTO HP)	85.32	100.0	117.46	119.67	121.19	125.78	126.11	128.20	135.22
Group IV (2 models, 2 companies) (75-90 PTO HP)		100.0	108.14	106.50	112.51	114.34	116.67	121.97	124.98
Group V (4 models, 4 companies) (90-100 PTO HP)		100.0	113.61	120.98	124.18	127.03	129.32	133.93	135.84
Group VI (2 models, 2 companies) (100-115 PTO HP)							124.68 ²	139.23	141.76
Group VII (2 models, 2 companies) (Over 115 PTO HP)				112.82 ²	128.64	132.42	143.09	142.13	146.89
All tractors—									
Equal weights	83.75	100.0	109.77	112.82	118.42	121.32	124.68	129.24	134.09
1968 weights ³	83.51	100.0	108.63	112.31	116.06	118.81	121.09	124.83	130.85

¹ Twenty-four tractor models in all. Actual company price lists for up to four leading companies (1967) in each group used 1966-68; other years, National Farm & Power Equipment Dealers' Association, *Official Tractor and Farm Equipment Guide* (St. Louis, Mo.), various years.

² Entered at average of other tractor groups in year.

³ Indexes for new entrants also weighted at 1968 weight factors.

point, a predecessor model having the same or similar specifications for cylinder size, separation area, and cleaning area was selected and the series carried back using this predecessor model. Ancillary specifications such as type of table lift, size of table, form of hydraulics, and tire size were kept constant over the period analyzed. The results of this analysis for each combine model studied and an average for the eight models are shown in Table 31.4.

A comparison of the tractor and combine price indexes prepared by the Commission with other available price indexes for tractors and combines is provided in Table 31.5. These other indexes include price indexes for tractors and combines prepared from company price data supplied to the Dominion Bureau of Statistics as a basis for constructing their index of farm machinery prices (as a component of the index of commodities and services used by farmers), indexes based on a survey of farm machinery dealers hitherto unpublished and, for combines only, the industry selling prices sub-index. The official U.S. wholesale price indexes for tractors and combines are also shown. In general, the Commission's indexes show a significantly larger price rise for tractors and combines than that recorded by the data supplied by two companies to DBS. The Commission indexes also rise more than those recorded in the survey of dealers. However, these latter indexes include the effects of allowances off list prices, whereas the Commission's data are for official list price. Thus these two sets of index numbers are not fully comparable. For combines the price recorded in the Commission's index is very much larger than that recorded in the industry selling price index. As was pointed out earlier in this chapter, for farm machinery the latter is predominantly a price at which machines are transferred from one division to another of the same company. As such, the prices have rather limited significance.

The much greater rise shown by the Commission's price indexes for tractors and combines than that shown by data supplied to DBS by the farm machinery companies underlines the need to strengthen the basis of the official indexes and make them less dependent on data supplied by so few companies. The Commission has already discussed this matter with officials of the Dominion Bureau of Statistics.

Except for the dealer indexes all of these prices are suggested retail list prices. The prices actually paid by farmers in 1968 are believed to be about 15 per cent or more below this. In contrast, in 1956 the price paid by farmers was about 95 per cent of the list price. Allowance for this decline in the dealer's margin reduces the increase from 1956-68 in the average price of all tractors from 60 per cent to 43 per cent, and the increase over the same period in the average price of combines from 73 per cent to 55 per cent.

In terms of 1961 prices equalling 100, the index of prices adjusted for changes in dealer margins for 1968 would be 126.6 for tractors and 138.8 for combines. Although these two numbers are somewhat closer to the DBS indexes of 122.5 and 123.6 for these two products, it must be recognized that this result is

TABLE 31.4—COMBINE PRICE INDEXES DEVELOPED BY COMMISSION FROM COMPANY PRICE LISTS FOR EIGHT COMBINE MODELS
(1961 = 100)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Model 1	76.24	81.86	87.45	94.95	97.22	100.00	107.61	109.74	119.84	123.82	128.55	123.36	133.54	143.39
Model 2						100.00	103.32	106.59	108.54	112.02	114.30	131.39	138.32	149.46
Model 3									117.05 ¹	120.47	122.22	117.88	127.42	136.64
Model 4									117.05 ¹	119.61	119.61	136.12	142.16	147.40
Model 5	82.63	86.59	91.13	94.54	100.00	100.00	109.51	112.22	118.29	122.46	126.57	131.79	138.87	145.91
Model 6			92.26 ¹	95.89	100.00	100.00	109.67	112.90	119.72	124.44	128.61	135.10	146.13	150.90
Model 7				95.86 ¹	95.86	100.00	113.77	117.70	119.87	128.16	133.96	139.49	148.90	148.90
Model 8							108.78 ¹	112.46	116.03	123.75	126.05	130.59	130.59	150.21
All combines	79.43	84.23	90.28	95.31	98.27	100.00	108.27	111.94	117.05	121.84	124.98	130.71	138.24	146.60

¹ Entered at average of other combines in year.

TABLE 31.5—COMPARISON OF FARM MACHINERY INDEXES: DOMINION BUREAU OF STATISTICS, U.S. BUREAU OF LABOR STATISTICS, AND INDEXES DEVELOPED BY COMMISSION FROM COMPANY PRICE LISTS
(1961 = 100)

	Tractors				Combines			
	DBS		U.S. Bureau of Labor Statistics		Commission from Company Price Lists		U.S. Bureau of Labor Statistics	
	Company Prices	Dealers' Survey	Annual Average	Commission from Company Price Lists	Company Prices	Dealers' Survey	Annual Average ³	Commission from Company Price Lists
	(Weighted)			(Equal weights)	(Weighted)			(Eight models)
1956	77.0	n.a.	82.5	83.75	84.4	n.a.	82.7	80.25
1957	85.1	n.a.	84.4	n.a.	85.0	n.a.	84.0	85.09
1958	88.1	90.2	89.0	n.a.	92.7	91.4	90.1	90.21
1959	93.2	93.8	91.6	n.a.	96.9	95.4	91.4	95.07
1960	96.3	96.0	94.3	n.a.	99.7	97.8	95.0	95.07
1961	100.0	100.0	100.0	100.00	100.0	100.0	100.0	100.00
1962	102.6	104.8	108.5	109.77	104.1	105.6	107.4	108.95
1963	104.8	109.4	111.4	112.82	108.1	109.1	110.2	112.10
1964	107.3	113.8	113.4	108.42	108.7	112.8	112.6	117.49
1965	108.3	117.9	116.4	121.32	110.5	117.2	117.0	119.48
1966	111.2	123.0	120.1	124.68	115.0	122.2	121.1	125.43
1967	116.9	127.1	122.9	129.24	119.7	125.2	126.2	131.19
1968	122.5	130.3	127.6	134.09	123.6	128.6	132.7	138.72
1969			133.7				135.2	147.15

¹ Index obtained from unweighted averages of four tractor HP sizes (01-04) reported 1956-60 and continuation of three highest classes plus addition of diesel tractor class (05) 1961-66. Average Index thus obtained converted to Canadian dollars at Bank of Canada average noon rates for the year.

² Industry Selling Price Index.

³ Data provided by U.S. Bureau of Labor Statistics, converted to Canadian dollars at Bank of Canada average noon rates for the year.

entirely fortuitous. The latter indexes are intended to show changes in suggested retail prices rather than changes in the prices actually paid by the farmer.

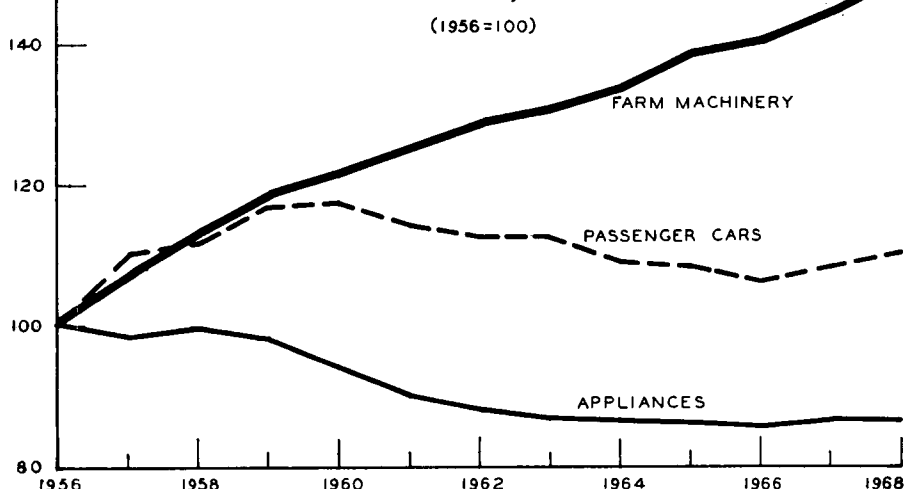
Finally, it should be noted that the price indexes for combines and tractors prepared by the Commission from company price lists are taken from price lists that appear late in the year. They measure prices that normally apply to the following selling season.

Comparison of Price Changes for Farm Machinery and for Other Durables

Farm machinery prices have increased a great deal more in recent years than the prices of other durable commodities which make use of similar materials and whose producers have experienced roughly similar rates of wage increase. As Figure 31.2 shows, the retail price of passenger cars rose only about 10 per cent between 1956-68. In the same period appliance prices declined about 14 per cent. In contrast, for farm machinery the official index of prices to the farmer increased by almost 50 per cent. Even when allowance is made for the fact that dealer margins declined during this period, the adjusted index still shows a rise of about 34 per cent for farm machinery.

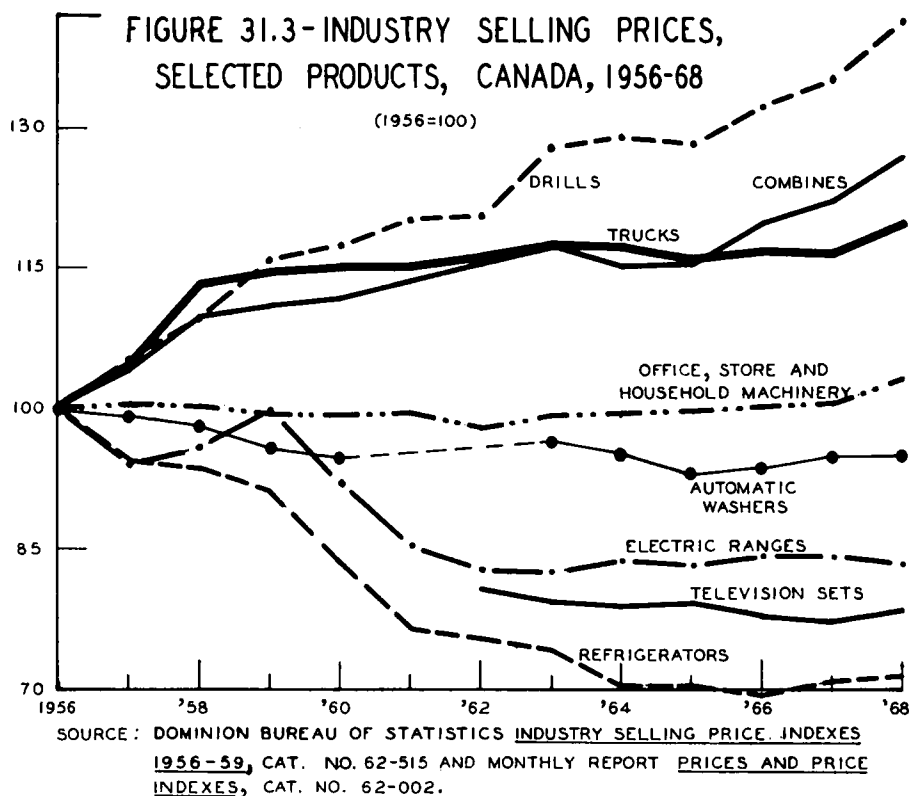
The same pattern also emerges from an examination of the industry selling prices of some of the major products produced by these industries (see Figure

FIGURE 31.2-COMPARISON OF INDEX PRICES TO FINAL BUYER, FARM MACHINERY, APPLIANCES, AND PASSENGER CARS, CANADA, 1956-68



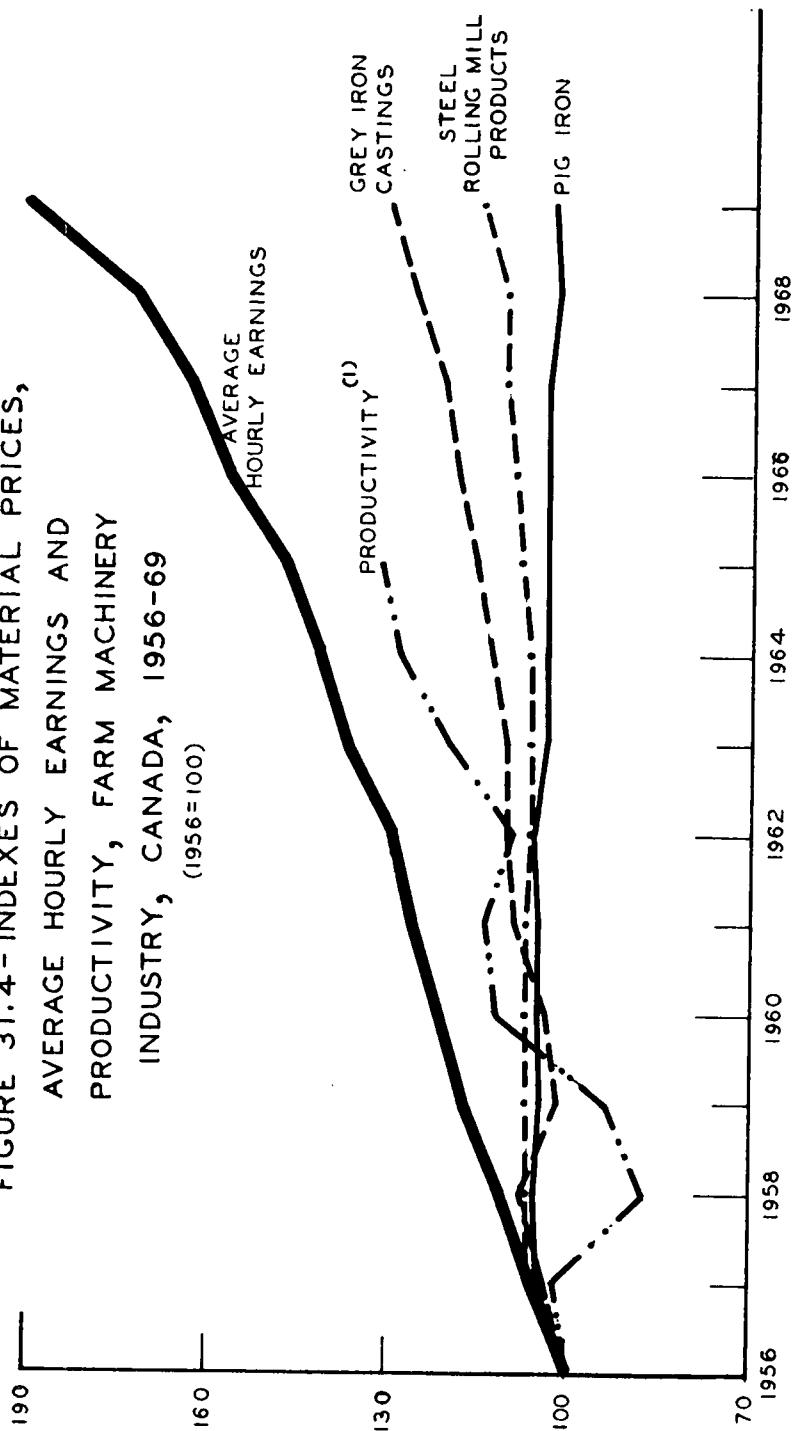
NOTE: FARM MACHINERY PRICES ARE LIST PRICES AS SHOWN BY INDEX OF COMMODITIES AND SERVICES USED BY FARMERS. PASSENGER CARS AND APPLIANCES PRICES ARE AS REPORTED IN DOMINION BUREAU OF STATISTICS, PRICES AND PRICE INDEXES, 1956-68.

31.3). Television sets, domestic refrigerators, electric ranges, and automatic washers, all declined in price by amounts ranging from 5 to 28.5 per cent between 1956-68. Office, store, and household machinery increased by about 3 per cent, and trucks by some 20 per cent. In the same period the price of combines increased 27 per cent and the price of drills 41.6 per cent.



The cost situation faced by farm machinery manufacturers is illustrated in Figure 31.4. The industry had to absorb an increase in the average hourly earnings paid to production workers of 91 per cent between 1956-69. On the other hand, the increase in the price of some of the industry's basic materials has been very modest. Steel rolling-mill products increased only 15 per cent between 1956-69, and pig iron by only 3 per cent. Significantly larger than this has been the increase in price shown by grey iron castings, almost 31 per cent. Offsetting these cost increases in part has been a substantial rise in productivity. Estimates prepared for the Commission indicate that value added per man-hour paid in the industry, measured in constant dollars, increased by about 32 per cent between 1956-66. However, this estimate must be treated with considerable caution. Industry sales were depressed in the mid-fifties, and the industry's productivity in 1956 was apparently below its level a few years earlier.

FIGURE 31.4-INDEXES OF MATERIAL PRICES,
AVERAGE HOURLY EARNINGS AND
PRODUCTIVITY, FARM MACHINERY
INDUSTRY, CANADA, 1956-69
(1956=100)



(1) VALUE ADDED IN CONSTANT DOLLARS PER MANHOUR PAID.

SOURCE: DOMINION BUREAU OF STATISTICS, INDUSTRY SELLING PRICE INDEXES 1956-59,

CAT. NO. 62-515, AND MONTHLY REPORT PRICES AND PRICE INDEXES, CAT. NO. 62-002.

Having examined this evidence, the question can be raised as to why the prices of the farm machinery industry's products should have increased by so much more than the prices of passenger cars, major appliances, and similar products. Many of the industry's products have become immensely more complicated with the introduction of hydraulics, advanced types of transmissions, diesel engines, sensing mechanisms, and power steering. Similar but less complicated changes have occurred in passenger cars.

A major difference between farm machinery and passenger cars and other similar products is the volume of output available to the manufacturer. As farms get larger, they get fewer in number. These fewer but larger farms require larger machines, but the annual *number* of tractors and other products purchased has been declining. In recent years the North American automobile industry has produced around 8 or 9 million passenger cars. In contrast, total output of farm and industrial wheeled tractors in North America in recent years has been under 250,000. General Motors has an annual output of cars in excess of 5 million. Massey-Ferguson, the world's largest producer of tractors, had an annual output in 1966 of 154,000 units. And while automobile output has been increasing in volume, output of tractors and many other farm machines has been declining. Between 1953-67, output of tractors in North America fell from 390,000 to 242,000. Thus, unlike the automobile industry which has had available to it the economies of scale that go with large-scale output, the farm machinery industry has had to adjust to declining volume. While there is no firm evidence on this question, it seems highly probable that this factor has made it difficult for the farm machinery industry to achieve the same rate of productivity growth as has been possible in the automobile and other industries.

To some degree the industry has tried to adjust to this squeeze, between rising wages and material prices and declining volume, by moving to rationalize their operations more fully on an international basis. The changes that Ford and Massey-Ferguson have made in respect to their tractor operations were described in previous chapters. It seems likely that the industry will see further moves in this direction in the years ahead. Thus, for major products such as tractors and combines, the recent trend towards fewer and larger firms, rationalizing their manufacturing operations on a worldwide basis, is likely to continue.

Prices of Farm Machinery Parts

No official data have been available on the prices of farm machinery parts. To obtain information on what has been happening in this area, it was necessary for the Commission to prepare its own index of parts prices. Unfortunately, data limitations made it necessary to limit this index to the period from 1963-67. In addition, one company was able to supply an index of its own parts prices back to 1959. For three major companies the index was based on a sample of 200 parts, selected to represent both slow- and fast-moving parts. For the fourth company, the company's own index based on complete coverage was used. The breakdown of the sample by different sales volume of parts is given for one company in Table

31.7. An industry index for the period 1963-67 was prepared by weighting the parts-price index of each individual company by the dollar value of its parts sales in 1966. The resulting index and the sub-indexes for each company are given in Table 31.6.

TABLE 31.6—INDEX OF FARM MACHINERY PARTS PRICES, FOUR MAJOR COMPANIES, CANADA, 1963-67
(1963 = 100)

	A	B	C	D	Weighted Index
1963	100.0	100.0	100.0	100.0	100.0
1964	102.7	103.3	100.0	102.2	101.6
1965	98.4	104.3	103.9	105.4	103.8
1966	103.1	103.3	117.4	108.5	110.5
1967	110.0	106.0	125.3	112.3	116.0

Note: Company D also supplied an index covering the years 1959-63 as follows: 1959, 86.6; 1960, 89.1; 1961, 91.8; 1962, 97.0; 1963, 100.0.

TABLE 31.7—SAMPLE SELECTION PROCEDURE FOR FARM MACHINERY PARTS PRICES

Group	Unit Sales Volume	Quantity of Part Numbers in Groups	Percentage of Dollars Sales	Size of Sample (Part Numbers)	Sampling Ratio
1	5,000 and over	885	24.7	32	1/28
2	3,000 to 4,999	606	9.2	11	1/55
3	1,000 to 2,999	2,300	17.1	34	1/68
4	500 to 999	2,595	12.1	25	1/104
5	300 to 499	2,429	7.7	17	1/143
6	100 to 299	7,675	14.1	51	1/150
7	1 to 99	53,830	15.3	30	1/1,794

Source: Data show sampling method as applied to one responding company.

The weighted index of four companies shows an increase in parts prices of 16 per cent between 1963-67. This is appreciably more than the 10.4 per cent increase during this period registered for the list price of farm machinery. However, there was a marked variation in the price increase reported for the four different companies. Thus, for three companies, A, B, and D, the increase over this period ranged from 6 to 12.3 per cent. The fourth company, C, reported a price rise of 25.3 per cent, more than twice as much as for any other single company. This company claimed that some of its price increase reflected the delayed effects of the devaluation of the Canadian dollar. Almost all of this change occurred between 1965-67, and it affected both slow- and fast-moving parts. However, prices of the fastest-moving parts, those in Group 1 (Table 31.7) which would be subject to the

most competition from the "well-fit" manufacturers, increased by only 13 per cent, or by less than half the amount recorded for most other groups.

The one company that reported changes in its parts prices over the longer period from 1959-67 registered a 30 per cent rise in its parts prices over this period. This compares with a 22 per cent rise in the price of farm machinery over this period. Thus, for both the shorter period from 1963-67 and the longer period from 1959-67, there is evidence that prices of farm machinery parts have risen by more than the prices of new machinery.

It is recommended that the Dominion Bureau of Statistics take over and publish on a regular basis the parts price index that was initiated by the Commission.

Any explanation as to why the prices of parts have risen more in recent years than the prices of finished machines must be to some degree speculative. According to Massey-Ferguson, non-competitive parts—those that fit Massey-Ferguson machines only—are priced by establishing a list price of about three times factory cost.¹ This price may be varied if the pricing specialist deems it out of line with the price of other similar parts. On competitive parts, consideration is also given to the price at which the part may be obtained from other suppliers.

An analysis of the price increase in parts from 1963-67 provides some evidence that the slower-moving parts have increased more in price than the faster-moving parts. However, this pattern is not completely uniform. The data, ranked in order from fast- to slow-moving parts, are as follows for an unweighted average of the price increase reported by three major companies:

	<u>Per cent</u>		<u>Per cent</u>
Group 1	9	Group 5	11
" 2	11	" 6	15
" 3	13	" 7	19
" 4	18	All groups	14

Thus, the two fastest-moving groups, namely 1 and 2, showed price increases of 9 and 11 per cent, whereas the two slowest-moving groups, 6 and 7, registered increases of 15 and 19 per cent. Since the slower-moving groups presumably contain a good many parts for older machines, there must have been a systematic repricing for many of these parts. A number of companies reported that it costs them about 15 per cent of the value of a stock of parts to carry them for one year. This includes the interest cost on the money invested, the cost of warehousing, and the cost of tagging, cleaning, and oiling parts. Thus, for the slower-moving parts which are manufactured only every few years, or where lifetime requirements for a part are manufactured at one time, there would be a gradual increase in cost over a period of years. However, this 15 per cent would presumably only apply to the

¹ Massey-Ferguson Industries Limited, *Brief to the Royal Commission on Farm Machinery*, Ottawa, January 8, 1968, Vol. II, Ch. VI.

manufacturing cost, which is estimated at about one-third of selling price. In practice, automatic use of this pricing formula may result in the list price being advanced in line with the increase in cost.

An international comparison of the rise in farm machinery prices over the past decade in Canada, the United States, a number of countries in Western Europe, Australia, and Japan, is provided in Table 31.8. Because inflation has occurred at varying rates in different countries, comparisons are made both in current currency values and in constant currency values—that is, for an index adjusted by the rise in consumer prices in each country. An examination of these data shows widely divergent rates of price rise, ranging from almost no change in Italy to an increase of 56 per cent in Belgium. The rise in Canada is somewhat on the high side of the range, being exceeded by 5 of the 14 countries included. In terms of the constant currency values measure, a similar divergence in results is evident. The range is from a reduction of about 28 per cent in Italy to a rise of almost 25 per cent in Belgium. The rise in Canada is about 15 per cent, being exceeded by only two of the other countries in the group. Not too much emphasis should be placed on this comparison because little information is available about the construction and comparability of the various indexes.

Until recently the farm machinery component of the *DBS Price Index Numbers of Commodities and Services Used by Farmers* was an index of the suggested retail list prices of a selected number of farm machines. Price data were supplied by just two companies. Prices included some freight charges. Currently, prices are collected from a sample of farm machinery dealers as well. Although for this index an attempt is made to collect actual transaction prices, the Dominion Bureau of Statistics believes that in many instances list prices are reported.

In view of the widespread interest that attaches to farm machinery price indexes, it is recommended that (1) coverage be improved by collecting data on a larger number of machines; (2) sub-indexes for tractors, combines, and some other major machine groups be published separately; (3) for the dealer price index, in view of the uncertainty of the nature of the price data now being collected, DBS collect both list price data and an estimate of the cash discount from list that would be allowed on a sale not involving a trade-in; and (4) the parts price index which was initiated by the Commission be taken over and incorporated in the *Price Index Numbers of Commodities and Services Used by Farmers*.

It was noted above that the present selling price index for farm machinery is largely an index of transfer prices between different branches of the same company. It has no clear meaning as a measure of market prices. Accordingly, it is recommended that DBS also collect and publish an index of wholesale or dealer prices for farm machinery.

The farmer often does not know the suggested list price for the machine he is considering buying. As a result, the dealer may quote a price above list as his starting point for bargaining, thus placing the farmer at a disadvantage. There is no

TABLE 31.8—INTERNATIONAL COMPARISON OF PRICE INDEXES OF FARM MACHINERY, SELECTED COUNTRIES, IN CURRENT AND CONSTANT CURRENCY VALUES, 1956-67

Country	With Current Currency Values				With Constant Currency Values			
	1956	1965	1966	1967	1956	1965	1966	1967
Canada (Canadian \$)	100	136.1	140.0	144.3	100	115.8	114.9	114.4
United States	100	125.1	128.8	133.0	100	107.8	107.9	108.4
Britain	100	124.2	—	—	100	96.5	—	—
France	100	145.2	147.4	149.6	100	92.9	91.8	90.7
Italy	100	98.3	99.6	—	100	72.9	72.2	—
Austria	100	133.7	142.1	146.2	100	101.8	107.2	105.6
West Germany	100	122.7	125.7	122.4	100	100.2	99.2	95.2
Belgium	100	147.5	156.0	159.0	100	122.7	124.6	123.4
Finland	100	152.3	—	—	100	110.7	—	—
The Netherlands	100	119.8	—	—	100	90.6	—	—
Norway	100	121.7	123.5	129.1	100	90.8	88.8	89.0
Switzerland	100	135.6	141.6	145.7	100	110.7	110.3	109.2
Australia	100	129.4	132.1	—	100	116.8	115.7	—
Japan	100	108.6	111.4	—	100	75.4	75.3	—

Source: FAO *Production Yearbook*, 1968 and earlier issues and Statistical Office of the European Economic Community, *Agricultural Statistics*, 1967. Indexes were converted to a 1956 base by mechanical means. Most indexes are for farm machinery including tractors. Data for Britain are for tractors only and are taken from A. J. Rayner, "Price-Quality Relationships in a Durable Asset: Estimation of a Constant Quality Price Index for New Farm Tractors, 1948-1965", *Journal of Agricultural Economics*, Vol. XIX, No. 2, May 1968, p. 241. Indexes in constant currency values were obtained by dividing the index in current currency values by an index of consumer prices for the country concerned.

reason why information on list prices should not be available to the farmer. Two remedies are suggested. The first is to have the companies attach, at the factory, an invoice giving the suggested retail price for all machines priced above a certain level, say \$500. This invoice would list the retail price of the basic machine and the price of optional attachments for the unit in question. At least one major company already does this. In the United States, automobile manufacturers are required by federal law to attach such retail price invoices to their vehicles and dealers are forbidden to remove them before the sale is made.

An alternative would be to require the farm machinery companies to publish the list prices of their machines and make the publication freely available to farmers. In other countries such as Britain, France, West Germany, Italy, and Australia this information is already being made available to farmers.

For repair parts, complaints from farmers and discussions with major companies indicate that dealers may often sell above the suggested list price. The farm machinery companies contend that this practice is pretty well impossible to prevent. One solution to this problem would be to give the farmer the right to inspect the dealer's parts price book to determine whether or not he is being charged the list price.

Accordingly, it is recommended that the government require farm machinery companies to attach invoices to all machines with a list price in excess of \$500, giving the company's suggested retail price for each machine, *or* publish general price lists providing the same information. It is further recommended that the farmer be given the right to inspect the dealer's parts price list whenever he feels he is being overcharged for a part.

APPENDICES

Appendix A

SELECTED STATISTICAL DATA

Table	Page
A.1 World Production and Stock of Tractors, Selected Years, 1951-66	578
A.2 Estimates of Total and Average Horsepower of Wheel-Type Farm Tractors Sold at Retail Level, 1945-68	579
A.3 Farm Machinery Industry, Canada, 1947-66	580
A.4 Farm Machinery Industry, United States, 1947-66	581
A.5 Net Trade Balance All Farm Equipment and Selected Commodities, Canada-World, 1945-69	582
A.6 Domestic Sales of Farm Implements and Repair Parts, and Imports of Farm Machinery from all Countries and from the United States as a Percentage of Domestic Sales, 1936-68	583
A.7 Total Value of Farm Machinery Manufactures and Exports of Farm Machinery to All Countries and to the United States and Canada, 1900, 1910, 1923, 1928-30, 1937-39, 1946-67	584
A.8 Index of Prices Paid by Farmers for Farm Machinery, Canada, 1913-69. . .	585
A.9 Machinery Operating and Depreciation Expenses, and Machinery Operating and Depreciation Expenses as a Percentage of Total Farm Operating and Depreciation Expenses, Canada, 1926-69	586
A.10 Machinery Operating and Depreciation Expenses, and Machinery Operating and Depreciation Expenses as a Percentage of Total Farm Operating and Depreciation Expenses, Canada and Provinces (Excluding Newfoundland), 1927, 1947, 1957, 1967	588
A.11 Sales of Selected Farm Machines and Repair Parts, Canada, 1936-69.	590
A.12 Total and Improved Acreage, All Farms and Per Farm, Canada and Provinces, Census Years 1921-66	592
A.13 Total Value of Investment in Farm Machinery in Millions of Dollars; Num- ber of Horses, Motor Trucks, Tractors and Grain Combines on Farms, Canada and Provinces, Census Years 1921-66	594
A.14 Real Estate Values in Dollars Per Acre, Canada and Major Regions, Selected Years, 1910-69	596
A.15 Population on Census-Farms, Number of Census-Farms, and Population Per Census-Farm, Canada and Provinces, 1921-66	597
A.16 Derivation of Detailed Productivity Indexes for Selected Agricultural Inputs	598
A.16-1 Derivation of Deflator for Capital, Used in Table A.16	603

TABLE A.1—WORLD PRODUCTION AND STOCK OF TRACTORS, SELECTED YEARS, 1951-66
(In thousands of units)

	Africa		Asia		Europe		Latin America		United States and Canada		Oceania		U.S.S.R.		Total World	
	Stock ¹	Production	Stock	Production	Stock	Production	Stock	Production	Stock ³	Production	Stock	Production	Stock	Production	Stock	Production
1951	100.0	n.a.	40.0	n.a.	1,100.0	209.8 ²	149.3	n.a.	4,077.7	559.2 ²	192.0	4.0 ²	591.5 ⁵	n.a.	6,250.5	773.0 ²
1961	221.0	n.a.	144.0	n.a.	3,764.0	465.5	395.2	n.a.	5,244.8	191.2 ⁴	349.0	n.a.	1,212.0	n.a.	11,330.0	745.9
1963	279.5	n.a.	175.5	n.a.	4,394.6	473.0	415.4	n.a.	5,299.3	224.3	372.8	n.a.	1,442.0	n.a.	12,379.0	697.3
1964	296.3	n.a.	192.9	n.a.	4,677.1	471.2	453.6	n.a.	5,334.0	240.6	387.7	n.a.	1,539.0	n.a.	12,880.7	732.5
1965	310.6	n.a.	206.8	n.a.	4,958.2	496.9	480.8	n.a.	5,371.7	271.6	395.2	n.a.	1,613.0	n.a.	13,336.3	789.4
1966	327.7	n.a.	236.5	n.a.	5,243.6	492.1	512.1	n.a.	5,398.5	299.1	406.1	n.a.	1,660.0	n.a.	13,784.5	822.8

¹Includes South Africa; without South Africa totals are 1951, 52; 1961, 102; 1963, 109; 1964, 116; 1965, 121; 1966, 128 (Table 19.19).

²Data are for 1950.

³Canadian data given only for census years, interpolated on straight line basis. Totals for Canada and United States taken from Dominion Bureau of Statistics, *Census of Canada 1966, Agriculture*, and United States Department of Agriculture, *Agricultural Statistics, 1967*; other data taken from *FAO Production Yearbook*, various years. World totals, therefore, will not correspond to FAO totals.

⁴Contractors' off-highway tractors are included until 1954.

⁵U.S.S.R. data for 1951 were given in 15 HP units, therefore, given total 971.1 was reduced.

Source: United States Department of Agriculture, *Agricultural Statistics, 1967*; DBS, *Census of Canada 1966, Agriculture*; FAO *Production Yearbook* and O.E.C.D., various years, and R. E. Linneman, *The United States Tractor Industry in Selected Foreign Markets, 1964*.

TABLE A.2—ESTIMATES OF TOTAL AND AVERAGE HORSEPOWER¹ OF WHEEL-TYPE FARM TRACTORS SOLD AT RETAIL LEVEL, 1945-68

	Canada		Prairies		Ontario	
	Total HP ('000)	Average HP	Total HP ('000)	Average HP	Total HP ('000)	Average HP
1945	352	19.3	—	—	—	—
1946	398	18.3	234	19.8	—	—
1947	647	19.3	410	22.0	—	—
1948	856	19.0	535	21.8	—	—
1949	1,206	19.4	738	21.3	—	—
1950	1,115	20.0	669	23.4	—	—
1951	1,110	22.2	587	27.0	—	—
1952	1,057	24.0	638	30.1	—	—
1953	1,130	28.9	682	33.6	—	—
1954	734	29.0	404	35.5	—	—
1955	793	30.7	351	36.1	—	—
1956	1,003	42.5	509	50.6	—	—
1957	931	42.8	479	52.0	207	37.0
1958	1,027	44.3	537	54.3	237	38.1
1959	1,177	46.3	615	55.9	263	37.4
1960	1,207	47.5	676	58.7	265	40.5
1961	1,117	47.5	583	60.8	251	39.2
1962	1,176	49.5	645	61.6	254	42.0
1963	1,390	53.9	836	66.9	265	43.9
1964	1,559	56.7	1,010	70.1	307	44.8
1965	1,608	59.9	1,043	74.0	332	48.1
1966	1,909	62.5	1,212	78.2	408	49.9
1967	1,879	63.0	1,108	80.4	437	52.3
1968	1,447	62.6	683	83.2	389	53.4

¹ Earlier years adjusted to approximate maximum observed PTO horsepower at maximum engine r.p.m. equivalent to actual data reported, 1961 to date.

Source: Estimates based on Dominion Bureau of Statistics, *Farm Implement and Equipment Sales*, Cat. No. 63-203 (Ottawa: Queen's Printer), 1945-68; Nebraska Test ratings, University of Nebraska, and company returns to DBS.

TABLE A.3—FARM MACHINERY INDUSTRY, CANADA, 1947-66

	Value of Shipments \$ Million		Value Added \$ Million		Production Workers (Numbers)	Total Employees (Numbers)	Wages (\$ Million)	Wages and Salaries (\$ Million)	Costs of Materials, Fuel and Electricity (\$ Million)	Capital Expendi- tures (\$'000)	Paid Man- hours of Production Workers ('000)
	(Current \$)	(Constant \$)	(Current \$)	(Constant \$)							
1947	102.0	197.7	49.4	95.7	13,688	16,013	26.0	31.2	51.3	n.a.	n.a.
1948	167.7	278.1	82.0	136.0	15,510	18,747	36.3	45.3	83.6	6,170	33,874
1949	202.0	294.5	102.4	149.3	13,860	17,074	34.7	44.2	97.8	4,237	29,622
1950	170.6	237.3	88.4	122.9	13,161	16,223	33.9	43.3	81.1	3,341	26,896
1951	195.3	265.4	94.0	127.7	14,038	17,236	41.5	52.2	98.5	4,266	28,761
1952	234.8	272.7	121.3	140.9	14,753	18,046	49.7	62.4	111.9	6,223	30,226
1953	195.5	201.5	102.3	105.5	10,989	14,161	37.4	50.3	92.1	4,226	22,229
1954	135.8	157.7	63.6	73.9	8,949	11,805	28.5	40.2	68.4	3,005	18,335
1955	130.0	135.7	70.5	73.6	8,952	11,753	30.7	41.9	61.0	2,402	18,481
1956	140.0	140.0	66.6	66.6	7,271	9,838	25.9	36.7	66.7	3,455	15,031
1957	139.8	134.7	75.3	72.5	7,318	9,725	26.8	37.6	60.0	4,064	16,617
1958	147.4	136.2	75.3	69.6	7,989	10,526	33.1	45.8	77.7	5,290	17,380
1959	189.6	172.2	98.1	89.1	10,169	13,056	44.2	60.0	101.6	3,587	21,363
1960	181.0	162.8	89.5	80.5	7,879	10,924	35.2	52.7	80.4	5,976	16,142
1961	160.6	141.7	82.0	72.4	6,986	10,058	31.1	46.3	75.9	7,782	14,309
1962	162.1	140.7	85.0	73.8	7,331	9,949	34.9	48.9	78.5	3,013	15,182
1963	211.7	180.8	114.9	98.1	8,623	11,160	44.1	58.4	99.5	14,360	18,354
1964	272.2	233.0	136.2	116.6	9,569	12,474	51.5	68.5	137.7	18,725	20,488
1965	316.1	269.3	152.9	130.2	10,599	13,721	56.3	75.6	165.3	12,507	22,310
1966	364.3	299.8	172.2	141.7	11,332	14,498	64.2	85.3	193.3	11,269	24,248

Note: All dollar values are current dollars unless otherwise stated.

Source: C. J. Maule, *Productivity in the Farm Machinery Industry*, Royal Commission on Farm Machinery, Study No. 3 (Ottawa: Queen's Printer 1969), Table A5, p. 63.

TABLE A.4—FARM MACHINERY INDUSTRY, UNITED STATES, 1947-66
(Values given in Canadian dollars)¹

	Value of Shipments \$ Million		Value Added \$ Million		Production Workers (Numbers)	Total Employees (Numbers)	Wages (\$ Million)	Wages and Salaries (\$ Million)	Costs of Materials, Fuel and Electricity (\$ Million)	Capital Expendi- tures (\$'000)	Paid Man- hours of Production Workers ('000)	Exchange Rate Canadian Cents per U.S. Dollars
	(Current \$)	(Constant \$)	(Current \$)	(Constant \$)								
1947	1,457.3	2,055.4	633.8	893.9	116,871	143,446	317.2	412.3	823.7	82,904	247,346	100
1948	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	100
1949	1,958.2	2,306.5	883.5	1,040.6	116,273	145,499	371.8	505.7	1,073.8	44,441	237,616	103
1950	2,062.1	2,378.4	956.4	1,103.1	108,898	137,807	372.8	507.6	1,105.8	39,102	227,074	109
1951	2,489.2	2,645.3	1,097.0	1,165.8	121,680	152,957	459.3	610.6	1,392.2	49,556	257,524	105
1952	2,284.5	2,397.2	1,031.9	1,082.8	110,616	142,603	408.9	563.7	1,254.6	51,081	229,506	98
1953	2,139.3	2,230.8	950.1	990.7	98,708	129,565	387.7	543.4	1,189.2	58,272	204,286	98
1954	1,593.0	1,662.8	740.1	772.6	78,959	104,416	303.9	434.9	842.6	47,100	162,182	97
1955	1,886.3	1,952.7	898.2	929.8	87,836	114,001	358.3	504.1	1,029.0	49,108	184,983	99
1956	1,746.5	1,746.5	834.3	834.3	79,423	104,563	318.2	462.6	955.9	39,673	165,200	98
1957	1,898.4	1,813.2	879.2	839.7	81,462	108,368	338.7	492.8	1,061.6	40,344	168,170	96
1958	2,349.2	2,155.2	1,055.2	968.1	79,922	108,586	362.0	534.5	1,278.8	48,286	164,160	97
1959	2,457.1	2,186.0	1,125.3	1,001.2	84,803	113,153	407.0	593.1	1,392.7	43,727	178,595	96
1960	2,097.7	1,830.5	912.8	796.5	71,110	99,115	345.3	524.0	1,127.2	53,751	147,169	97
1961	2,362.9	2,204.8	1,067.7	914.9	76,371	102,538	385.8	585.1	1,264.1	46,405	159,249	101
1962	2,655.7	2,231.7	1,290.3	1,084.3	77,139	106,222	441.9	661.5	1,428.5	46,009	162,856	107
1963	3,069.6	2,541.1	1,434.7	1,187.7	84,650	112,614	514.9	744.2	1,659.7	69,585	179,153	108
1964	3,460.4	2,820.2	1,648.2	1,343.3	90,215	118,621	581.4	831.5	1,884.8	90,282	194,215	108
1965	3,812.0	3,047.2	1,816.9	1,452.4	93,941	123,241	618.9	819.0	2,017.2	101,127	202,236	108
1966	4,678.6	3,632.5	2,221.7	1,724.9	105,181	137,341	733.7	966.3	2,551.2	127,060	n.a.	108

Note: All dollar values are current dollars unless otherwise stated.

¹ All U.S. dollar values have been converted to Canadian dollars by use of the exchange rate shown in last column.

Source: C. J. Maule, *Productivity in the Farm Machinery Industry*, Royal Commission on Farm Machinery, Study No. 3 (Ottawa: Queen's Printer 1969), Table A6, p. 64.

TABLE A.5—NET TRADE BALANCE ALL FARM EQUIPMENT AND SELECTED COMMODITIES,¹
CANADA—WORLD, 1945-69
(Millions of Canadian dollars)

	All Farm Equipment	Tractors and Parts	Combines and Parts	Other Equipment
1945	(30.3)	(33.0)	(0.9)	3.6
1946	(39.7)	(45.1)	1.6	3.8
1947	(63.2)	(63.4)	2.1	1.9
1948	(66.2)	(77.9)	13.4	1.7
1949	(84.0)	(110.1)	16.4	9.7
1950	(72.9)	(99.0)	15.3	10.8
1951	(87.6)	(116.0)	19.6	8.8
1952	(91.9)	(109.5)	5.5	12.1
1953	(134.8)	(119.9)	(5.9)	(9.0)
1954	(66.4)	(76.9)	17.9	(7.4)
1955	(100.8)	(111.6)	14.9	(4.1)
1956	(164.6)	(156.1)	9.2	(17.7)
1957	(132.5)	(125.3)	10.8	(18.0)
1958	(100.7)	(113.5)	23.6	(10.8)
1959	(159.1)	(167.6)	22.1	(13.6)
1960	(141.0)	(127.4)	13.3	(26.9)
1961	(126.9)	(126.7)	14.1	(14.3)
1962	(142.8)	(132.0)	3.4	(14.2)
1963	(185.2)	(175.4)	(0.7)	(9.1)
1964	(180.9)	(173.9)	18.3	(25.3)
1965	(183.7)	(188.0)	35.2	(30.9)
1966	(223.8)	(214.1)	26.2	(35.9)
1967	(214.5)	(217.2)	40.5	(37.8)
1968	(174.0)	(177.9)	45.3	(41.4)
1969	(155.5)	(151.5)	39.8	(43.8)

Note: Figures in brackets indicate a negative trade balance.

¹All figures include re-exports where data were available. The inclusion of re-exports in the data has the effect of understanding the negative trade balance by the amount of re-exports.

Source: Dominion Bureau of Statistics, *Trade of Canada, Exports by Commodities*, Cat. No. 65-004 (Ottawa: Queen's Printer), 1945-69. DBS, *Trade of Canada, Imports by Commodities*, Cat. No. 65-007 (Ottawa: Queen's Printer), 1945-69.

TABLE A.6—DOMESTIC SALES OF FARM IMPLEMENTS AND REPAIR PARTS,
AND IMPORTS OF FARM MACHINERY FROM ALL COUNTRIES
AND FROM THE UNITED STATES AS A PERCENTAGE
OF DOMESTIC SALES, 1936-68

	Sales of Farm Implements and Repair Parts	Imports of Farm Machinery from All Countries, Including the United States as Percentage of Sales		Imports of Agricultural Machinery from the United States	Imports of Agricultural Machinery from the United States as Percentage of Sales
	(\$ Million)	(\$ Million)	(Per cent)	(\$ Million)	(Per cent)
1936	19.7	9.4	47.7	8.8	44.7
1937	31.3	17.2	55.0	16.3	52.1
1938	42.8	20.3	47.4	19.2	44.9
1939	40.3	20.9	51.9	20.1	49.9
1940	56.4	30.7	54.4	30.2	53.5
1941	61.6	31.0	50.3	30.7	49.8
1942	59.6	23.6	40.0	23.6	39.6
1943	44.6	20.2	45.3	20.2	45.3
1944	71.9	40.6	56.5	40.5	56.3
1945	83.0	50.4	60.7	50.1	60.4
1946	102.5	68.4	66.7	67.7	66.0
1947	145.7	105.4	72.3	104.6	71.8
1948	197.7	140.0	70.8	137.4	69.5
1949	245.2	177.2	72.3	173.1	70.6
1950	248.0	161.6	65.2	152.6	61.5
1951	264.4	195.1	73.8	187.6	71.0
1952	281.5	197.3	70.1	190.1	67.5
1953	269.9	209.1	77.5	202.8	75.1
1954	174.0	143.2	82.3	136.8	78.6
1955	181.6	178.2	98.1	173.1	95.3
1956	202.6	232.1	114.6	226.7	111.9
1957	183.7	202.2	110.1	194.3	105.8
1958	206.0	198.3	96.3	189.9	92.2
1959	251.1	273.8	109.0	254.9	101.5
1960	258.8	212.3	82.0	195.6	75.6
1961	241.4	213.4	88.4	193.7	80.2
1962	282.7	234.3	82.9	211.1	74.7
1963	337.6	299.8	88.8	273.9	81.1
1964	380.1	330.5	87.0	307.2	80.8
1965	427.0	354.4	83.0	329.0	77.0
1966	478.9	413.6	86.4	378.8	79.1
1967	494.3	418.4	84.6	377.7	76.4
1968	442.1	353.2	79.9	312.5	70.7

Note: Because of different valuation levels, i.e. sales figures are actual sales to farmers, imports figures include dealer inventories, the data for imports may be overstated somewhat. In addition, sales figures are valued at a price less the dealer trade discount. Imports figures are valued, typically, at a transfer price between farm machinery company affiliates. In relation to the Suggested Retail Price, the transfer price may be as much as 16 per cent lower than the price less the dealer trade discount.

Source: Dominion Bureau of Statistics, *Farm Implement and Equipment Sales*, Cat. No. 63-203 (Ottawa: Queen's Printer), 1936-68.

DBS, *Trade of Canada, Imports by Commodities*, Cat. No. 65-007 (1944-1968) and 65-D-02 (1936-1944).

TABLE A.7—TOTAL VALUE OF FARM MACHINERY MANUFACTURES AND
EXPORTS OF FARM MACHINERY TO ALL COUNTRIES
AND TO THE UNITED STATES AND CANADA,
1900, 1910, 1923, 1928-30, 1937-39, 1946-67

Million of Canadian Dollars					
	Total Production ¹	Exports To All Countries ⁵	Exports To United States ⁵	Exports To All Others	Domestic Consump- tion
1900	10.3	1.7 ²		1.7	8.6
1910	23.0	4.3 ³	0.1 ³	4.2	18.7
1923	26.0	6.1 ⁴	1.3 ⁴	4.8	19.9
1928	41.2	14.5	3.5	11.0	26.7
1929	40.7	19.8	5.1	14.7	20.9
1930	26.9	10.3	2.7	7.6	16.6
1937	19.0	9.8	3.3	6.5	9.2
1938	21.3	7.8	2.5	5.3	13.5
1939	16.0	7.0	1.9	5.1	9.0
1946	54.0	28.7	14.5	14.2	25.3
1947	83.9	42.2	23.5	18.7	41.7
1948	139.1	73.8	50.6	23.2	65.3
1949	169.6	92.5	70.2	22.3	77.1
1950	141.7	87.8	70.7	17.1	53.9
1951	162.3	106.4	83.5	22.9	55.9
1952	194.7	105.4	83.7	21.7	89.3
1953	159.9	74.3	58.1	16.2	85.6
1954	113.1	76.8	53.3	23.5	36.3
1955	109.7	76.0	63.4	12.6	33.7
1956	117.7	67.5	55.6	11.9	50.2
1957	117.9	69.7	59.4	10.3	48.2
1958	129.1	97.6	90.3	7.3	31.5
1959	152.0	114.7	109.6	5.1	37.3
1960	140.7	85.4	79.6	5.8	55.3
1961	120.8	85.5	76.0	9.5	35.3
1962	122.5	91.5	82.7	8.8	31.0
1963	155.0	114.6	104.8	9.8	40.4
1964	190.9	140.7	127.7	13.0	50.2
1965	220.5	161.9	145.0	16.9	58.6
1966	258.7	182.5	171.6	10.9	76.2
1967	259.2	194.3	184.1	10.2	64.9

¹See M.C. Urquhart and K.A.H. Buckley (eds), *Historical Statistics of Canada* (Toronto: The Macmillan Company of Canada, 1965), for years 1900-1923; also calendar year factory shipments as reported in Dominion Bureau of Statistics, *Agricultural Implement Industry*, Cat. No. 42-202 (Ottawa: Queen's Printer, various years), for years 1928-67.

²Minister of Customs, *Table of Trade and Navigation of the Dominion of Canada*, Sessional Papers No. 11, for the fiscal year ending June 30, 1900.

³Minister of Customs, *Table of Trade and Navigation of the Dominion of Canada*, Sessional Papers No. 11, for the fiscal year ending March 31, 1910.

⁴DBS, *Trade of Canada Fiscal Year Ending March 31, 1923*.

⁵DBS, *Trade of Canada (Imports for Consumption and Exports) Calendar Year*, for years 1928-39, various years and DBS, *Trade of Canada Volume 1: Summary and Analytical Tables*, for years 1946-67, various years.

TABLE A.8—INDEX OF PRICES PAID BY FARMERS FOR FARM MACHINERY, CANADA, 1913-69
(1935-39 = 100)

1913	54.6	1931	94.9	1951	186.8
1914	55.0	1932	94.1	1952	195.4
1915	54.4	1933	92.1	1953	196.7
1916	55.1	1934	94.6	1954	197.9
1917	62.0	1935	95.5	1955	198.8
1918	82.1	1936	97.8	1956	209.4
1919	86.9	1937	97.2	1957	223.8
1920	92.2	1938	104.1	1958	236.1
1921	111.4	1939	103.6	1959	247.8
1922	89.9	1940	105.8	1960	253.5
1923	92.9	1941	109.1	1961	260.7
1924	102.4	1942	114.4	1962	268.1
1925	97.9	1943	117.1	1963	272.9
1926	97.6	1944	118.2	1964	279.6
1927	97.5	1945	115.1	1965	284.9
1928	97.6	1946	118.8	1966	293.1
1929	97.5	1947	126.3	1967	302.2
1930	97.0	1948	141.6	1968	313.7
		1949	158.3	1969	324.1
		1950	165.1		

Source: Dominion Bureau of Statistics, Prices Division, July 19, 1968. Canada Department of Agriculture, *Canadian Farm Economics*, various editions.
DBS, *Prices and Price Indexes*, Cat. No. 62-002 (Ottawa: Queen's Printer, December 1969).

TABLE A.9—MACHINERY OPERATING AND DEPRECIATION EXPENSES, AND MACHINERY OPERATING AND DEPRECIATION EXPENSES
AS A PERCENTAGE OF TOTAL FARM OPERATING AND DEPRECIATION EXPENSES, CANADA, 1926-69

	Thousands of Canadian Dollars										Percentages of Total Farm Operating and Depreciation Expenses									
	Machinery Operating Expenses					Total Machinery Operating and Depreciation Expenses					Machinery Operating Expenses					Total Machinery Operating and Depreciation Expenses				
	Fuel and Lubricants ¹			All Other ¹		Depreciation Expense on Machinery			Total		Repairs			Fuel and Lubricants ¹		All Other ¹		Total		
	Repairs																			
1926	17,094	53,370	70,464	55,431	125,895	584,842	3	9	12	10	22		3	9	12	10	22		22	
1927	17,803	58,338	76,141	60,642	136,783	611,895	3	9	12	10	22		3	9	12	10	22		22	
1928	17,876	66,267	84,143	67,046	151,189	639,736	3	10	13	10	23		3	10	13	10	23		23	
1929	16,697	73,596	90,293	72,860	163,153	632,207	3	11	14	12	26		3	11	14	12	26		26	
1930	16,395	73,899	90,294	69,426	159,720	590,766	3	12	15	12	27		3	12	15	12	27		27	
1931	11,795	65,145	76,940	59,813	136,753	498,914	3	12	15	12	27		3	12	15	12	27		27	
1932	12,818	58,951	71,769	56,252	128,021	448,539	3	13	16	13	29		3	13	16	13	29		29	
1933	12,512	55,279	67,791	53,182	120,973	430,912	3	13	16	12	28		3	13	16	12	28		28	
1934	13,831	61,746	75,577	50,120	125,703	453,619	3	14	17	11	28		3	14	17	11	28		28	
1935	16,302	58,637	74,939	48,101	123,040	464,782	3	13	16	10	26		3	13	16	10	26		26	
1936	15,353	59,397	74,750	47,167	121,917	474,620	3	13	16	10	26		3	13	16	10	26		26	
1937	15,728	61,751	77,479	47,391	124,870	497,835	3	12	15	10	25		3	12	15	10	25		25	
1938	17,846	65,746	83,592	49,022	132,614	494,873	4	13	17	10	27		4	13	17	10	27		27	
1939	19,177	73,326	92,503	49,390	141,893	513,548	4	14	18	10	28		4	14	18	10	28		28	
1940	19,917	79,669	99,586	51,662	151,248	528,544	4	15	19	10	29		4	15	19	10	29		29	
1941	20,416	89,998	110,414	54,434	164,848	565,037	4	16	20	9	29		4	16	20	9	29		29	
1942	27,891	97,033	124,924	60,215	185,139	690,163	4	14	28	9	27		4	14	28	9	27		27	
1943	31,478	99,244	130,722	65,820	196,542	770,829	4	13	17	8	25		4	13	17	8	25		25	
1944	36,000	104,381	140,381	69,004	209,385	814,162	4	13	17	9	26		4	13	17	9	26		26	
1945	39,060	108,422	147,482	75,341	222,823	829,374	5	13	18	9	27		5	13	18	9	27		27	

1946	42,952	119,725	162,677	82,630	245,307	928,606	4	13	17	9	26
1947	47,386	132,276	179,662	94,089	273,751	1,065,874	4	13	17	9	26
1948	54,062	166,387	220,449	110,236	330,685	1,179,134	5	14	19	9	28
1949	55,999	192,154	248,153	131,416	379,569	1,232,810	5	15	20	11	31
1950	n.a.	n.a.	267,060	157,129	424,189	1,316,183			20	12	32
1951	82,574	153,330	285,987	181,132	467,119	1,466,194	6	11	3	12	32
1952	92,940	164,676	306,721	197,175	503,896	1,542,264	6	11	3	13	33
1953	94,726	175,947	320,121	217,888	538,009	1,554,611	6	12	21	14	35
1954	81,015	183,826	314,011	230,504	544,515	1,557,694	5	12	3	15	35
1955	84,294	194,152	329,065	226,243	555,308	1,622,055	5	12	3	14	34
1956	94,278	203,918	351,194	225,748	576,942	1,739,077	5	12	3	20	33
1957	99,839	209,599	364,202	238,041	602,243	1,736,230	6	12	21	14	35
1958	100,336	211,790	370,297	247,085	617,382	1,850,073	5	12	3	20	33
1959	114,791	212,872	388,615	255,818	644,453	1,961,016	6	12	21	14	35
1960	122,007	212,804	398,743	265,059	663,802	2,038,947	6	11	3	20	33
1961	116,574	209,923	392,001	266,820	658,821	2,072,370	6	10	3	19	32
1962	129,268	221,536	419,706	287,560	707,266	2,228,152	6	10	3	19	32
1963	146,656	226,191	442,691	298,956	741,647	2,377,044	6	9	3	18	31
1964	156,577	233,252	461,527	317,450	778,977	2,485,311	6	9	3	18	31
1965	161,987	233,872	473,424	338,609	812,033	2,641,140	6	9	3	18	31
1966	182,530	221,826	494,588	378,162	872,750	2,993,568	6	7	3	16	29
1967	183,677	236,833	516,020	420,450	936,470	3,211,912	6	7	3	16	29
1968	187,479	249,523	534,075	457,726	991,801	3,367,111	6	7	3	16	30
1969	191,999	257,348	554,440	483,009	1,037,449	3,429,129	6	7	3	16	30

¹ Cost of fuel and lubricants not reported separately until 1951.

Source: Dominion Bureau of Statistics, *Handbook of Agricultural Statistics*, Part II, 1926-65, Cat. No. 21-511, DBS, *Farm Net Income*, 1969, Cat. No. 21-202, Table 5.

TABLE A.10—MACHINERY OPERATING AND DEPRECIATION EXPENSES, AND MACHINERY OPERATING AND DEPRECIATION EXPENSES AS A PERCENTAGE OF TOTAL FARM OPERATING AND DEPRECIATION EXPENSES, CANADA AND PROVINCES (EXCLUDING NEWFOUNDLAND), 1927, 1947, 1957, 1967

		Machinery Operating		Machinery Depreciation		Total Machinery		Total Farm	
		Expenses		Expenses		Operating and Depreciation	Expenses	Operating and Depreciation	Expenses
		(\$'000)	(Per cent) ¹	(\$'000)	(Per cent) ¹	(\$'000)	(Per cent) ¹	(\$'000)	(Per cent) ¹
Canada	1927	76,141	12	60,642	10	136,783	22	611,895	
	1947	179,662	17	94,089	9	273,751	26	1,065,874	
	1957	364,202	21	238,041	14	602,243	35	1,736,230	
	1967	516,020	16	420,450	13	936,470	29	3,211,912	
Prince Edward Island	1927	397	8	505	10	902	18	5,138	
	1947	1,055	9	717	6	1,772	15	11,789	
	1957	2,608	14	1,946	11	4,554	25	18,294	
	1967	4,763	15	3,417	10	8,180	25	32,220	
Nova Scotia	1927	1,194	9	688	5	1,882	14	13,134	
	1947	2,410	10	1,172	5	3,582	15	23,906	
	1957	4,582	15	2,475	8	7,057	23	29,969	
	1967	5,673	13	3,144	7	8,817	20	44,855	
New Brunswick	1927	1,220	10	885	7	2,105	17	12,272	
	1947	2,396	10	1,225	5	3,621	15	23,434	
	1957	5,586	18	2,643	8	8,229	26	31,336	
	1967	6,396	15	3,458	8	9,854	23	42,951	
Quebec	1927	5,514	7	6,685	9	12,199	16	75,650	
	1947	12,395	7	9,485	6	21,880	13	169,179	
	1957	36,582	13	22,146	8	58,728	21	272,651	
	1967	59,977	12	37,113	7	97,090	19	503,713	

Ontario	1927	19,105	11	11,225	6	30,330	17	175,453
	1947	39,056	12	18,018	5	57,074	17	330,405
	1957	81,132	14	48,728	9	129,860	23	574,729
	1967	118,735	11	87,807	8	206,542	19	1,058,592
Manitoba	1927	9,032	16	7,374	13	16,406	29	55,563
	1947	23,404	25	11,912	13	35,316	38	92,148
	1957	41,682	30	28,959	21	70,641	51	138,395
	1967	57,457	21	47,762	18	105,219	39	271,453
Saskatchewan	1927	25,784	16	20,654	13	46,438	29	161,173
	1947	56,265	27	28,355	14	84,620	41	204,408
	1957	99,277	31	71,320	22	170,597	53	319,878
	1967	127,741	22	127,634	22	255,375	44	574,798
Alberta	1927	12,127	13	11,829	12	23,956	25	96,269
	1947	38,669	23	20,860	13	59,529	36	163,403
	1957	83,040	30	53,620	19	136,660	49	275,981
	1967	119,857	22	98,815	18	218,672	40	543,332
British Columbia	1927	1,768	9	797	4	2,565	13	19,243
	1947	4,012	8	2,345	5	6,357	13	47,202
	1957	9,713	13	6,204	8	15,917	21	74,997
	1967	15,421	11	11,300	8	26,721	19	139,998

¹ Expressed as a percentage of Total Farm Operating and Depreciation Expenses.

Source: Dominion Bureau of Statistics, *Handbook of Agricultural Statistics*, Part II, Farm Income - 1926-1965, Cat. No. 21-511 (Ottawa: Queen's Printer, June 1967),
DBS, *Farm Net Income, 1969*, Cat. No. 21-202 (Ottawa: Queen's Printer, June 1970).

TABLE A.11—SALES OF SELECTED FARM MACHINES AND REPAIR PARTS, CANADA, 1936-69
(Dollars in millions and as percentages of total sales)

	Tractors		Combines		Haying Machinery ¹		Tillage Machinery ²		Plows ³		Total Sales of Machines		Sales of Repair Parts		
	\$	As Per-centage of Total Sales of Machines	\$	As Per-centage of Total Sales of Machines	\$	As Per-centage of Total Sales of Machines	\$	As Per-centage of Total Sales of Machines	\$	As Per-centage of Total Sales of Machines	\$	As Per-centage of Total Sales of Machines and Repair Parts	\$	As Per-centage of Total Sales of Machines and Repair Parts	
1936	6.2	32.1	0.3	1.6	1.0	5.2	3.5	18.1	2.3	11.9	19.3	84.6	3.5	15.4	22.8
1937	12.5	40.6	0.4	1.3	1.3	4.2	4.7	15.3	3.0	9.7	30.8	84.6	5.6	15.4	36.4
1938	15.3	42.3	1.6	4.4	1.4	3.9	4.6	12.7	2.6	7.2	36.2	84.6	6.6	15.4	42.8
1939	14.8	43.4	2.9	8.5	1.1	3.2	4.3	12.6	2.6	7.6	34.1	84.6	6.2	15.4	40.3
1940	20.6	43.2	6.1	12.8	1.5	3.1	6.4	13.4	4.1	8.6	47.7	84.6	8.7	15.4	56.4
1941	22.1	42.4	4.7	9.0	1.8	3.5	7.4	14.2	4.7	9.0	52.1	84.6	9.5	15.4	61.6
1942	18.9	37.4	5.8	11.5	1.8	3.6	6.5	12.9	3.9	7.7	50.5	84.7	9.2	15.4	59.6
1943	8.4	28.2	3.3	11.1	1.1	3.7	5.1	17.1	3.2	10.7	29.8	66.8	14.8	33.2	44.6
1944	21.0	38.3	7.6	13.9	1.6	2.9	2.1	3.8	3.4	6.2	54.8	76.2	17.1	23.8	71.9
1945	19.7	30.6	9.9	15.4	2.4	3.7	3.1	4.8	4.2	6.5	64.3	77.5	18.7	22.5	83.0
1946	22.9	28.0	10.4	12.7	3.7	4.5	4.6	5.6	5.5	6.7	81.7	79.7	20.8	20.3	102.5
1947	39.3	32.1	17.0	13.9	5.7	4.7	6.3	5.1	8.2	6.7	122.4	84.0	23.3	16.0	145.7
1948	59.2	34.7	31.4	18.4	9.4	5.5	9.3	5.4	12.0	7.0	170.7	86.3	27.0	13.7	197.7
1949	94.7	43.6	29.7	13.7	10.6	4.9	12.2	5.6	17.9	8.2	217.1	88.5	28.1	11.5	245.2
1950	96.4	44.2	34.6	15.9	10.6	4.9	13.2	6.0	15.2	7.0	218.2	88.0	29.9	12.1	248.0

1951	90.5	38.4	46.2 ⁴	19.6	14.8	6.3	12.5	5.3	15.4	6.5	235.6	89.1	28.8	10.9	264.4
1952	87.9	35.1	61.8	24.7	17.2	6.9	10.1	4.0	18.2	7.3	250.3	88.9	31.2	11.1	281.5
1953	82.5	34.6	57.9	24.3	20.8	8.7	10.7	4.5	16.9	7.1	238.1	88.2	31.8	11.8	269.9
1954	53.4	36.4	19.4	13.2	17.7	12.1	7.6	5.2	10.2	7.0	146.7	84.3	27.3	15.7	174.0
1955	57.1	37.3	20.7	13.5	19.8	12.9	7.0	4.6	8.2	5.4	153.1	84.3	28.5	15.7	181.6
1956	61.8	36.2	25.3	14.8	27.2	15.9	7.1	4.2	8.0	4.7	170.8	84.3	31.8	15.7	202.6
1957	54.9	36.6	16.9	11.3	23.6	15.7	7.8	5.2	8.9	5.9	149.9	81.6	33.8	18.4	183.7
1958	61.2	35.6	21.5	12.5	26.3	15.3	9.7	5.6	9.8	5.7	172.0	83.5	34.0	16.5	206.0
1959	76.6	36.1	33.4	15.7	30.7	14.5	11.9	5.6	11.2	5.3	212.2	84.5	38.9	15.5	251.1
1960	78.7	36.2	35.5	16.3	30.5	14.0	12.6	5.8	11.6	5.3	217.5	84.0	41.3	16.0	258.8
1961	73.4	36.4	26.3	13.0	29.3	14.5	12.9	6.4	11.5	5.7	201.8	83.6	39.6	16.4	241.4
1962	78.3	32.8	43.3	18.1	32.2	13.5	15.4	6.4	11.2	4.7	238.8	84.5	43.9	15.5	282.7
1963	94.8	32.9	58.2	20.2	31.4	10.9	18.0	6.3	12.9	4.5	287.8	85.3	49.7	14.7	337.5
1964	111.1	34.0	60.2	18.4	30.9	9.5	21.1	6.5	15.9	4.9	326.9	86.0	53.2	14.0	380.1
1965	119.7	32.2	81.5	21.9	30.0	8.1	23.5	6.3	17.2	4.6	371.3	87.0	55.6	13.0	426.9
1966	145.7	34.9	73.7	17.7	29.8	7.1	28.8	6.9	19.7	4.7	416.9	87.1	62.0	12.9	478.9
1967	148.0	34.2	65.5	15.2	29.0	6.7	33.8	7.8	20.9	4.8	432.3	87.5	62.0	12.5	494.3
1968	116.7	30.9	56.3	14.9	26.4	7.0	28.7	7.6	16.0	4.2	378.1	85.5	64.0	14.5	442.1
1969	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	340.3	83.7	66.3	16.3	406.6

¹ Haying machinery includes: mowers, rakes, conditioners, balers, etc.

² Tillage machinery includes: harrows, rotary hoes, pulverizers, cultivators, rod weedeers, etc.; until 1943 included plows as well.

³ Plows include: moldboard, disk plows, diskers, rotary tillers, etc.; until 1943 plows were considered part of tillage machinery.

⁴ Does not include category of over 6 ft. PTO.

Source: Dominion Bureau of Statistics, *Farm Implement and Equipment Sales*, Cat. No. 63-203 (Ottawa: Queen's Printer, 1936-69).

TABLE A.12—TOTAL AND IMPROVED ACREAGE, ALL FARMS AND PER FARM, CANADA AND PROVINCES, CENSUS YEARS 1921-66

		Canada ¹	Nfld. ²	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Total acreage of all census-farms (Millions of acres except for Nfld. shown in actual acres)	1921 1931 1941 1946 ⁴ 1951 1956 1961 1966	140.9 ³ 163.1 173.6 n.a. 174.0 173.9 172.6 174.1	n.a. n.a. n.a. n.a. 85,040 71,814 54,561 49,513	1.2 1.2 1.2 n.a. 1.1 1.1 1.0 0.9	4.7 4.3 3.8 n.a. 3.2 2.8 2.2 1.9	4.3 4.2 4.0 n.a. 3.5 3.0 2.2 1.8	17.3 17.3 18.1 n.a. 16.8 15.9 14.2 12.9	22.6 22.8 22.4 n.a. 20.9 19.9 18.6 17.8	14.6 ³ 15.1 16.9 16.7 17.7 17.9 18.2 19.1	44.0 ³ 55.7 60.0 59.4 61.7 62.8 64.4 65.4	29.3 ³ 39.0 43.3 41.5 44.5 46.0 47.2 49.0	2.9 3.5 4.0 n.a. 4.7 4.5 4.5 5.3
Average acreage per census-farm ⁵	1921 1931 1941 1946 ⁴ 1951 1956 1961 1966	198 224 237 n.a. 279 302 359 404	n.a. n.a. n.a. n.a. 23 30 31 29	89 93 96 n.a. 108 113 131 146	100 109 116 n.a. 135 132 178 192	116 122 124 n.a. 131 135 187 208	125 127 117 n.a. 125 130 148 160	114 119 126 n.a. 139 141 153 162	274 279 291 306 338 364 420 480	369 408 432 473 550 607 686 763	353 400 434 463 527 578 645 706	130 136 153 n.a. 178 183 226 277
Improved acreage of all census-farms (Millions of acres except for Nfld. shown in actual acres)	1921 1931 1941 1946 ⁴ 1951 1956 1961 1966	70.8 85.7 91.6 n.a. 96.9 100.3 103.4 108.2	n.a. n.a. n.a. n.a. 28,981 24,234 20,455 20,566	0.8 0.8 0.7 n.a. 0.6 0.6 0.6 0.6	1.0 0.8 0.8 n.a. 0.7 0.6 0.5 0.5	1.4 1.3 1.2 n.a. 1.0 1.0 0.7 0.6	9.1 9.0 9.1 n.a. 8.8 8.6 7.9 7.6	13.2 13.3 13.4 n.a. 12.7 12.6 12.0 12.0	8.1 8.5 9.8 9.8 10.8 11.5 12.0 12.4	25.0 33.5 35.6 35.6 38.8 40.5 43.1 45.5	12.0 17.7 20.1 20.0 22.3 23.7 25.3 27.3	0.5 0.7 0.9 n.a. 1.1 1.2 1.3 1.6

Average improved acreage per census-farm ⁵	1921	1931	1941	1946 ⁴	1951	1956	1961	1966	100	n.a.	56	21	37	66	66	151	210	142	25
		118	125	n.a.	155	174	215	251	118	n.a.	60	21	39	66	69	157	246	182	27
									125	n.a.	60	25	39	59	75	169	256	202	33
									n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	179	283	223	n.a.
									155	8	64	28	38	66	85	205	346	264	43
									174	10	68	30	43	70	89	233	392	299	47
									215	12	79	40	62	82	99	276	459	345	65
									251	12	90	50	73	95	109	313	531	393	85

¹ Contains information for Yukon and Northwest Territories for 1951 and subsequent years.
² Data not available prior to union of Newfoundland with Canada in 1949.
³ Farms on Indian Reserves in the Prairie Provinces were not included.
⁴ Only Prairie Provinces enumerated in 1946 Census.
⁵ See Table A.15 for number of census-farms.
Source: Dominion Bureau of Statistics, 1966 *Census of Canada, Agriculture* (Ottawa: Queen's Printer, 1968), Tables 2 and 14.

TABLE A. 13—TOTAL VALUE OF INVESTMENT IN FARM MACHINERY IN MILLIONS OF DOLLARS;
NUMBER OF HORSES, MOTOR TRUCKS, TRACTORS AND GRAIN COMBINES ON FARMS,
CANADA AND PROVINCES, CENSUS YEARS 1921-66

	Canada ¹	Nfld. ²	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Total value of investment in farm machinery on census-farms (\$'000,000)											
1921	665.2 ^{3,4}	n.a.	6.9 ⁴	10.1 ⁴	13.5 ⁴	111.9 ⁴	170.0 ⁴	67.8 ^{3,4}	176.7 ^{3,4}	98.8 ^{3,4}	9.4 ⁴
1931	650.7	n.a.	8.1	10.6	13.3	97.3	151.9	54.8	185.5	116.3	12.9
1941	596.0	n.a.	5.8	11.0	10.8	85.2	150.4	58.9	142.8	116.1	15.1
1946 ⁵	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	94.4	223.5	163.3	n.a.
1951	1,933.3	1.4	16.3	25.2	27.0	211.9	445.3	231.8	525.6	390.0	58.8
1956 ⁶	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1961	2,568.6	2.9	26.9	30.3	31.7	301.3	579.3	272.0	686.8	550.9	86.5
1966	3,522.4	3.5	35.7	34.4	36.8	374.0	758.4	380.4	1,020.6	785.0	123.5
Number of horses on census-farms ('000)											
1921	3,451.8 ³	n.a.	32.0	54.4	62.4	332.5	669.0	355.7 ³	1,077.9 ³	806.2 ³	61.4
1931	3,113.9	n.a.	30.0	43.1	51.2	301.4	577.3	324.7	997.4	731.7	57.2
1941	2,788.8	n.a.	28.0	36.2	45.2	332.7	532.0	301.8	800.7	649.2	63.0
1946 ⁵	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	215.1	570.5	469.2	n.a.
1951	1,306.6	2.9	21.3	26.0	31.0	232.9	260.6	130.9	303.9	261.1	36.1
1956	784.0	1.7	14.6	17.9	19.3	163.6	139.7	75.1	170.8	154.7	26.7
1961	512.0	1.2	7.9	8.9	9.3	97.4	88.9	50.8	110.3	113.2	23.9
1966	387.3	1.1	5.0	5.7	6.1	62.1	75.4	37.0	74.7	93.7	26.5
Number of tractors on census-farms											
1921	47,455 ³	n.a.	49	164	104	968	7,161	10,027 ³	19,243 ³	9,215 ³	524
1931	105,360	n.a.	176	424	289	2,417	18,993	14,366	43,308	23,985	1,402
1941	159,752	n.a.	577	1,386	1,140	5,869	35,460	22,050	54,129	36,445	2,696
1946 ⁵	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	30,802	71,596	48,763	n.a.
1951	399,686	126	2,776	4,307	5,221	31,971	105,204	50,984	106,664	79,282	13,148
1956	499,811	296	4,840	6,537	7,646	54,322	136,062	59,265	121,388	94,156	15,282
1961	549,789	462	5,713	7,074	8,102	70,697	150,046	61,463	126,613	102,624	16,974
1966	598,483	519	6,341	7,252	7,989	81,674	162,303	65,552	134,908	112,245	19,676

Number of motor trucks on census-farms	1921 ⁶	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	1931	48,401	n.a.	n.a.	1,126	5,152	14,586	n.a.	n.a.	10,938	7,319	n.a.
	1941	77,480	n.a.	n.a.	1,861	6,703	17,537	n.a.	n.a.	21,285	14,512	3,947
	1946 ⁵	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	27,756	18,451	4,825
	1951	196,122	507	1,679	5,687	4,786	19,167	41,486	21,163	52,626	39,723	n.a.
	1956	277,183	735	3,247	7,200	5,614	28,758	58,041	28,556	74,498	58,749	9,291
	1961	302,012	715	3,253	5,965	4,657	26,597	62,812	31,806	82,669	71,508	11,758
Number of combines on census-farms	1921 ⁶	344,836	764	3,306	5,393	4,404	24,499	67,622	36,689	102,470	85,559	12,004
	1931	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	14,116
	1941	8,917	n.a.	nil	nil	nil	nil	nil	n.a.	6,019	2,523	n.a.
	1946 ⁵	19,013	n.a.	4	2	15	55	796	1,714	11,202	5,165	20
	1951	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5,724	22,498	10,648	60
	1956	90,500	nil	18	16	211	420	10,031	15,268	42,997	20,851	n.a.
	1961	136,927	nil	238	88	598	1,481	16,644	21,425	61,861	33,531	687
	1966	155,611	2	644	154	770	3,046	22,387	23,662	65,084	38,530	1,060
		170,182	nil	1,020	252	965	6,108	25,372	24,815	67,144	42,838	1,331
												1,667

¹ Contains information for Yukon and Northwest Territories for 1951 and subsequent years.

² Data not available prior to union of Newfoundland with Canada in 1949.

³ Farms on Indian Reserves were not included in the totals for Canada in 1921.

⁴ Does not include automobiles.

⁵ Only Prairie Provinces enumerated.

⁶ Not enumerated.

TABLE A.14—REAL ESTATE VALUES IN DOLLARS PER ACRE, CANADA AND MAJOR REGIONS, SELECTED YEARS, 1910-69

	Canada	Quebec	Ontario	Prairies ¹
1910	33	43	48	24
1920	48	70	70	33
1929	37	55	60	26
1930	32	48	52	23
1935	24	41	42	17
1939	25	44	46	16
1940	24	44	46	16
1945	30	57	57	19
1946	32	59	59	21
1947	35	61	64	23
1948	39	63	68	28
1949	40	59	71	29
1950	43	66	75	31
1951	47	74	90	33
1952	48	76	92	34
1953	51	77	98	36
1954	50	81	101	36
1955	52	82	107	37
1956	55	86	111	34
1957	56	86	115	38
1958	58	89	123	40
1959	60	92	133	40
1960	62	95	132	43
1961	65	98	141	45
1962	67	97	147	47
1963	72	100	150	53
1964	80	104	163	61
1965	90	111	175	71
1966	100	119	195	76
1967	111	123	224	89
1968	120	132	258	94
1969	122	—	—	—

¹Weighted average, using acreages of farmland in provinces as weights.

Source: Dominion Bureau of Statistics, special data from Agriculture Division, Finance Section; and *Census of Canada, Agriculture*, various years.

TABLE A.16—DERIVATION OF DETAILED PRODUCTIVITY INDEXES FOR SELECTED AGRICULTURAL INPUTS

	Adjusted Gross Value of Agricultural Production			Index of Adjusted Agricultural Output (1951=100)
	Adjusted Value of Agricultural Output ¹	Index of Prices Received for Farm Products ² (1935-39=100)	Adjusted Value of Agricultural Output Deflated by Farm Prices Index (1) ÷ (2)	
	(1) (\$ Million)	(2)	(3) (\$ Million)	(4)
1926	1,095.3	144.4	758.5	71.6
1927	1,139.1	138.6	821.9	77.5
1928	1,167.7	136.3	856.7	80.8
1929	932.6	140.8	662.4	62.5
1930	855.7	119.5	716.1	67.5
1931	549.3	78.9	696.2	65.7
1932	503.6	65.5	768.8	72.5
1933	471.7	69.3	680.7	64.2
1934	580.6	83.5	695.3	65.6
1935	625.1	88.0	710.3	67.0
1936	637.7	96.9	658.1	62.1
1937	721.0	119.7	602.3	56.8
1938	782.8	105.0	745.5	70.4
1939	864.9	91.8	942.2	88.9
1940	934.6	96.8	965.5	91.1
1941	946.6	110.2	858.9	81.0
1942	1,575.8	133.1	1,183.9	111.7
1943	1,391.4	157.8	881.7	83.2
1944	1,772.8	172.4	1,028.3	97.0
1945	1,575.2	185.7	848.2	80.0
1946	1,894.3	204.1	928.1	87.5
1947	1,995.0	215.8	924.5	87.3
1948	2,380.5	255.8	930.6	87.8
1949	2,229.8	255.4	873.0	82.4
1950	2,523.9	260.8	967.7	91.3
1951	3,145.4	296.8	1,059.8	100.0
1952	3,275.9	274.4	1,193.9	112.6
1953	2,890.1	250.4	1,154.2	108.9
1954	2,256.2	236.8	952.8	81.9
1955	2,590.7	232.7	1,113.3	105.0
1956	2,818.4	234.6	1,201.4	113.3
1957	2,460.8	234.2	1,050.7	99.2
1958	2,769.4	245.5	1,128.1	106.4
1959	2,736.8	247.4	1,106.2	104.3
1960	2,914.2	250.0	1,165.7	110.0
1961	2,605.0	261.2	997.3	94.0
1962	3,426.5	272.0	1,259.7	118.9
1963	3,735.7	268.4	1,391.8	131.3
1964	3,447.2	265.8	1,296.9	122.4
1965	3,850.6	282.2	1,365.0	128.8
1966	4,642.6	307.0	1,512.2	142.6
1967	4,071.7	304.7	1,336.3	126.0
1968	4,293.5	298.0	1,440.8	135.9

¹ Dominion Bureau of Statistics, Agricultural Division, unpublished series.

² Wholesale Price Index of Canadian Farm Products 1926-34 taken from M. C. Urquhart, K. A. H. Buckley (eds.), *Historical Statistics of Canada* (Series J 77). Index of Farm Prices of Agricultural Production for years 1935-50 from *Historical Statistics of Canada* (Series L 88); for 1950-69 from Economics Branch, Canada Department of Agriculture, *Canadian Farm Economics*, various years.

TABLE A.16—DERIVATION OF DETAILED PRODUCTIVITY INDEXES FOR
SELECTED AGRICULTURAL INPUTS (Continued)

	Output Related to Capital Employed			
	Total Capital on Farms ³	Deflator for Capital (Table A.16-1, Col. 6)	Total Capital on Farms (5) ÷ (6)	Output per Constant \$ Million Total of Capital (3) ÷ (7)
	(5) (Current \$ Million)	(6)	(7) (Constant \$ Million)	(8)
1926	6,151	142.2	4,326	.18
1927	6,230	145.4	4,285	.19
1928	6,300	145.4	4,333	.20
1929	6,313	142.2	4,440	.15
1930	5,849	125.6	4,657	.15
1931	5,256	112.1	4,689	.15
1932	4,733	98.7	4,795	.16
1933	4,443	98.3	4,520	.15
1934	4,464	95.6	4,669	.15
1935	4,523	99.0	4,569	.16
1936	4,390	99.5	4,412	.15
1937	4,384	99.4	4,410	.14
1938	4,214	100.9	4,176	.18
1939	4,299	104.1	4,130	.23
1940	4,214	101.2	4,164	.23
1941	4,247	105.2	4,037	.21
1942	4,681	109.6	4,271	.28
1943	5,275	116.8	4,516	.20
1944	5,490	123.6	4,442	.23
1945	5,580	122.9	4,540	.19
1946	5,878	130.2	4,515	.21
1947	6,390	141.7	4,509	.21
1948	7,105	158.1	4,494	.21
1949	7,503	164.9	4,550	.19
1950	8,171	176.2	4,637	.21
1951	9,451	193.9	4,874	.22
1952	9,536	199.0	4,792	.25
1953	10,110	209.2	4,833	.23
1954	9,959	206.1	4,832	.20
1955	10,313	212.9	4,844	.23
1956	10,539	225.0	4,684	.26
1957	10,842	231.2	4,689	.22
1958	11,742	240.5	4,882	.23
1959	12,308	249.5	4,933	.22
1960	12,680	257.2	4,930	.24
1961	13,159	268.7	4,897	.20
1962	13,670	276.8	4,939	.26
1963	14,509	294.3	4,930	.28
1964	15,744	321.9	4,891	.27
1965	17,218	355.9	4,838	.28
1966	19,063	390.5	4,882	.31
1967	20,952	428.6	4,888	.27
1968	22,378	460.5	4,860	.30

³M. C. Urquhart, K. A. H. Buckley (eds.), *ibid.* (Series L 18) and DBS, *Quarterly Bulletin of Agricultural Statistics*, April-June 1966 and April-June 1969, Cat. No. 21-003, Newfoundland not included in totals.

TABLE A.16—DERIVATION OF DETAILED PRODUCTIVITY INDEXES FOR
SELECTED AGRICULTURAL INPUTS (Continued)

Output Related to Machinery Employed					
	Value of Machinery on Farms ⁴	Deflator for Machinery (Table A.16-1, Col. 4)	Value of Machinery on Farms	Output per Constant \$ Million Value of Machinery (3) ÷ (12)	Index of Output per Constant \$ Million Value of Machinery (1951=100)
	(10) (Current \$ Million)	(11)	(12) (Constant \$ Million)	(13)	(14)
1926	665	97.6	681	1.11	107.8
1927	665	97.5	682	1.21	117.5
1928	665	97.6	681	1.26	122.3
1929	665	97.5	682	.97	94.2
1930	651	97.0	671	1.07	103.9
1931	651	94.9	686	1.01	98.1
1932	651	94.1	692	1.11	107.8
1933	574	92.1	623	1.09	105.8
1934	539	94.6	570	1.22	118.4
1935	534	95.5	559	1.27	123.3
1936	524	97.8	536	1.23	119.4
1937	527	97.2	542	1.11	107.8
1938	544	104.1	523	1.43	138.8
1939	547	103.6	528	1.78	172.8
1940	568	105.8	537	1.80	174.8
1941	596	109.1	546	1.57	152.4
1942	660	114.4	577	2.05	199.0
1943	722	117.1	617	1.43	138.8
1944	758	118.2	641	1.60	155.3
1945	827	115.1	719	1.18	114.6
1946	905	118.8	762	1.22	118.4
1947	1,027	126.3	813	1.14	110.7
1948	1,195	141.6	844	1.10	106.8
1949	1,416	158.3	894	.98	95.1
1950	1,681	165.1	1,018	.95	92.2
1951	1,932	186.8	1,034	1.03	100.0
1952	2,077	195.4	1,063	1.12	108.7
1953	2,258	196.7	1,148	1.01	98.1
1954	2,353	197.9	1,189	.80	77.7
1955	2,284	198.8	1,149	.97	94.2
1956	2,263	209.4	1,081	1.11	107.8
1957	2,371	223.8	1,059	.99	96.1
1958	2,441	236.1	1,034	1.09	105.8
1959	2,510	247.8	1,013	1.09	105.8
1960	2,575	253.5	1,016	1.15	111.7
1961	2,566	260.7	984	1.01	98.1
1962	2,660	268.1	992	1.27	123.3
1963	2,811	272.9	1,030	1.35	131.1
1964	3,016	279.6	1,079	1.20	116.5
1965	3,263	284.9	1,145	1.19	115.5
1966	3,549	293.1	1,211	1.25	121.4
1967	3,829	302.2	1,267	1.05	101.9
1968	4,027	313.7	1,284	1.12	108.7

⁴ M. C. Urquhart, K. A. H. Buckley (eds.), *ibid.* (Series L 16) and DBS, *Quarterly Bulletin of Agricultural Statistics*, April-June 1966 and April-June 1969, Cat. No. 21-003. Newfoundland not included in totals.

TABLE A.16—DERIVATION OF DETAILED PRODUCTIVITY INDEXES FOR
SELECTED AGRICULTURAL INPUTS (*Continued*)

	Output per Man		
	Number of Persons Employed in Agriculture ⁵	Output per Man (3) ÷ (15)	Index of Output per Man (1951=100)
	(15) (⁰⁰⁰)	(16)	(17)
1926	1,251	607	53.8
1927	1,284	640	56.7
1928	1,305	657	58.2
1929	1,307	507	44.9
1930	1,238	578	51.2
1931	1,216	572	50.7
1932	1,237	622	55.1
1933	1,257	541	47.9
1934	1,277	544	48.2
1935	1,298	547	48.4
1936	1,319	499	44.2
1937	1,339	450	39.9
1938	1,359	549	48.6
1939	1,379	683	60.5
1940	1,344	719	63.7
1941	1,224	702	62.2
1942	1,139	1,040	92.1
1943	1,118	789	69.9
1944	1,136	905	80.2
1945	1,144	741	65.6
1946	1,186	782	69.3
1947	1,122	824	73.0
1948	1,096	849	75.2
1949	1,077	811	71.8
1950	1,018	951	84.2
1951	939	1,129	100.0
1952	891	1,340	118.7
1953	858	1,345	119.1
1954	878	1,085	96.1
1955	819	1,359	120.4
1956	777	1,546	136.9
1957	748	1,405	124.4
1958	718	1,571	139.1
1959	700	1,580	139.9
1960	683	1,707	151.1
1961	681	1,464	129.7
1962	660	1,909	169.1
1963	649	2,145	190.0
1964	630	2,059	182.4
1965	594	2,298	203.5
1966	544	2,779	246.1
1967	559	2,390	211.7
1968	546	2,639	233.7

⁵ M. C. Urquhart, K. A. H. Buckley (eds.), *ibid.* (Series C 53) and DBS, Special Surveys Division, The Labour Force, Cat. No. 71-001, Supplement, Newfoundland included beginning in 1950.

TABLE A.16—DERIVATION OF DETAILED PRODUCTIVITY INDEXES FOR
SELECTED AGRICULTURAL INPUTS (*Concluded*)

	Output per Acre		
	Number of Acres of Improved Land ⁶	Output per Acre (3) ÷ (18)	Index of Output per Acre (1951=100)
	(18) (‘000)	(19)	(20)
1926			
1927			
1928			
1929			
1930			
1931	85.7	81.2	74.2
1932			
1933			
1934			
1935			
1936			
1937			
1938			
1939			
1940			
1941	91.6	93.8	85.7
1942			
1943			
1944			
1945			
1946			
1947			
1948			
1949			
1950			
1951	96.9	109.4	100.0
1952			
1953			
1954			
1955			
1956	100.3	119.8	109.5
1957			
1958			
1959			
1960			
1961	103.4	96.5	88.2
1962			
1963			
1964			
1965			
1966	108.2	139.8	127.8
1967			
1968			

⁶DBS, 1966 Census of Canada, Table 2.

TABLE A.16-1—DERIVATION OF DEFLATOR FOR CAPITAL, USED IN TABLE A.16

	Average Value of Farmland per Acre ¹	Land Value Index Derived from (1) (1935-39=100)	Land Value Index, Weighted by Proportion of Capital Represented by Land ²	Machinery Cost Index (1935-39=100) ³	Machinery Cost Index, Weighted by Proportion of Capital Represented by Machinery ²	Deflator for Capital (3) + (5)
	(1)	(2)	(3)	(4)	(5)	(6)
1926	37	154.2	121.5	97.6	20.7	142.2
1927	38	158.3	124.7	97.5	20.7	145.4
1928	38	158.3	124.7	97.6	20.7	145.4
1929	37	154.2	121.5	97.5	20.7	142.2
1930	32	133.3	105.0	97.0	20.6	125.6
1931	28	116.7	92.0	94.9	20.1	112.1
1932	24	100.0	78.8	94.1	19.9	98.7
1933	24	100.0	78.8	92.1	19.5	98.3
1934	23	95.8	75.5	94.6	20.1	95.6
1935	24	100.0	78.8	97.8	20.7	99.0
1936	24	100.0	78.8	97.8	20.7	99.5
1937	24	100.0	78.8	97.2	20.6	99.4
1938	24	100.0	78.8	104.1	22.1	100.9
1939	25	104.2	82.1	103.6	22.0	104.1
1940	24	100.0	78.8	105.8	22.4	101.2
1941	25	104.2	82.1	109.1	23.1	105.2
1942	26	108.3	85.3	114.4	24.3	109.6
1943	28	116.7	92.0	117.1	24.8	116.8
1944	30	112.0	98.5	118.2	25.1	123.6
1945	30	125.0	98.5	115.1	24.4	122.9
1946	32	133.3	105.0	118.8	25.2	130.2
1947	35	145.8	114.9	126.3	26.8	141.7
1948	39	162.5	128.1	141.6	30.0	158.1
1949	40	166.6	131.3	158.3	33.6	164.9
1950	43	179.2	141.2	165.1	35.0	176.2
1951	47	195.8	154.3	186.8	39.6	193.9
1952	48	200.0	157.6	195.4	41.4	199.0
1953	51	212.5	167.5	196.7	41.7	209.2
1954	50	208.3	164.1	197.9	42.0	206.1
1955	52	216.7	170.8	198.8	42.1	212.9
1956	55	229.2	180.6	209.4	44.4	225.0
1957	56	233.3	183.8	223.8	47.4	231.2
1958	58	241.7	190.5	236.1	50.0	240.5
1959	60	250.0	197.0	247.8	52.5	249.5
1960	62	258.3	203.5	253.5	53.7	257.2
1961	65	270.8	213.4	260.7	55.3	268.7
1962	67	279.2	220.0	268.1	56.8	276.8
1963	72	300.0	236.4	272.9	57.9	294.3
1964	80	333.3	262.6	279.6	59.3	321.9
1965	90	375.0	295.5	284.9	60.4	355.9
1966	100	416.7	328.4	293.1	62.1	390.5
1967	111	462.5	364.5	302.2	64.1	428.6
1968	120	500.0	394.0	313.7	66.5	460.5
1969	122	508.3	400.5	324.1	68.7	469.2

¹ Taken from unpublished data on land values, Dominion Bureau of Statistics, Agriculture Division.² Weights derived from 1966 *Census of Canada* data, value of land \$13,150 million; value of machinery \$3,549 million, respectively 78.8 per cent and 21.2 per cent.³ Table A.8.

Appendix B

ECONOMIES OF SCALE IN CANADIAN FARMING

This appendix presents some evidence with respect to economies of scale in Canadian farming. It covers wheat farms, cash grain farm (grains other than wheat), milk farms, cattle farms, and hog farms in various parts of Canada. Farms have been classified by type on the basis of receiving 50 per cent or more of their sales revenue from one of those categories. The data used were those obtained by the Dominion Bureau of Statistics in its 1958 *Farm Income and Expenditure Survey*. The data satisfied many of the requirements of a good statistical analysis of economies of scale. The sample was large; it included farms ranging from very small to very large, and farms were chosen to give the correct proportional representation to farms of different sizes. Table B.1 summarizes the sample size for each of the relationships that were analyzed.

Economies of scale were analyzed by relating total cost and total machinery cost to gross income and total acreage for a number of different types of farming in different areas of Canada. For purposes of this analysis the following definitions were adopted. Gross Income includes sales of products and services, net change in inventory of crops and livestock, value of income in kind, supplementary payments and custom work. Total Cost, excluding rent and interest paid, includes an estimated 5 per cent return on the value of farm real estate (excluding the farm house and farm buildings rented to others), farm machinery, and livestock. It includes an allowance for the operator's own labour and unpaid family labour, estimated at \$40 per week for the number of weeks worked. These adjustments remove the effects that would be introduced by different tenure arrangements, amounts of indebtedness and degrees of family labour use.

An allowance for depreciation was included at 4 per cent for farm buildings; 10 per cent for tractors, self-propelled combines, trucks, and the farm share of the passenger automobile; and 7 per cent for other types of machinery. Fixed costs such as taxes, licence fees and insurance, and all other operating expenses, were also included.

Machinery Cost includes a return on the capital value of the machinery on the farm estimated at 5 per cent and depreciation estimated as above. Licence fees,

TABLE B.1—NUMBER OF FARMS BY RELATIONSHIPS ANALYZED
AND BY AREA, CANADA, 1958

Type of Farm and Location	Cost-Gross Income	Cost-Acres	Machinery Cost-Gross Income	Machinery Cost-Acres
Wheat				
Manitoba	140	140	140	140
Saskatchewan	653	653	653	653
Alberta	158	158	158	158
Cash Grain				
Ontario	79	—	79	79
Manitoba	196	—	196	196
Saskatchewan	—	—	262	262
Alberta	171	—	171	171
Milk				
Nova Scotia	41	—	41	—
Quebec	315	—	315	—
Ontario	310	—	310	—
British Columbia	91	—	91	—
Cattle				
Ontario	294	—	294	—
Manitoba	100	—	100	—
Saskatchewan	92	—	92	—
Alberta	201	—	201	—
British Columbia	84	—	84	—
Hogs				
Quebec	65	—	—	—
Ontario	95	—	—	—
Alberta	127	—	—	—

registration costs, insurance, fuel, repairs, and other machine operating costs are also included.

Linear and non-linear hypotheses about the cost-scale relationship were tested by including first-, second-, and third-degree terms in gross income, or improved acres. The first-degree term captures a linear relationship, while the second- and third-degree terms capture a non-linear relationship. Thus we may write

$$Y = a + bX + cX^2 + dX^3 + U$$

where Y is gross income or improved cost,

X is gross income or improved acres, and

U reflects the influence of the random factors, which may be large in agriculture, as it is a biological industry.

Stepwise, least-squares regression method was used. It relates the influence of one variable at a time to the dependent variable.

Table B.2 presents the regression equations obtained from this analysis and the coefficients of determination for different types of farms in various locations in Canada. Average cost relationships derived from these regression equations are presented for a number of farm types and locations in Figures B.1 to B.5.

In nearly all cases the relations between total cost and total machinery cost on the one hand and total output or total acreage on the other is linear or almost linear. Where a quadratic or cubic term appears it is invariably very small. Where total cost is regressed against both gross income and total improved acreage the former regression in most instances provides a higher coefficient of determination. The same is true with respect to total machinery cost.

As is evident in Figure B.1 the average cost curves derived from the total cost functions fall rapidly at first and then tend to approach a horizontal straight line. This indicates that as the average farm size increases, average costs fall rapidly at first, but beyond a certain size, average costs change very little with increased size. For wheat farms in Saskatchewan in 1958, the data show little decline in costs per unit of output for increases in farm size beyond an annual income of \$10,000. A similar kind of relationship appears to hold for total machinery cost in relation to farm size measured in gross income. This general pattern was fairly similar for each of the farm types analyzed. However, machinery costs were a much less important component of cost in the case of farms whose major crop was livestock or livestock products.

TABLE B.2—REGRESSION RESULTS, TOTAL COST, AND TOTAL MACHINERY FUNCTIONS

	Y	a	bX	cX ²	dX ³	R ²
$Y = (a, bX, cX^2, dX^3)$						
Wheat Farms						
T.C. — Output	Y =	1,690.44	1.311 (0.203) ¹	-0.000069 (0.000019) ¹	0.000000000000098 (0.000000000000028) ¹	0.661
Manitoba						
Saskatchewan	Y =	3,285.11	0.629 (0.0185) ¹			0.640
Alberta	Y =	2,772.80	0.709 (0.0314) ¹			0.765
T.M.C. — Output						
Manitoba	Y =	792.10	0.229 (0.0149) ¹			0.632
Saskatchewan	Y =	1,089.92	0.217 (0.0084) ¹			0.510
Alberta	Y =	1,013.33	0.178 (0.0258) ¹	0.000027 (0.00000069) ¹		0.775
T.C. — Acres						
Manitoba	Y =	2,293.80	12.055 (0.840) ¹			0.599
Saskatchewan	Y =	3,287.04	5.849 (0.724) ¹	0.0013 (0.00039) ¹	-0.0000000000075 (0.0000000000011) ¹	0.576
Alberta	Y =	1,939.57	12.557 (1.2999) ¹	-0.00196 (0.00042) ¹	0.0000000000086 (0.00000000000047)	0.570
T.M.C. — Acres						
Manitoba	Y =	447.72	4.726 (0.280) ¹			0.675
Saskatchewan	Y =	932.13	2.145 (0.341) ¹	0.00089 (0.00024) ¹	-0.00000022 (0.000000039)	0.570
Alberta	Y =	301.47	4.942 (0.6029) ¹	-0.00094 (0.00026) ¹	0.000000046 (0.000000026) ²	0.530

Cash Grain Farms

T.C. - Output

Ontario	Y =	1,534.59	1.095 (0.1986) ¹	-0.0000297 (0.0000148) ²	0.0000000036 (0.00000000175) ²	0.903
Manitoba	Y =	2,450.71	1.140 (0.274) ¹	-0.000074 (0.000032) ²	0.0000000025 (0.0000000010) ²	0.482
Alberta	Y =	2,340.32	0.929 (0.080) ²	-0.000022 (0.0000045)	0.0000000003 (0.00000000054)	0.879

T.M.C. - Output

Ontario	Y =	592.22	0.202 (0.0275) ¹	-0.0000092 (0.00000043) ²		0.703
Manitoba	Y =	968.85	0.186 (0.0149) ¹			0.440
Saskatchewan	Y =	182.16	0.511 (0.039) ¹	-0.000023 (0.0000024) ¹	0.0000000000000016 (0.0000000000000011) ¹	0.818
Alberta	Y =	1,092.29	0.188 (0.010) ¹			0.676

T.M.C. - Acres

Ontario	Y =	209.03	15.191 (1.413) ¹			0.600
Manitoba	Y =	505.42	4.757 (0.2635) ¹			0.627
Saskatchewan	Y =	97.11	5.000 (0.2677) ¹		-0.000000011 (0.0000000009)	0.592
Alberta	Y =	555.25	4.910 (0.348) ¹		-0.000000013 (0.0000000011) ¹	0.544

TABLE B.2—REGRESSION RESULTS, TOTAL COST, AND TOTAL MACHINERY FUNCTIONS—Continued

	Y	a	Y = (a, bX, cX ² , dX ³)			dX ³	R ²
			bX	cX ²			
Milk Farms							
T.C. — Output							
Nova Scotia	Y =	3,159.51	0.643 (0.0798) ¹				0.625
Quebec	Y =	3,600.66	0.474 (0.137) ¹	0.00004 (0.00001) ¹		-0.00000000001 (0.00000000002) ¹	0.691
Ontario	Y =	1,476.67	1.210 (0.099) ¹	-0.00003 (0.000005) ¹		0.00000000005 (0.00000000007) ¹	0.868
B.C.	Y =	4,038.00	0.400 (0.156) ²	0.00002 (0.000006) ¹		-0.00000000003 (0.00000000006)	0.867
T.M.C. — Output							
Nova Scotia	Y =	424.99	0.110 (0.0231) ¹				0.370
Quebec	Y =	281.73	0.111 (0.028) ¹	0.000008 (0.000002) ¹		-0.00000000002 (0.00000000003) ¹	0.660
Ontario	Y =	35.76	0.267 (0.0255) ¹	-0.00000086 (0.0000014) ¹		0.00000000001 (0.00000000002) ¹	0.731
B.C.	Y =	299.48	0.249 (0.388) ¹	-0.000007 (0.000002) ¹		0.00000000008 (0.00000000002)	0.837
Cattle Farms							
T.C. — Output							
Ontario	Y =	2,447.61	0.915 (0.0392) ¹	0.0000024 (0.00000078) ¹			0.917
Manitoba	Y =	2,147.59	0.996 (0.0599) ¹			-0.00000000001 (0.00000000005)	0.887
Saskatchewan	Y =	4,005.31	0.717 (0.047) ¹				0.721
Alberta	Y =	3,658.86	0.697 (0.0219) ¹				0.836
B.C.	Y =	2,118.83	0.736 (0.0699) ¹				0.575

T.M.C. - Output						
Ontario	Y =	545.76	0.098 (0.007) ¹	-0.0000000000076 (0.0000000000022) ¹	0.495	
Manitoba	Y =	43.02	0.375 (0.030) ¹	-0.000007 (0.00000096) ¹	0.710	
Saskatchewan	Y =	771.96	0.228 (0.0145) ¹		0.732	
Alberta	Y =	650.36	0.226 (0.0339) ¹	-0.000005 (0.0000012) ¹	0.568	
B.C.	Y =	190.82	0.189 (0.031) ¹	-0.0000000000064 (0.0000000000030) ¹	0.513	
Hog Farms						
T.C. - Output						
Quebec	Y =	242.34	1.591 (0.265) ¹	-0.000047 (0.000019) ²	0.886	
Ontario	Y =	2,939.78	0.680 (0.0998) ¹	0.000011 (0.000004) ²	0.957	
Alberta	Y =	5,055.94		0.00007 (0.00001) ¹	0.712	

T.C. - total cost.

T.M.C. - total machinery cost.

Y - regression values, estimated total cost or estimated total machinery cost, dollars.

X - gross income in dollars or improved acres.

Note: Values in parentheses are standard errors.

¹ Significant at 1 per cent level.² Significant at 5 per cent level.

FIGURE B.1- SASKATCHEWAN WHEAT FARMS

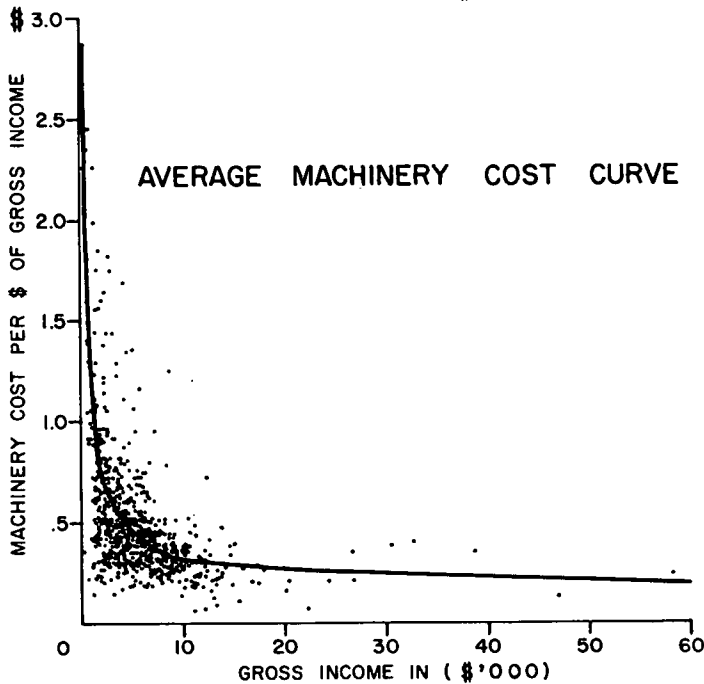
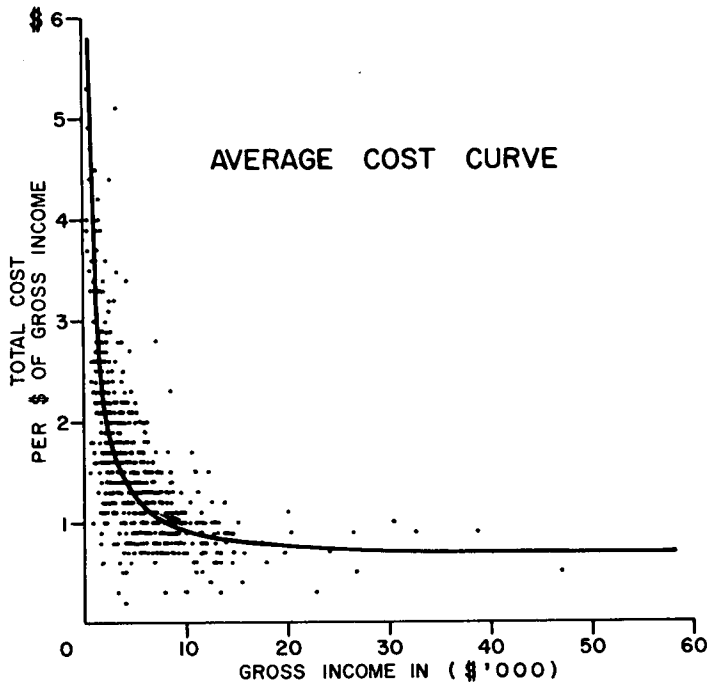


FIGURE B.2—SASKATCHEWAN WHEAT FARMS
(IMPROVED ACRES)

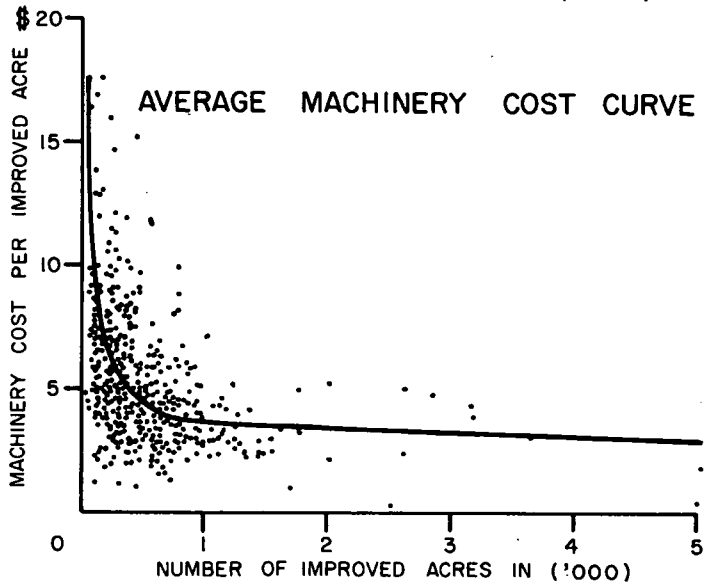
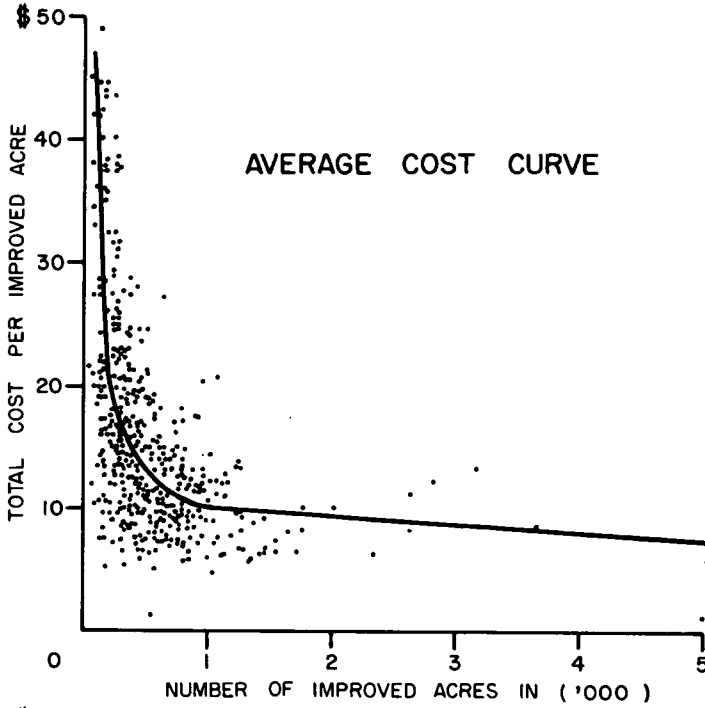


FIGURE B.3-ONTARIO CASH GRAIN FARMS

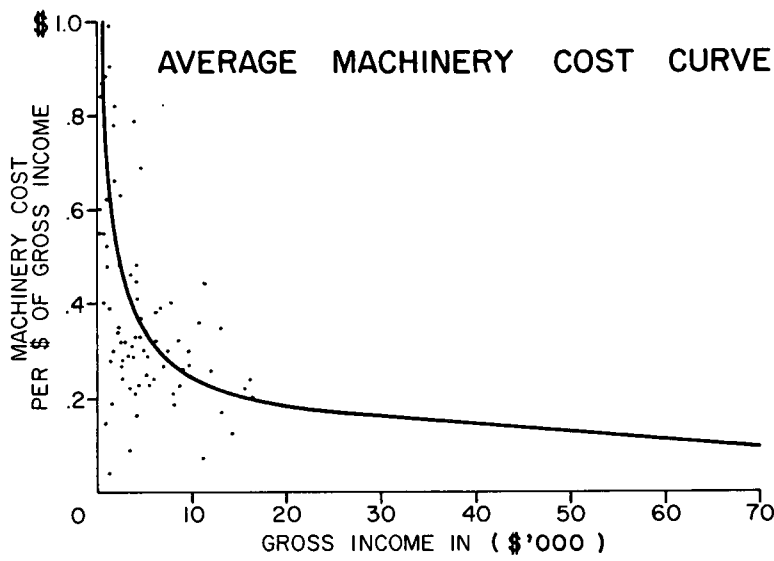
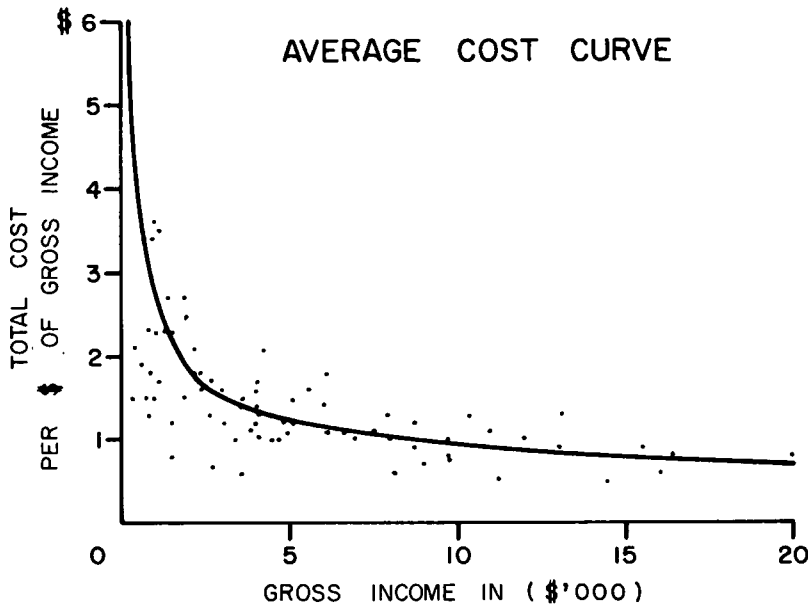


FIGURE B.4 – ONTARIO MILK FARMS

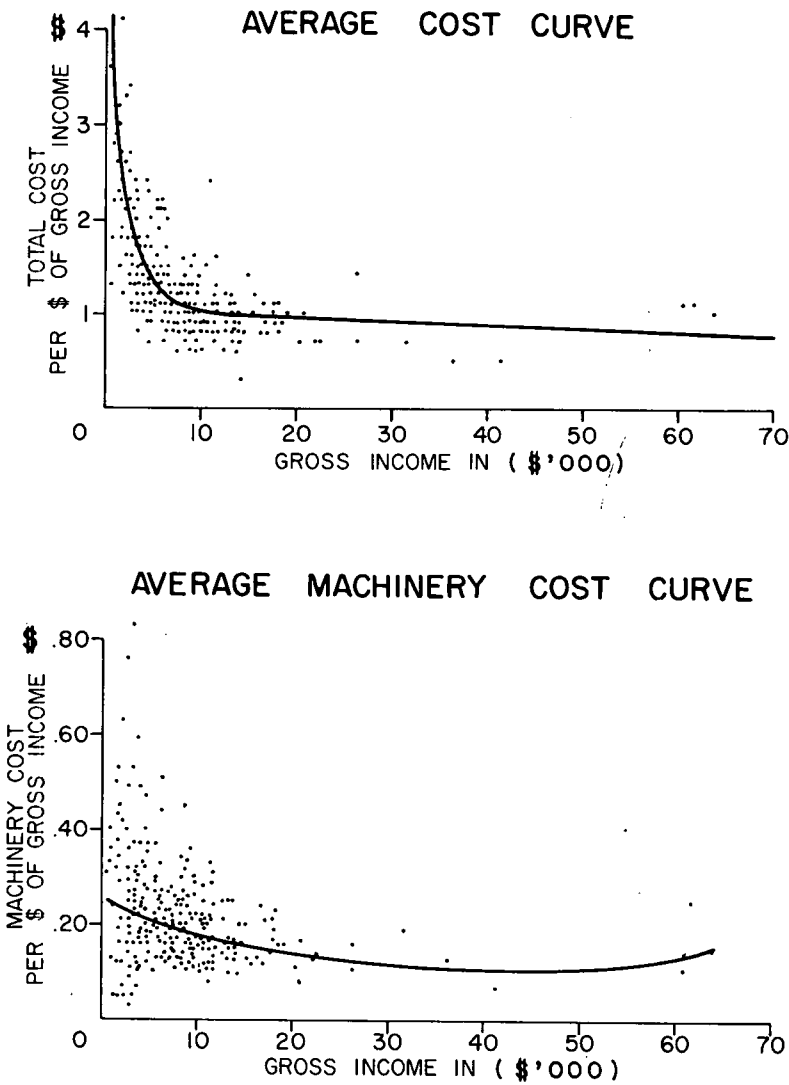
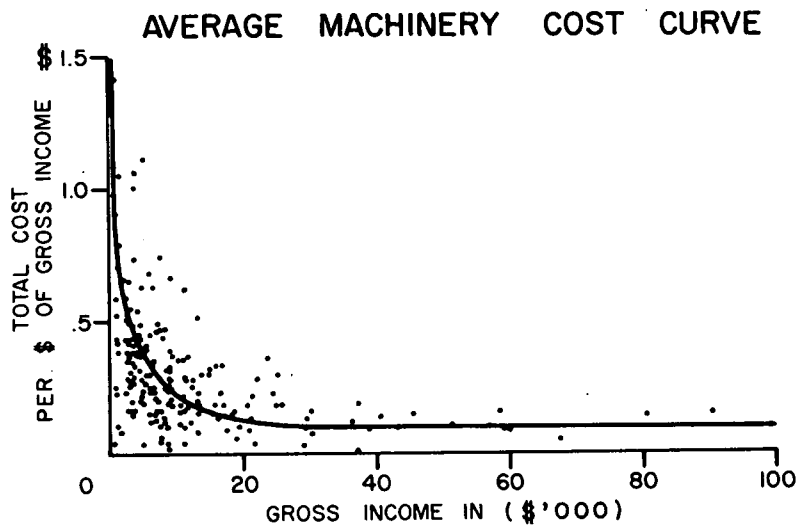
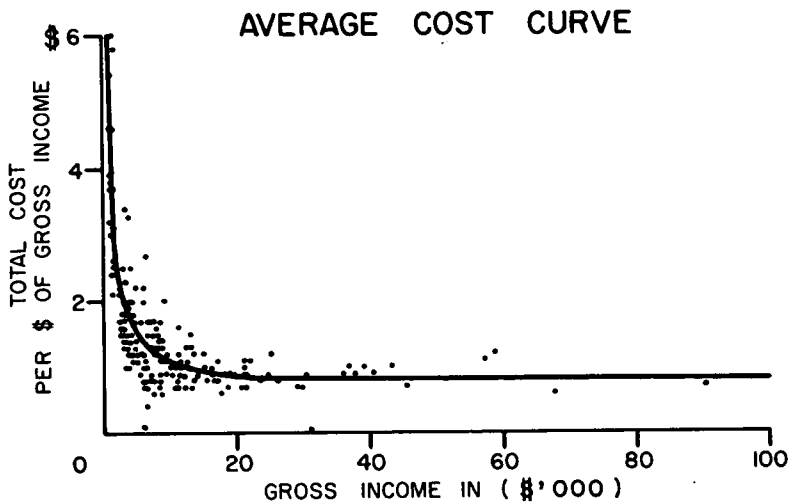


FIGURE B.5—ALBERTA CATTLE FARMS



Appendix C

PRESENTATIONS AND SUBMISSIONS MADE TO THE ROYAL COMMISSION ON FARM MACHINERY AT PUBLIC HEARINGS

* Oral presentation only

‡ Partly or wholly in-camera

WINNIPEG

March 6 and 7, 1967

Government of Manitoba

Manitoba Farm Bureau

Manitoba Farmers' Union

Western Manitoba Farm Business Association

EDMONTON

March 13-15, 1967

Alberta Department of Agriculture

Professor F. V. MacHardy, Private Brief

Professor H. P. Harrison, Private Brief

Professor T. A. Preston, Private Brief

Alberta Federation of Agriculture

Farmers' Union of Alberta

CALGARY

March 16 and 17, 1967

Robin-Nodwell Mfg. Ltd.

United Farmers of Alberta Co-operative Ltd.

Alberta Wheat Pool

Alberta Retail Implement Dealers' Association

Mr. M. H. C. Ford, Private Brief

Mr. J. C. Rogers, Private Brief

VICTORIA

March 20, 1967

Government of British Columbia, Department of Agriculture

British Columbia Federation of Agriculture

VANCOUVER

March 21, 1967

Mr. W. Pekonen, Private Brief
Farmers' Union of British Columbia

REGINA

March 28 and 29, 1967

Government of Saskatchewan, Department of Agriculture
Mr. J. R. Knelsen, Private Brief
Mr. D. L. Trapp, Private Brief
Saskatchewan Federation of Agriculture
Saskatchewan Wheat Pool

SASKATOON

March 30, 1967

Saskatchewan Farmers Union
Saskatchewan Implement Dealers Association
Mr. L. Kolbinson, Private Brief
Professor O. L. Symes, Private Brief

FREDERICTON

April 3, 1967

Province of New Brunswick
New Brunswick Federation of Agriculture

CHARLOTTETOWN

April 5, 1967

The P.E.I. Federation of Agriculture

HALIFAX

April 7, 1967

Nova Scotia Department of Agriculture and Marketing
The Nova Scotia Federation of Agriculture, Farm Machinery Committee
Scotian Gold Co-operative Limited, Machine Shop Division

ST. JOHN'S

April 10, 1967

The Newfoundland Co-operative Union and The Newfoundland
Producers Co-operative Society, Combined Brief

QUEBEC CITY

April 17, 1967

Professor J.-M. Fortin

MONTREAL

April 19, 1967

Mr. Alfred G. Morrison

REGINA

October 12 and 13, 1967

The Saskatchewan Association of Rural Municipalities and The Agricultural
Economics Department of the University of Saskatchewan
The Canadian Federation of Farm Equipment Dealers
Mr. Fred J. Schneider, Private Brief
Western Manitoba Farm Business Association
Communist Party of Canada, Central Committee

OTTAWA

October 23 and 24, 1967

J. I. Case Company
John Deere Limited†

TORONTO

October 30-November 2, 1967

Ontario Farm Machinery Advisory Board, representing the Ontario Department
of Agriculture and Food and the Province of Ontario
The Ontario Federation of Agriculture
Ontario Farmers' Union
Cosmos Imperial Mills Limited
George White & Sons Co. Limited
Mr. Alan M. Heisy, Private Brief

OTTAWA

November 13-16, December 11-14, 1967, and
January 8-10, 15, 16, 18, and 19, 1968

Cockshutt Farm Equipment of Canada Limited
Minneapolis-Moline of Canada, Ltd.
New Holland Division of Sperry Rand Corporation†
Ford Motor Company of Canada, Limited, Tractor and Equipment Operations†
International Harvester Company of Canada, Limited†
The Canadian Co-operative Implements Ltd.

Holiday Farm – Machinery Testing, Rental and Repair Service
Allis-Chalmers, Rumely, Ltd.
Massey-Ferguson Industries Limited
The National Committee on Agricultural Engineering
Canadian Labour Congress
National Farmers Union
The Canadian Federation of Agriculture
Avco New Idea Farm Equipment*†
Farm Equipment Manufacturers Association

Appendix D

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LIST OF TABLES

Table	Page
3.1 Gross Sales of Farm Machinery and Parts, Canada, 1926-35	39
3.2 Production and Sales of Farm Machinery, Canada, By Type, 1941	40
5.1 Importance of Various Reasons in Influencing Farm Operators' Decisions to Purchase Farm Machinery Where They Do	58
5.2 Extent to Which Various Sources of Information About Farm Machinery Are Utilized by Farm Operators	60
5.3 Importance of Various Reasons in Influencing Farm Operators' Decisions to Purchase Most Recent Unit of Farm Machinery	61
5.4 Sales of Farm Machinery, Canada, Major Machines, 1949 and 1967	66
5.5 Shipments of Farm Machinery for Domestic Use, United States, 1966	68
5.6 Estimated Production of Tractors and Other Farm Machinery, North America and Western Europe, 1965	71
6.1 Seasonality of Retail Sales of Farm Machinery in Comparison with Retail Sales of Motor Vehicles (Averages 1965-67, Canada)	75
6.2 Annual Sales of Tractors, by Country, 1950-66, with a Forecast for 1970 . . .	79
7.1 Estimated Economies of Scale in Tractor Manufacturing, North America, 1967-68	88
7.2 Estimates of Rates of Return on Investment in Tractor Plants, by Production Volume and Make-Buy Mix	89
7.3 Estimated Unit Costs of Farm Tractors by Type of Cost and Volume of Output	90
7.4 Reduction in Unit Tractor Costs as Volume Increases	91
7.5 Total Unit Costs of Farm Tractors by Volume of Output and by Manufacturing Process and Function	93
7.6 Percentage of Value Added, by Plant Process, Tractors and Combines, North America, 1968	94
7.7 Index of Economies of Scale in Combine Manufacturing Costs, Canada, by Volume of Output	95
7.8 Breakdown of Combine Manufacturing Costs at 10,000-Unit Volume	102
7.9 Index of Combine Machining Operations Costs	103
7.10 Index of Combine Stamping Operations Costs	104
7.11 Index of Estimated Costs of Purchased Parts for Combines	105
7.12 Index of Estimated Costs of Combine Assembly Operations	105
7.13 Index of Estimated Costs of Combine Manufacturing Operations	106
7.14 Index of Estimated Costs of Combines by Cost Factor	106

Table		Page
8.1	Concentration Ratios for Farm Machinery Sales, Canada and Provinces, 1967, and Percentage of Total Sales Accounted for by Provinces, 1957-67	111
8.2	Percentage of Annual Sales in Canada of Farm Machinery, Including Repair Parts, Accounted for by the Big Three, and by the Six and Eight Largest Firms, 1957-67	112
8.3	Concentration Ratios for Farm Machinery in Canada, by Product Groups, 1967, and Percentage of Total Sales Accounted for by Product Groups, 1957-67	113
8.4	Percentage of Annual Sales of Swathers and Windrowers; Haying Machinery; Plows; Tilling, Cultivating, and Weeding Machinery; and Planting, Seeding and Fertilizing Machinery; in Canada, by Big Three, and by the Four, Six, and Eight Largest Firms, 1957-67	114
8.5	Percentage of Annual Sales of Combines in Canada, by Big Three, and by the Four, Six, and Eight Largest Firms, 1957-67	115
8.6	Percentage of Annual Sales of Wheeled Tractors in Canada, by Big Three, and by the Four, Six, and Eight Largest Firms, 1957-67	116
8.7	Concentration Ratios for Tractors and Combines, Canada and Five Provinces, 1967	117
8.8	Concentration Ratios for Wheeled Tractors, by Size Class, Canada, 1962-67 . .	118
8.9	Concentration Ratios for Farm Machinery and Equipment, Canada and the United States Compared, Selected Years	119
8.10	Percentage of Tractors Sold in Various Western European Countries, Accounted for by Largest Companies, and Total Number of Tractors Sold in Each Country, 1964	122
8.11	Share of North American Farm Machinery Market, Leading Firms, 1967 . . .	123
9.1	Share of Canadian Farm Machinery Sales Accounted for by the Big Three, by Product Lines, 1957-67	130
9.2	Market Share of the Big Three, Tractors, by Size Group, 1957-67	131
9.3	World Production of Wheeled Tractors, Actual and Estimated, 1966	132
9.4	Gross Margin for Distribution and Other Costs Including Profit, by Size of Tractor and Level of Annual Output, North American Tractor Manufacturing Costs	135
9.5	Comparison of North American and European Tractor Manufacturing Costs at Annual Output Levels of 20,000, 60,000, and 90,000 as of 1967	136
9.6	Estimated Profitability of Tractor Manufacturing in Britain, Based on British Prices and Costs, 1967 and 1968 Selling Seasons	138
9.7	Largest Horsepower Size Offered for Sale, Wheeled Tractors, Major Manufacturers, 1949-69	140
9.8	Diesel Tractors Price per Horsepower, Big Three and Other Firms Compared and Companies with Lowest Priced Models, by Horsepower Groups, Canada, 1967 Selling Season	141
9.9	Comparison of Self-Propelled Combine Prices, Canada, 1968 Selling Season . .	143
9.10	World Production of Combines in 1965, Actual and Estimated	144

Table	Page
9.11 Difference in Market Share Between Best and Worst Year, by Company and Product Line, Canada, 1957-67	148
9.12 Basic Farm Tractor Models and Tractor Model Variations Available, Selected Companies, North America, 1946, 1956, and 1967	149
9.13 Price Changes, Timing of and Percentage Change, One Selling Season Over Previous Selling Season, Major Companies and Product Lines, Canada, 1963-68 Selling Seasons	152
9.14 Suggested Retail and Net Wholesale Prices of Farm Tractors, Canada and Britain, 1970 Selling Season	156
9.15 Suggested Retail and Net Wholesale Prices of Farm Tractors in Britain as Percentage of Canadian Prices, 1966-70 Selling Seasons	158
10.1 Price Levels in the Canadian Farm Machinery Industry	161
10.2 Extent of Joint Franchises in Saskatchewan, by Company, 1967	164
10.3 Number of Farm Machinery Dealer Franchises, Group I and II Companies, Canada 1950, 1955, 1962-69	165
10.4 Statistics on Dealers, Classified by Sales Size, 1967	170
10.5 Significant Farm Machinery Dealership Statistics and Ratios by Size of Dealership in Sales Dollars	172
10.6 Sales per Employee, by Size of Dealership and Geographic Area, Farm Machinery, Canada, 1961	173
10.7 Profit and Related Data for Farm Machinery Dealers, 1947-67	176
10.8 Branch Office Marketing Costs as Percentage of Net Sales, Nine Major Full-Line and Long-Line Farm Machinery Manufacturers, Canada, 1962 and 1966	178
10.9 Selling, General and Administrative Expenses, Selected Canadian and International Farm Machinery Companies, 1960-67	180
10.10 Turnover Rates of Wholesale Distribution Assets of Canadian Farm Machinery Firms, by Group, 1960-66	181
10.11 Trends in U.S. Manufacturers' Sales Branches and Offices, 1939-63	183
11.1 Income Statements of Finance Subsidiaries of Five Major Farm Machinery Firms, 1965	197
12.1 Worldwide Sales of All Products, Farm Machinery Sales, and North American Sales, Six Major Companies, 1967	203
12.2 Sales Percentages for Major Product Lines, Six Major Farm Machinery Companies, 1967	204
12.3 Percentage of Company Sales and Assets Outside North America, Three Major Farm Machinery Companies, Selected Years, 1957-69	205
12.4 Indicators of Investment in Fixed Assets and Capital Expenditures, Six Major Farm Machinery Companies, Various Periods, 1957-67	206
12.5 Operating Profits as Percentage of Net Sales, Six Major Farm Machinery Companies, 1947-56, 1957-67, 1963-67, 1968, and 1969	207
12.6 Costs and Profits of Farm Machinery Companies per \$100 Sales	208

Table	Page
12.7 Balance Sheet Structure, 1957 and 1967, Six Major Farm Machinery Firms, Including and Excluding Finance Subsidiaries	209
12.8 Ten-Year Cash Flow, Major Farm Machinery Firms, 1957-67 Consolidated Data Including Finance Subsidiaries	210
12.9 Net Income, Assets Employed, Return on Investment and Return on Total Assets, Six Major Farm Machinery Companies, Including Finance Subsidiaries, Expressed as Percentage of Sales, 1963-67	211
12.10 Return on Investment and Return on Total Assets, Six Major Farm Machinery Firms, 1946-67	213
12.11 Average Rates of Return on Total Assets (Book Values) in Various Industries in the United States, 1948-57 and 1958-65	213
12.12 Return on Assets of Canadian Farm Machinery Firms by Group, 1960-66 (Group III, 1963-68)	216
12.13 Comparative Profitability Data: Return on Assets and Return on Investment of Five Major Farm Machinery Firms and Selected U.S. Manufacturing Industries, Averages for 1957-67	217
12.14 Assets Employed per \$100 Sales, Groups of Canadian Companies, 1960-66 Averages	218
12.15 Gross and Operating Profits as a Percentage of Sales, and Operating Profits as a Percentage of Total Assets, Deere and Versatile, 1965-67 and 1967-69 . .	219
12.16 Estimated Worldwide Profits Before Taxes and Interest on Canadian Domestic Sales of Farm Machinery, 1966	222
12.17 Gross and Net Profits Before Tax on Wholegoods and Repair Parts for Group I and II Companies, Averages for Period 1962-66	224
12.18 Canadian Farm Machinery Companies: Sales, Costs and Profits, 1961-69 . . .	226
12.19 Analysis of Revenues, Costs and Profits, Farm Machinery Companies, 1961-69	226
12.20 Analysis of Revenues, Costs and Profits, Group I and II Farm Machinery Companies, 1961-69	227
12.21 Comparison of Sales and Profits for Group I Companies, Canadian Subsidiaries and Total Parent Organization, 1963-69	228
12.22 Profit Rates of Major Farm Machinery Companies, United States, 1929 and 1936	229
12.23 Profits of Full- and Long-Line Compared to Short-Line Farm Machinery Manufacturers, United States, 1927-29	230
12.24 Farm Machinery Products Sold by Canadian Companies, by Group	232
12.25 Wholesaling Activities of Canadian Farm Machinery Companies, by Group, 1966	233
12.26 Farm Machinery Factory Locations and Factory Employment, Canadian Farm Machinery Companies, by Group, 1966	234
12.27 Domestic Net Sales, Exports and Imports of Farm Machinery and Light Industrial Equipment, 17 Major Canadian Farm Machinery Firms, by Group, 1966	236

List of Tables

629

Table	Page
12.28 Financial Statistics – Canadian Farm Machinery Firms, 1960-66, Group I – Three Firms (of Four)	237
12.29 Financial Statistics – Canadian Farm Machinery Firms, 1960-66, Group II – Five Firms (of Six)	238
12.30 Financial Statistics – Canadian Farm Machinery Firms, 1963-68, Group III – One Firm	239
12.31 Financial Statistics – Canadian Farm Machinery Firms, 1960-66, Group IV – Three Firms	240
12.32 Examples of Possible Patterns of Distribution of Profits Earned on Sales in Canada Between Canada and Other Countries	241
12.33 Group I Canadian Farm Machinery Companies, Sales, Costs and Profits, 1961-69	242
12.34 Group II Canadian Farm Machinery Companies, Sales, Costs and Profits, 1961-69	243
12.35 Group III, Sales, Costs and Profits of Versatile Manufacturing, 1964-69	244
12.36 Group IV Canadian Farm Machinery Companies, Sales, Costs and Profits, 1961-69	245
14.1 Exports of Farm Machinery, from Major Exporting Countries, 1952, 1958, 1964, and 1966	260
14.2 World Imports of Farm Machinery, 1966	262
14.3 World Exports of Agricultural Machinery, by Region or Country and by Machinery Type, and Balance of Trade, 1966	264
14.4 Increases in Manufacturing Plant Capacity for Major North American Farm Machinery Manufacturers, by Country or Region, 1955-67	271
14.5 Nominal and Effective Tariff Rates on Farm Machinery, Selected Countries, 1962	272
14.6 Average Tariff Rates on Agricultural Machinery and Tractors, Western Europe, 1957-59	272
14.7 Ocean Shipping Costs for Ford 5000 8-speed Tractor Shipped Unpacked/ Packed between Various Locations, Mid-1967 or Mid-1968 General Ocean Freight Rates	275
14.8 Freight Costs for Unpacked Tractors of Different Sizes Shipped between Canada and Britain, Mid-1967 or Mid-1968 General Freight Rates	276
15.1 Canadian Exports of Farm Machinery, by Country: The Historical Pattern	278
15.2 Canadian Exports of Farm Machinery to United States and All Other Countries, Selected Years, 1900-69	280
15.3 Canadian Exports as Percentage of U.S. Exports, Agricultural Machinery, by Type of Machine and Destination, 1966	282
15.4 Canadian and U.S. Exports of Farm Machinery to the Rest of the World (Excluding Canada and United States), Selected Years, 1928-69	283
15.5 Canadian Imports of Farm Machinery: from All Countries, from United States, and from Western Europe, Selected Years, 1929-67	284

Table	Page
15.6 U.S. Imports of Farm Machinery, by Country of Origin, Selected Years, 1952-67	285
15.7 U.S. Exports of Tractors, by Type and Size, 1952, 1964, and 1967	286
16.1 Percentage Share of Each Region or Province in the Value of Total Shipments (or Production) from the Farm Machinery Industry in Canada, Selected Years, 1900-67	292
16.2 Percentage Share of Each Region, State or Province in the Value of Total Shipments (or Production) from the Farm Machinery Industry in Canada and United States (Excluding Farm Tractors), Selected Years, 1900-63 . . .	294
16.3 Destination of Canadian Production of Farm Machinery, Selected Years, 1900-67	297
16.4 Canada's Average Annual Share of North American Farm Machinery Production, 1947-66	298
16.5 Breakdown of Manufacturing Costs in Ontario, Farm Machinery Industry, 1966 (Average of Four Companies)	304
16.6 Comparison of Inbound Freight Costs at Brantford, Ontario, Winnipeg, Manitoba, and Moline, Illinois, as Percentage of Brantford Material Costs . .	306
16.7 Comparison of Average Wage and Salary Rates, the Farm Machinery Industry, Canada and United States, 1966	307
16.8 Comparison of Average Wage and Salary Rates, the Farm Machinery Industry, Canada and United States, 1968	308
16.9 Productivity in the Farm Machinery Industry, Canada as Percentage of the United States	310
16.10 Power, Light and Heat Cost, Three Farm Machinery Locations	313
16.11 Comparative Manufacturing Cost Advantage of Farm Machinery Manufacturing Plants in Brantford, Winnipeg, and Moline, 1966 Wage and Salary Rates . . .	314
16.12 Comparative Outbound Freight Costs for Specified Products, Brantford, Winnipeg, and Moline	315
16.13 Comparative Outbound Freight Costs for Self-Propelled Combines to Western Canadian and U.S. Markets, Brantford, Winnipeg, and Moline	316
16.14 Effects of Transport Costs on Delivered Price of Combines from Brantford, Winnipeg, and Moline to Selected Delivery Points, 1968	317
16.15 Comparative Costs, Including Outbound Transportation Costs and Profits for Combine Plants in Brantford, Winnipeg, and Moline	318
16.16 Comparable Production Costs of Brantford Farm Machinery Plant Before and After Wage Parity with Moline Plant	320
16.17 Differences Between Estimated Cost at Brantford and Actual Cost at Detroit of Operating Tractor Assembly, and Transmission and Axle Plants (Nov. 1, 1964 to Oct. 31, 1965)	322
17.1 Research and Development Expenditures as Percentage of Sales of All Products, Major Farm Machinery Manufacturers, 1960-69	328
17.2 Current Expenditures on Research and Development, Farm Machinery Industry, Canada, 1955, and 1960-66	330

List of Tables 631

Table	Page
17.3 Current Expenditures on Farm Machinery Research and Development, Canadian Universities, Selected Years, 1949-66	331
17.4 Research and Development Support for Farm Mechanization, U.S. Government and Land-Grant Colleges, 1966	334
17.5 An Estimate of the Benefits of Improved Farm Machine Technology, Canada, 1926 and 1966	339
19.1 Gross Stock of Machinery and Equipment on Canadian Farms, per Farm and per Improved Acre, Selected Years, 1926-66 (1961 prices)	355
19.2 Tractors on Farms, by Major Areas of the World, 1952-56 and 1966	358
19.3 Tractor Use per Unit of Land (1954 and 1966) and Labour (1954 and 1964), by Region	358
19.4 Total Combine Harvesters in Use, by Region, Relative to Cereal Cultivation and Production, 1954 and 1964	359
19.5 Farm Machinery Used (1966) and Absorbed (1965), Western Europe, by Region and Major Country	360
19.6 Mechanization of Agriculture in Europe, 1950-66	361
19.7 Net Change in Tractor and Animal Horsepower on Farms, Europe, Selected Years, 1950-65	362
19.8 Total Sales of Farm Machinery in North America, 1967	364
19.9 Elasticities of Demand for Different Type of Farm Machines with Respect to Changes in Cash Receipts Received by Farmers	366
19.10 Machinery Operating and Depreciation Expenses as a Percentage of Gross Farm Income and Total Farm Expenses, Canada, Selected Years, 1927-68.	369
19.11 Best Equations: Investment-Demand/Stock-Adjustment Model, Dependent Variable, <i>I</i> t (Gross Investment)	373
19.12 Normal Draught Power of Various Animals	374
19.13 Selected Agricultural Statistics, Developing Countries, 1966	375
19.14 Effect of Tractor Power on Animal Power, and Human Labour Utilization per Acre, Punjab, India	376
19.15 Capital-Output Ratios in Agriculture, India, West Germany, and the United States, Selected Years	378
19.16 Available Horsepower per Hectare of Arable Land and Land Under Permanent Crops, by Region	379
19.17 Estimated Annual Cost to Farmer, Tractors and Other Farm Machinery, Developing Countries, Asia, Africa and Latin America, 1966-86	381
19.18 Tractors on Farms, World Total, and Developing Countries, 1954-66	381
19.19 Projections of Tractors in Use in Developing Countries, by Region, 1966-85	382
19.20 Farm Mechanization in Selected Developed Countries	384
19.21 Number of Farms and Proportion of Acreage in Different Size Groups, Developing Countries, 1960	384
22.1 Farm Machinery in Canada, by Provinces, 1966	419

Table	Page
24.1 Average Farm Size, Canada and Major Provinces, 1921-66	441
24.2 Changes in the Size Structure of Canadian Farms, as Measured by Level of Sales, 1951 and 1966	445
24.3 Average Capital Investment per Farm, by Type of Capital, Canada, 1921-67	446
24.4 Analysis of Operating Expenses and Depreciation, Canadian Agriculture, Selected Years, 1927-67	449
24.5 Farm Machinery Fatalities in Canada — Accident Type and Age of Victim, 1962-66	458
27.1 Analysis of Massey-Ferguson's North American Parts Operation, 1966	512
30.1 Comparison Between Dealer Franchise Agreements of Six Farm Machinery and Three Automotive Companies	542
31.1 Man-Hours Required per Acre or per Unit of Livestock, Selected Crops and Livestock, United States, Selected Periods, 1910-14 to 1963-67	555
31.2 Dealer Trade Discounts on Farm Machinery (Before Volume Bonuses), Major Companies, Canada, 1948-68	556
31.3 Tractor Price Indexes Developed by the Commission from Company Price Lists, 1956-68	561
31.4 Combine Price Indexes Developed by Commission from Company Price Lists for Eight Combine Models	563
31.5 Comparison of Farm Machinery Indexes: Dominion Bureau of Statistics, U.S. Bureau of Labor Statistics, and Indexes Developed by Commission from Company Price Lists	564
31.6 Index of Farm Machinery Parts Prices, Four Major Companies, Canada, 1963-67	569
31.7 Sample Selection Procedure for Farm Machinery Parts Prices	569
31.8 International Comparison of Price Indexes of Farm Machinery, Selected Countries, in Current and Constant Currency Values, 1956-67	572
A.1 World Production and Stock of Tractors, Selected Years, 1951-66	578
A.2 Estimates of Total and Average Horsepower of Wheel-Type Farm Tractors Sold at Retail Level, 1945-68	579
A.3 Farm Machinery Industry, Canada, 1947-66	580
A.4 Farm Machinery Industry, United States, 1947-66	581
A.5 Net Trade Balance All Farm Equipment and Selected Commodities, Canada—World, 1945-69	582
A.6 Domestic Sales of Farm Implements and Repair Parts, and Imports of Farm Machinery from All Countries and from the United States as a Percentage of Domestic Sales, 1936-68	583
A.7 Total Value of Farm Machinery Manufactures and Exports of Farm Machinery to all Countries and to the United States and Canada, 1900, 1910, 1923, 1928-30, 1937-39, 1946-67	584
A.8 Index of Prices Paid by Farmers for Farm Machinery, Canada, 1913-69	585

Table	Page
A.9 Machinery Operating and Depreciation Expenses, and Machinery Operating and Depreciation Expenses as a Percentage of Total Farm Operating and Depreciation Expenses, Canada, 1926-69	586
A.10 Machinery Operating and Depreciation Expenses, and Machinery Operating and Depreciation Expenses as a Percentage of Total Farm Operating and Depreciation Expenses, Canada and Provinces (Excluding Newfoundland), 1927, 1947, 1957, 1967	588
A.11 Sales of Selected Farm Machines and Repair Parts, Canada, 1936-69	590
A.12 Total and Improved Acreage, All Farms and Per Farm, Canada and Provinces, Census Years 1921-66	592
A.13 Total Value of Investment in Farm Machinery in Millions of Dollars; Number of Horses, Motor Trucks, Tractors and Grain Combines on Farms, Canada and Provinces, Census Years 1921-66	594
A.14 Real Estate Values in Dollars Per Acre, Canada and Major Regions, Selected Years, 1910-69	596
A.15 Population on Census-Farms, Number of Census-Farms, and Population Per Census-Farm, Canada and Provinces, 1921-66	597
A.16 Derivation of Detailed Productivity Indexes for Selected Agricultural Inputs	598
A.16-1 Derivation of Deflator for Capital, Used in Table A.16	603
B.1 Number of Farms by Relationships Analyzed and by Area, Canada, 1958	606
B.2 Regression Results, Total Cost, and Total Machinery Functions	608

LIST OF FIGURES

Figure		Page
5.1	Annual Sales of Selected Farm Machines, Canada, 1948-68	62
5.2	Number of Units of Selected Farm Machines Manufactured, United States, 1946-68	69
6.1	Sales of Farm Machinery and Repair Parts, Canada and Major Regions, 1938-69	77
9.1	Effects of Price Cut and Volume on Profits: Break-Even Analysis	127
9.2	Tractor Prices, Manufacturing Costs and Gross Margin, Canada, 1967	134
9.3	Tractor Manufacturing Cost, North America and Britain Compared, 1968, by Volume of Output	137
16.1	Distribution of Tractors — 1964-66	300
16.2	Distribution of Combines — 1964-66	301
16.3	Distribution of Balers — 1964-66	302
19.1	Factors Affecting Machinery Use, U.S. Agriculture, 1920-69	354
19.2	Factors Affecting Machinery Use, Canadian Agriculture, 1921-69	356
19.3	Factors Affecting Demand for Farm Machinery, Canada, 1920-69	372
19.4	Relationship Between Yields in KG/Hectare and Power in Horsepower per Hectare	380
22.1	Area in Farms, Canada by Major Regions, 1901-66	400
22.2	Total Number of Farms, Canada by Major Regions and Size of Farms, 1891-1966	401
22.3	Components of the Agricultural Labour Force, Canada, 1891-1968	403
22.4	Index Numbers of Physical Volume of Agricultural Production, Canada by Major Regions, 1935-68	405
22.5	Three-Year Average Yields of Selected Crops, Canada, 1910-67	406
22.6	Sources of Power, Canadian Farms, 1921-66	407
22.7	Number of Selected Machines on Farms, Canada, 1931-66	408
22.8	Tractor Sales Canada, by Number and Horsepower, 1945-68	410
22.9	Crop Acres per Tractor, Canada by Selected Regions, 1921-66	411
22.10	Index Numbers of Wholesale Prices of Farm Products, Canada, 1939-69 . . .	413
22.11	Total Gross and Net Farm Income, Canada, 1926-68	414
22.12	Total Net Farm Income (N.F.I.) and Net Farm Income per Farm Operator, Canada, 1935-68	415
22.13	Real Estate Values per Acre, Canada by Major Regions, 1910-68	417
22.14	Machinery Stock per Improved Acre, Canada by Major Regions, 1901-66 . . .	418

Figure		Page
23.1	The Process of Change in Farm Mechanization	422
23.2	Price-Cost Relationships, Canadian Agriculture, 1935-69	430
24.1	Value of Assets per Farm, Canada and Major Regions, 1941-66	447
24.2	Indexes of Major Farm Operating Expenses, Canada, 1926-68	450
24.3	Selected Indexes of Productivity, Canadian Agricultural Inputs, 1926-68	453
24.4	Changes in Farm Machinery Fatality Rate, Farm Tractors and Farm Population in Canada, 1952-66	457
25.1	Estimated Machinery Cost Curves	472
26.1	Investment in Machinery and Equipment per Improved Acre, by Size of Farm, Constant Prices, Canada, 1951, 1961 and 1966	486
31.1	Comparison of Farm Machinery Price Indexes, Canada and the United States, 1956-68	559
31.2	Comparison of Index Prices to Final Buyer, Farm Machinery, Appliances, and Passenger Cars, Canada, 1956-68	565
31.3	Industry Selling Prices, Selected Products, Canada, 1956-68	566
31.4	Indexes of Material Prices, Average Hourly Earnings and Productivity, Farm Machinery Industry, Canada, 1956-69	567
B.1	Saskatchewan Wheat Farms	612
B.2	Saskatchewan Wheat Farms (Improved Acres)	613
B.3	Ontario Cash Grain Farms	614
B.4	Ontario Milk Farms	615
B.5	Alberta Cattle Farms	616