Understanding the Structure of Canadian Farm Incomes in the Design of Safety Net Programs

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1.0 Introduction

Recent years have seen an increased incidence of farm income disasters and catastrophes, and the development of safety net programs to cushion their effects. BSE, avian influenza, plum pox potyvirus, and exceptionally low grain and oilseed prices represent just a few examples. However, the analysis of appropriate design of programs to stabilize farm incomes assumes good information exists regarding the underlying structure of farm incomes and, indeed, that farm incomes are distributed somewhat uniformly along certain demographic parameters (such as farm size or the commodity produced). However, in-depth studies of structure and uniformity in Canadian farm incomes are lacking. These are needed as a reference in the analysis of income disasters and the programs designed to compensate for losses stemming from them.

1.1 Purpose and Objectives

The purpose of this paper is to investigate the structure of farm incomes in Canada and to explore the implications for safety net programs. The objectives of the paper are:

- To assess how subsets of farms according to income level have been taken into account in previous farm income research
- To test the structure of Canadian farms as it relates to farm profitability with data on farm size and economic characteristics
- To assess the extent to which the data presented on Canadian farm incomes reflects the underlying distribution of farms according to income
- To determine the implications of the above for policies to address farm income disasters

1.2 Organization of the Paper

The paper is organized as follows. Section 2 below provides a brief summary of literature relating to the structure of farm income. Section 3 provides a description of the data and analysis employed to study farm income structure, and provides a summary of results. Section 4 places the results in the context of safety net programs designed to stabilize and compensate farm incomes from losses, and concludes the paper.

2.0 Literature on Farm Income Structure

Much of the literature on farm income in Canada blends together issues of farm income adequacy and efficiency in resource use, and comes in the form of reports and studies completed based on periodic data collection. For example, Agriculture and Agri-food Canada publishes the *Farm Income Issues Data Source Book* (Culver, 2005). This publication is a resource book of statistics on farm income in Canada. It provides information on structural change in Canadian agriculture; farm income, assets and liabilities of the primary agriculture sector; variability and diversity of Canadian farm income and farm family finances. Its sources include the Statistics Canada Whole Farm Database, the Statistics Canada Census Database, the AAFC Farm Financial Survey, and other sources.

Among the many findings contained in the 2005 Farm Income Issues Data Source Book, the percentage of Canadian farm households in its low-income cutoff class has decreased from 14% in the mid 1980's to less than 4% as of 2002. As of 2000, approximately 45% of Canadian farm households engaged in off-farm work, which is significantly lower than that in the US (55%). Off-farm income appeared to be the most significant for Canadian beef, greenhouse/nursery, and cash crop farms.

The report also establishes the following Canadian farm income typologies:

- Retirement- Family farms where the oldest operator is 60 years or older and receiving a pension income, and where no children are involved in the day-to-day operation of the farm
- Lifestyle- Small-size family farms (revenues of $10,000 to $49,999) with total family off-farm income of $50,000 or more
- Low Income- Small and medium-size family farms (total revenues of $10,000 to $99,999) with total family income less than $35,000
- Small business-focus- Family farms with total operating revenues of $10,000 to $49,999
- Medium business-focus- Family farms with total operating revenues of $50,000 to $99,999
- Large business-focus- Family farms with total operating revenues of $100,000 to $499,999
- Very large business focus- Family farms with total operating revenues of $500,000 and over
- Non-family Farms- Hutterite Colonies, communal operations and other non-family farms Non-family farms

The distribution of these typologies was reported as of 2003. These are summarized in Tables 2.1 and 2.2. Table 2.1 shows that the very large and large business-focused farms account for the bulk of farm revenues and government payments. Smaller, retirement, and lifestyle farms make up a much larger proportion of the number of farms. Table 2.2 shows that, for most farm types, the majority of farms are in the medium size category or

Table 2.1 Distribution of Canadian Farms by Income Typology, 2003

	Number of Farms	Government Payments	Revenues
		Percent	
All farms	100	100	100
Very large business-focus	8	31	47
Large business-focus	35	46	38
Medium business-focus	7	4	2
Small business-focus	4	1	1
Low income	17	6	4
Lifestyle	11	2	1
Retirement	18	10	7

Table 2.2 Distribution of Canadian Farms by Type and Income Typology, 2003

	Horticulture	Hog	Dairy	Beef	Grains & Oilseeds
			Percent		
All farms	100	100	100	100	100
Very large business-focus	16	29	19	3	6
Large business-focus	28	47	72	21	38
Medium business-focus	9	3	x	8	9
Small business-focus	5	1	x	4	5
Low income	13	12	4	26	12
Lifestyle	12	2	x	16	9
Retirement	17	6	x	22	21

larger. The clear exception is beef farms, in which the majority are retirement, lifestyle, or low-income.

Hoppe *et al* (2004) compared the structure of farm incomes in Canada and the US. A common typology was developed to compare Canadian and US farm structure based on the Farm Financial Survey (Canada), and Agricultural Resource Management Survey (US). Direct comparisons showed that farm structure is mostly similar in the US and Canada, with revenues heavily concentrated in the large and very large categories in Canada and in the US, as well as nonfamily farms. Farm families in both countries have come to rely on off-farm income, with this reliance being more pronounced in the US. There are also important differences between the two countries, however. Nearly half of the US farms are in the retirement and lifestyle groups, while large, business-focused farms are the largest single group in Canada. The average farm size is also larger in Canada.

Biggs *et al* (2004) also considered the structure of farm incomes in Canada and US. Data on the number of farms by sales class, the concentration of sales and other production-related variables, and the distribution of income and receipts was analyzed in the study. For Canada, the data applied was from the Census of Agriculture and Statistics Canada Whole Farm Database. For the US, data from the Agricultural Resource Management Study survey was used. The period of the data was 1987-2001.

The results suggested that farm income in Canada is becoming more unequally distributed among farm operations, although it remains more equally distributed than US farm income. The distribution of farm income and revenues has changed over space and time in Canada and the US. Comparison of Gini coefficients suggested a somewhat greater inequality of the shares of net cash income in the US than in Canada and a greater inequality in some farm cash receipts compared to others. Statistically significant increases in Ginis occurred mostly in Canada over the period. The authors suggest that considerable more research is required to better understand what is driving these changes.

Mussell *et al* (2005) considered the structure of farm income issue at a disaggregated level by analyzing the distribution of farm incomes within farm size and type categories. It showed that there is more variability of farm profitability within a specific sales class, than there is between sales classes. As a consequence, while economies of scale were observed, large farms with low levels of household income and farm profitability were also observed. The results showed that, while farm income in the aggregate has not been increasing, there are farm operations that are increasing their profitability, and size is not the only means to profitability. The study concluded that differences in farm management skills appear to explain variability in farm household income and operating profitability, and that renewed investment in management training could improve the farm income situation.

Gundersen *et al* (2000) considered farm income inequality in the US and the impact of farm programs targeted to farm income typologies. The study examined four scenarios for government assistance to agriculture based on the concept of ensuring some minimum standard of living:

- Assured income equal to that of the median nonfarm household in the region.
- Assured income equal to 185 percent of the poverty line.
- Assured income equal to the average nonfarm household's annual expenditures.
- Assured income equal to the median hourly earnings of the nonfarm self-employed ($10 per hour).

The analysis estimated the distribution effects and costs of the four scenarios for the time period of 1993-1997, and projected results for the time period from 1999-2003. Data from the Agricultural Resource Management Study compiled by the USDA Economic Research Service was used.

In reviewing the data, eight farm income typologies were considered:

- Limited resource farms (Any farm with: (1) gross sales less than $100,000, (2) total farm assets less than $150,000, and (3) total operator household income less than $20,000)
- Retirement farms (Small farms whose operators report they are retired)
- Residential lifestyle farms (Small farms whose operators report they had a major occupation other than farming)
- Farming, low sales farms (Farms with sales less than $100,000 whose operators report farming as their major occupation. Excludes limited resource farms whose operators report farming as their major occupation)

- Farming, high sales farms (Farms with sales between $100,000 and $249,999 whose operators report farming as their major occupation)
- Large family farms (Sales between $250,000 and $499,999)
- Very large family farms (Sales of $500,000 or more)
- Non-family farms (Farms organized as nonfamily corporations or cooperatives, as well as farms operated by hired managers.

The results showed that lower income farm households would benefit relatively more from income safety net scenarios compared with the current farm programs. It also found that geographical location played a role, and that farm households in the Northern Crescent, the Eastern Uplands, the Southern Seaboard, and the Fruitful Rim would all generally receive a higher level and a greater proportion of benefits under the four safety net scenarios than under the current programs. The authors recommended that a clear understanding of objective and intended beneficiaries be a starting point for the discussions of future farm policy.

Hopkins (2001) considered the reference from aggregate measures of farm income back to the farm-level. The objective of the analysis was to examine how well current data on farm-sector income reflects the actual financial needs of farmers and their families, and to assess the success of these measures as benchmarks for policy intervention. The paper argued that current measures of farm income are inadequate tools for determining the need for government intervention in the ever broadening array of farm-related policies which extend to address food safety, food assistance, rural economic health, economic well-being of farm families, and conservation and environmental concerns. The question is also asked whether or net income measures are even appropriate for determining the need for income support payments to farmers. Over the years, using farm sector income measures as a policy benchmark have produced modest and uneven results.

Disadvantages of using a single aggregate measure of performance for measuring farm-sector income were found to include the following: aggregate farm income masks wide variations; aggregate farm income excludes off-farm income; it does not reflect wealth (accumulation); it does not reveal debt problems; it is not indicative of farm business failures; it does not capture the intrinsic benefits to farming. Therefore, policy requires a more comprehensive approach to measuring farm income.

Mishra and Goodwin (1997) investigated the impact of farm income variability on off-farm income. The premise behind this study was that, if farmers are risk averse, greater farm income variability should increase off-farm labour supply. This effect was confirmed in a sample of Kansas farmers. It was also found that farm operators and spouses who receive significant income support through government farm programs are less likely to work off the farm. This may suggest that policy changes reducing farm income support payments may increase off-farm employment of farmers and their spouses.

The analysis uses a simultaneous-equations Tobit estimator that accounts for joint labour supply decisions. The results confirm that the off-farm labour supply of farmers is

positively correlated with the riskiness of farm incomes. Farmers who experienced greater farm income variability in the 1980's were significantly more likely to work off the farm.

Mishra and Sandretto (2002) measured the variability in real net farm income in the U.S. agricultural sector and per farm and assessed whether variability has diminished over the period 1933 to 1999. The role of non-farm income in reducing the variability in total farm household income was also examined. The data used in this analysis was aggregate, and included indicators such as net farm income, aggregate real net farm income and off-farm income. The results indicated that variability in real net farm income in the sector and at the farm level has not diminished, but that non-farm income has helped to reduce the variability in total farm household income.

Allanson and Hubbard (1998) investigated the nature of farm income distribution is assessing farm income problems in Europe. The paper developed operational rules for ranking income distributions that could be used, given appropriate data, to address a range of policy issues concerning the economic welfare of the agricultural community, the comparability of agricultural and non-agricultural incomes, and the extent and depth of poverty in farming. The study applied a stochastic dominance procedure consistent with social preferences for higher incomes and a more equal distribution of income. A comparative analysis of the farm family income situation in the member states of the EU was performed. Data from the Farm Accountancy Data Network (FADN) for various EU member states was applied. A comparative analysis of farming income levels across the member states of the EU-12 was performed using FADN data on farm family income per holding for the years 1990/91 to 1994/95.

Results from this analysis suggested that overall, the farm family income situation in the Northern European states was more favourable than in the Mediterranean states, given the existence of wide disparities in mean income levels. However, because some farms experienced negative income problems, the Northern states do not uniformly dominate the Mediterranean states. Using the second degree stochastic dominance criterion led to a less clear-cut assessment than a simple comparison of mean income levels would.

2.1 Observations

The literature observed presents consistent and recurring themes that are relevant for this paper. First, the distribution of farm income according to demographics is fundamental in understanding baseline farm incomes, and thus in assessing appropriate mechanisms of compensation for income loss. Analyses in Canada suggest that the larger farm typologies account for the bulk of revenue and operating income, but represent a minority of farms. Results observed in the US and other countries are similar, and some studies take explicit consideration inequality in the distribution of income. As a result, there is not a single "farm income situation"; rather, farm incomes are diverse and range across farm sizes, types, and regions. As Hopkins has argued, treating sectoral income as a benchmark for farm incomes creates the danger of erroneous conclusions and policy prescriptions that could actually exacerbate the problem.

Much of the literature has addressed farm income from the perspective of rural poverty or income adequacy. This would appear to be the dominant consideration in the Canadian literature and that observed from the US and Europe. One thread of this appears to stem from concerns over the industrialization of agriculture; however, others (including those in Canada) deal with inequality as it relates to the purchasing power of farm households relative to non-farm households and of small farms relative to larger farms. Some consideration has been given to income variability, but this has been less of a focus than income adequacy and inequality.

Little research was observed that explicitly dealt with variability in operational profitability, and how farm programs designed to deal with catastrophic losses should address baseline variability. The purpose of this paper is to close this gap in the Canadian farm income literature, by building on previous work by Mussell *et al* and interpreting the results in the context of safety net and disaster programming.

3.0 Analysis of Canadian Farm Income Variability

To evaluate the income variability status of Canadian farms, a variable was defined that is approximately equivalent to Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA). EBITDA is a measure of operating profitability that measures the margin a business obtains from its operations to fund debt, taxes, capital replacement, and owner/family unpaid labour and management. It is typically used as a ratio relative to sales or relative assets. EBITDA/Sales measures the efficiency a business exhibits in generating funds from operations for capital, interest, tax and family living relative to its intensity of activity (as measured by sales). EBITDA/Assets measures the efficiency of a business in generating margin (EBITDA) relative to the value of assets deployed. This latter ratio illustrates another aspect of EBITDA. Asset values will themselves tend to be driven by EBITDA, simply because the budget for capital assets is contained within EBITDA.

To the extent that cash expenses are substitutes for owned capital use, the relative magnitude of EBITDA will differ. For example, consider a feedlot operation in which feeder cattle and feed are purchased and slaughter cattle are sold. In this operation, almost all expenses are realized as cash. In contrast, consider a cash crop operation which purchases seed, fertilizer, chemicals and fuel, but has a significant proportion of expenses relating to depreciation of machinery, which is a non-cash cost. In this context, the cash crop farm will tend to have a structurally higher EBITDA/Sales than the feedlot, simply because a smaller proportion of its expenses are realized as cash.

3.1 Data

Data to measure farm income variability was extracted from the Statistics Canada Whole Farm Database. Analyses were conducted with two datasets fragmented by farm sales category, by farm type, and by province. First, data collected under the Tax Data Program (TDP) for incorporated and unincorporated farms was analyzed. This data is a time series extracted for the period 1998-2004. The information from this source is collected from income taxes filed by individual farm operators and from incorporated farms, and relates to sales and expenses, typically reported on a cash basis.

Secondly, data collected under the Farm Financial Survey (FFS) was analyzed. The information from this source is obtained from a mail survey which collects data on revenue, expenses, assets, and liabilities. The FFS is a panel of data, consisting of data drawn from 1997, 1999, 2001, 2002, 2003, and 2004.

For the TDP data, this was defined as Net Operating Income plus Net Interest Expenses and Net Property Tax[1]. For the FFS data, this was defined as Total Operating Revenues - Total Operating Expenses + Interest Paid On Farm Debt[2]. Within each province, farm type, and sales category, the data were sorted into a distribution of EBITDA/Sales and

[1] R2500 + R2126 + R2127
[2] F601 – F606 + F605

EBITDA/Assets defined by quartiles. This was used to explore the distribution of EBITDA according to the following sales categories; $10,000 - $100,000; $100,000 - $249,999; $250,000 - $499,999 and $500,000 and over. Given these sales categories, the farm types presented in Table 3.1 were explored.

Tables 3.2 and 3.3 provide an illustration of the support for the data applied in the analysis, based on the number of observations in the 2004 data. The 2004 TDP data are stratified to be representative of just over 181,000 farms for the provinces and farm types identified[3]. The FFS data is representative of 136,000 farms for the provinces and farm types identified[4].

Table 3.1 Farm Types and Provinces Considered in the Analysis

PEI	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	BC
Potato	Dairy	Dairy	Oilseed & Grain	Oilseed & Grain	Oilseed & Grain	Greenhouse, Nursery and Floriculture
Dairy	Poultry	Oilseed & Grain	Beef	Beef	Beef	Potato, Other Veg, and Melon
Poultry	Hog	Poultry	Hog	Other Animal	Other Crop	Fruit & Tree Nut
Hog	Oilseed & Grain	Greenhouse	Dairy	Other Crop	Other Animal	Other Crop
Beef	Other Crop	Hog	Other Animal	Dairy	Dairy	Beef
Other Animal	Beef	Other Crop	Potato	Hog	Hog	Hog & Other Animal
Oilseed & Grain	Other Veg & Melon	Beef	Other Crop	Poultry	Potato	Dairy & Milk

[3] The taxfiler data is a sample stratified to the population according self-employment statistics. The taxfiler sample is a relatively high proportion of the estimated population (≈ 50%) because of the preponderance of tax e-filings

[4] The Farm Financial Survey data is a sample stratified to the population according the Agricultural Census. The FFS sample is a smaller proportion of the estimated population compared with the taxfiler data

Table 3.2 Farm Observations Represented in TDP Data, 2004

	PEI	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	BC	Total
Grain and Oilseed Farming	-	3,670	13,865	8,915	32,685	17,650	-	**76,785**
Potato Farming	160	-	-	-	-	-	175	**335**
Other Vegetable	-	765	-	-	-	-	-	**765**
Fruit and Tree Nut	-	-	-	-	-	-	1,970	**1,970**
Greenhouse, Nursery and Floriculture	-	-	1,410	-	-	-	515	**1,925**
Other Crop	-	3,895	3,310	945	1,735	4,965	925	**15,775**
Beef Cattle Ranching and Farming	315	4,800	9,425	6,035	11,525	20,615	2,810	**55,525**
Dairy Cattle and Milk Production	-	7,370	5,480	425	-	465	605	**14,345**
Hog and Pig Farming	-	1,840	2,010	685	40	425	1,095	**6,095**
Poultry and Egg Production	-	880	1,680	-	-	-	580	**3,140**
Other Animal Production	-	-	-	870	1,125	2,505	-	**4,500**
Total	**475**	**23,220**	**37,180**	**17,875**	**47,110**	**46,625**	**8,675**	**181,160**

Table 3.3 Farm Observations Represented in FFS Data, 2004

	PEI	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	BC	Total
Grain and Oilseed Farming		3,010	10,175	6,290	23,150	11,575	-	**54,200**
Potato Farming	115	-	-	-	-	-	55	**170**
Other Vegetable	-	420	-	-	-	-	-	**420**
Fruit and Tree Nut	-	-	-	-	-	-	1,240	**1,240**
Greenhouse, Nursery and Floriculture	-	-	1,105	-		-	290	**1,395**
Other Crop	-	2,400	1,920	285	185	1,105	505	**6,400**
Beef Cattle Ranching and Farming	270	3,820	8,970	5,375	10,180	18,525	2,290	**49,430**
Dairy Cattle and Milk Production	55	6,795	5,215	480	-	510	570	**13,625**
Hog and Pig Farming	-	1,505	1,905	275	40	350	670	**4,745**
Poultry and Egg Production	-	475	1,425	-	-	-	370	**2,270**
Other Animal Production	-	-	-	110	335	1,700	-	**2,145**
Total	**440**	**18,425**	**30,715**	**12,815**	**33,890**	**33,765**	**5,990**	**136,040**

3.2 Results

The data were extracted and separated into quartiles according to EBITDA as described above. As described below, the EBITDA data broken into quartiles were divided by the mean level of either sales or asset value within the quartile, to obtain either EBITDA/Sales or EBITDA/Assets.

3.2.1 Results Using Tax Data Program Information

EBITDA/Sales was observed by quartile for the four sales categories and for the farm types described above in BC, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and Prince Edward Island. The extraction provided results of EBITDA/Sales across the distribution of farm sizes and as a time series.

Appendix A below presents the results from the analysis of the TDP data. The figures present the 1998-2004 average EBITDA/sales for the four sales categories for a subset of the farm types studied. For the sake of brevity, the Appendix figures present results for PEI potatoes, Quebec hog and dairy farms, Ontario grain/oilseed and dairy farms, Manitoba hog and grain/oilseed farms, Saskatchewan grain/oilseed and beef farms, Alberta grain/oilseed and beef farms, and BC fruit/tree nut and greenhouse farms. However, the results apply quite generally across the full range of farm types and provinces presented in Table 3.1 above.

Several observations can be drawn from the figures in Appendix A. First, it is immediately evident that, regardless of farm type or province, there is a greater variation in EBITDA/Sales within a sales category than there is across sales categories. This was a robust finding.

Secondly, it is evident that some farms, notably those in the third and fourth quartile, generate significant operating earnings relative to sales. The figures in Appendix B show that the fourth quartile commonly has EBITDA/Sales in excess of 30% or even 40%. These farms are relatively efficient at generating margin for capital replacement, debt servicing, taxes, and family income.

Finally, a surprising observation relates to EBITDA/Sales for the category of largest farms. The figures in Appendix A generally show that for the largest sales category, the upper quartiles (especially the fourth quartile) falls below the lower sales categories in terms of EBITDA/Sales. On the surface, this would appear to indicate diseconomies to scale, which contradicts conventional wisdom. There are several factors that may explain this anomaly:

- The largest farm size category, as an open-ended category, will tend to have the greatest heterogeneity of farms. Some farms in this category may include additional farm enterprises, as well as on-farm processing or marketing operations, where farms in the lower sales categories generally will not. Such

enterprises may have an entirely different structure of cash relative to non-cash expenses than the identified farm type.

- Related to the above, the largest category (and the fourth quartile of the largest category) will tend to have a very large variance.
- Relative to the lower sales categories, the largest farms will tend to have been the source of more farm expansions. With expansions, there will be transitionally lower returns as "ramping up" occurs.
- For beef farms, the farms in the largest category will tend to be dominated by feedlots while the farms in the smaller categories will tend to be cow-calf operations. A relatively small proportion of expenses are realized as cash on a cow calf operation, while a very high proportion of expenses will be realized as cash for a feedlot. As such, a feedlot should have a structurally lower EBITDA/Sales compared with a cow-calf farm, and the largest sales class will thus tend to have a lower EBITDA/Sales than the lower sales classes for beef farms.
- Finally, the largest farm size categories are likely to have greater use of hired labour, and labour expense is included in EBITDA. Smaller farms, in contrast, will use less hired labour, and will more commonly make use of owner income withdrawals rather than formal wages and salaries, which are apt not to be reported as labour expense.

3.2.2 Results Using Data from the Farm Financial Survey

The above analysis of EBITDA/Sales from the Tax Data Program was repeated using data collected in the Farm Financial Survey. In addition, because asset values are collected in the Farm Financial Survey, EBITDA/Assets was used as a basis for sorting. Thus, measures of EBITDA/Sales and EBITDA/Assets were calculated for the same dataset of farms, as averages over the panel of data from 1997-2004.

The results are presented in the graphs in Appendix B for EBITDA/Sales and in Appendix C for EBITDA/Assets. As described above, the range of results actually presented in the appendices was paired down for brevity. However, the results described here apply quite generally. The results show the following. First, within each sales category, for each farm type and each province, the farms in the first two quartiles typically struggle to exhibit signs of profitability using either EBITDA/Sales or EBITDA/Assets. While those farms in the third and fourth quartiles generally show good signs of profitability, farms in the first quartile of each sales category have negative returns. Farms in the second quartile exhibit negative to slightly positive values for the profitability. Frequently, fourth quartile farms have EBITDA/Sales values over 40% and EBITDA/Asset values exceeding 10%. This means that farms of a given size, type, and location do not necessarily guarantee a better return or operating profit efficiency.

Secondly, relating to supply management, the profitability measures applied to dairy farms (and also poultry farms, although the data were more limited) show that generally all four quartiles exhibit positive values and they tend not change much over time. This means dairy farms don't experience the extreme highs and lows often associated with

non-supply managed commodities. For example, in the $250,000 - $499,999 sales-Ontario dairy farm category, EBITDA/Assets ranged from 6% to 12% between 1997 and 2004. For the same period and sales category for Ontario beef farms, EBITDA/Assets ranges from 6% to 25%.

Thirdly, there is also a trend relating EBITDA/Assets to farm size. Generally, as farm size increases, EBITDA/Assets also increases. While this is subject to the variability across farm size categories, for the same quartile across size categories EBITDA/Assets increases. This is an indication of economies of scale and improved capacity utilization on behalf of larger farms.

4.0 Observations on Safety Net Design and Disaster Programming

Both sets of data used to assess farm profitability produced remarkably consistent results, and the results were consistent across provinces and farm types. It is clear from the results that farm size is not a good proxy for operating profitability. This is evident from the consistent finding that there is more variability in EBITDA/Sales and in EBITDA/Assets within a farm size than there is across farm sizes. However, there is evidence of economies of scale, as illustrated by the fourth quartile of successively larger farms increasing in EBITDA/Sales, and especially in EBITDA/Assets. The caveat related to this is the surprising observation related to the largest sales category which showed a break in the scale economy trend in EBITDA/Sales, the nature of which is described above. The apparent implication of the above is that differences in management must explain a significant portion of observed farm profitability. Thus there are some farms under $100,000 in sales which are, relative to their size, quite profitable, and other very large farms that struggle.

It is important to note that the period of time, and breadth in terms of farm size, type, and region should be sufficient in this analysis to capture a meaningful baseline. The time period captures some disastrous periods (e.g. 2003-04 for beef farms and 1998 for hog farms) but for most farms analyzed the majority of the time period would be thought of as "typical". In any case, averaging over the time period has the effect dampening the effect of the disastrous periods. Thus, while anomalous years have been included in some cases, the analysis is largely composed of normal years. Given that the results establish a baseline, the implication is that the extreme variability in operating profitability observed under long-run "normal" conditions is a factor that farm income programs need to address in their design.

The caveats associated with interpreting the results should also be recognized. The nature of the data is such that it is impossible to determine how consistent the data is over time, in terms of the same farms being observed in the sample from one year to the next. It is certainly the case that not all the same farms are reporting every year, so some error results from the sample changing over time, particularly with respect to the FFS data for which the sample is relatively smaller. Moreover, the data cannot indicate whether it is the *same* farms that repeatedly rank in a given quarter year after year. This is prevented both by the changing sample over time and by confidentiality requirements in data collection.

4.1 Implications for Safety Net and Disaster Programming Design

If the results obtained here represent a reasonable baseline for income variability, then it presents some challenges in the design of safety net and disaster programming. First, the observation of widespread variability draws into question the validity of the "representative farm" or "model farm" approach for the purposes of establishing program parameters or compensatory payments. The results obtained here suggest that farms viewed on the basis of readily measured attributes (such as products produced, level of

sales, or region) can have sharply different results in terms of operating profit. None of these commonly referenced descriptors appears to be a good proxy for farm income/profitability, which is usually the ultimate target for safety net and disaster programming.

Secondly, consistent with the above observation, farm type, level of sales, and region do not appear to be good indicators of farm financial viability. The best evidence of this is that the observed profitability ratios in the first quartile tended not to differ significantly according to size category. So while it is widely held in farm income typologies that small farms struggle to be economically viable, in fact a significant proportion of large farms also struggle for economically viable. Thus, unequivocal statements regarding the baseline economic viability of farms that are the recipients of public support are not possible- payments are made to some large farms that the results show are not economically viable, so there is no return to the public from cushioning downturn to protect the future value generated by these farms. Conversely, some program payments made to the relatively small farms with positive operating profit trends may have a public payback in terms of future value added. These subtrends both exist in a material way within a broader trend of economies of scale.

Thirdly, the notion of payment caps or limits on program eligibility is brought into question by these results. The results show that some large farms suffer from low profitability. Notwithstanding the observation above on economic viability, it is evident that some large farms suffer through very low profitability. To the extent that farm program caps are used to manage program liability or provide a measure of fairness in distribution, it may prevent large farms with low profitability from being compensated for actual losses. In essence, the notion of program caps assumes that the variance in income about the mean is constant as farm sizes increase. The results show that actual variance in operating income is at least proportional, if not greater than proportional, as mean farm size is increased.

The observations above have application to the current set of farm income policy tools currently in use in Canada. With respect to the Canadian Agricultural Income Stabilization (CAIS) program, the observations above are supportive of individually fragmented reference production margins used in determining eligibility for payment under the program. Conversely, the observations above are not supportive of the basic production unit (BPU) model farms used in making structural change adjustments under CAIS. Given observed variability, the measures used in adjusting for structural change would be better adapted from (credible) individual data. A similar criticism can be made of deficiency payment schemes based on a model farm, such the Quebec *Assurance Stabilization Revenue Agricole* (ASRA) program, and of the cost of production models used for pricing in some supply managed markets.

Similarly, the results are supportive of production insurance designs based on individual yield normals, rather than regional averages. Similarly, the design of certain *ad hoc* programs has relied on the notion of industry averages in disbursing payments; the results

here suggest that industry averages are of more limited use than perhaps was previously thought.

Finally, through a better understanding of the baseline structure of farm incomes into which farm income policies are applied, improved targeting and attainment of policy objectives may occur. For example, policies designed to target the median using a single program set with tight design parameters is apt to achieve a very different result than policies that explicitly recognize income variability, and target subsets appropriately. The results here suggest the latter approach is likely to be more effective.

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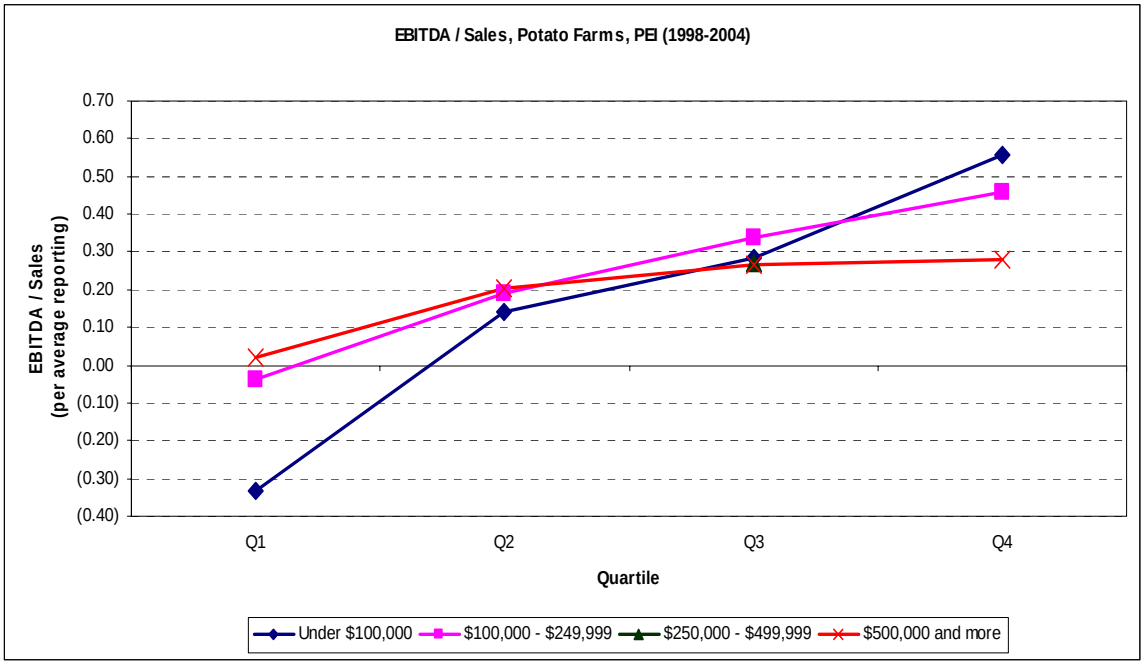
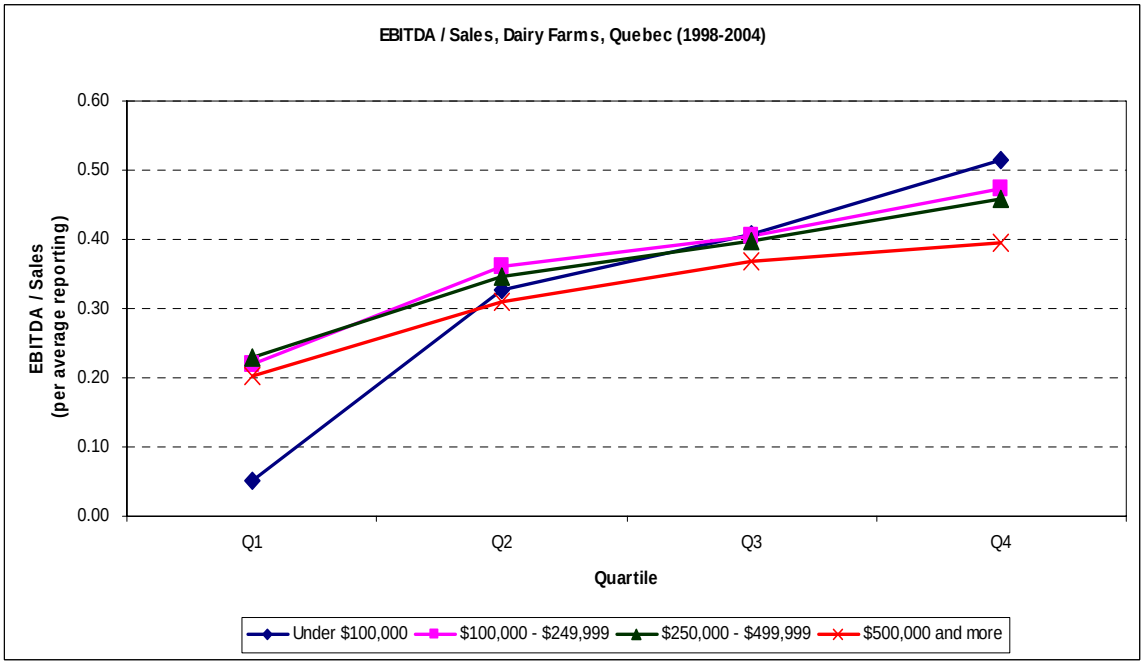
Appendix A
EBITDA/Sales Results from the Tax Data Program

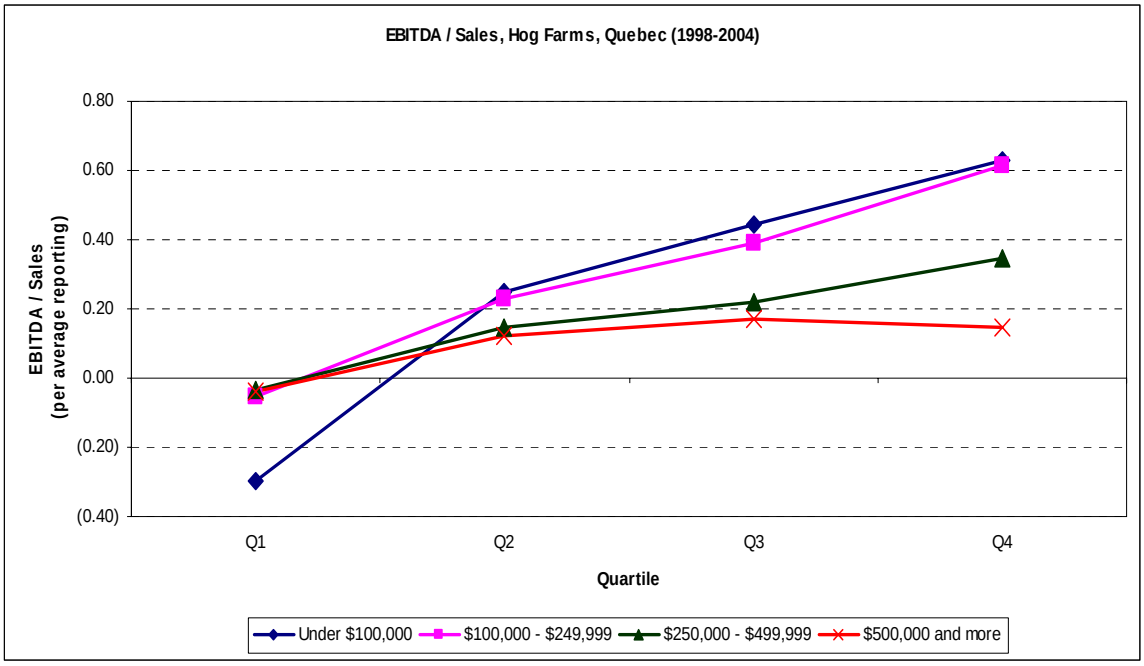
EBITDA/Sales, Prince Edward Island Potato Farms, 1998-2004



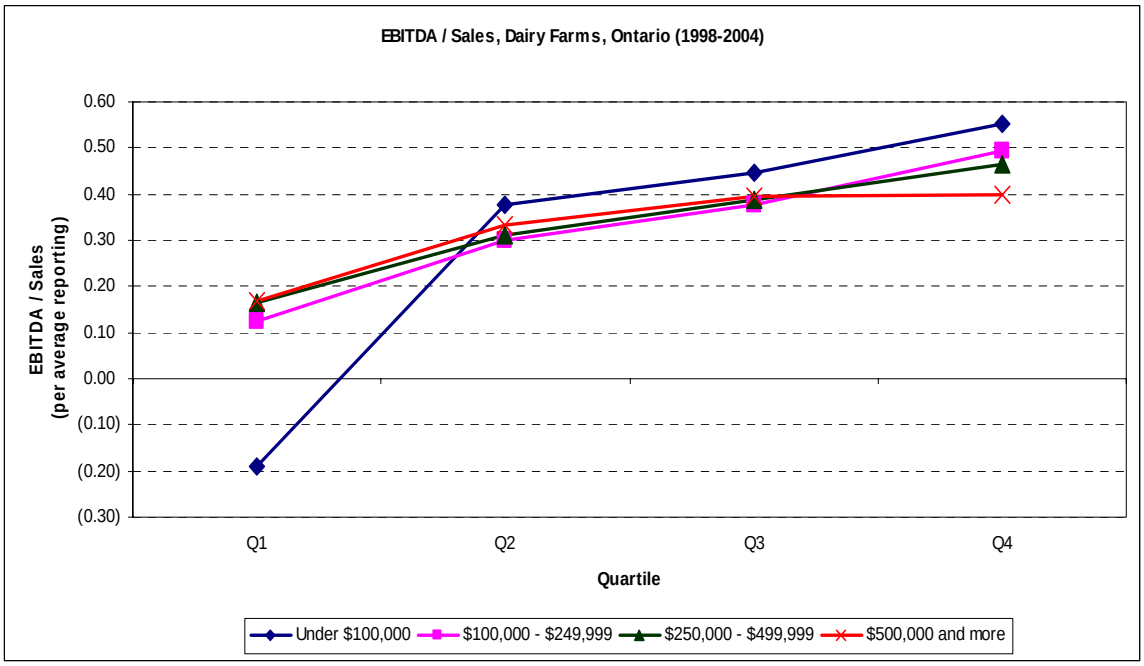
EBITDA/Sales, Quebec Dairy Farms, 1998-2004



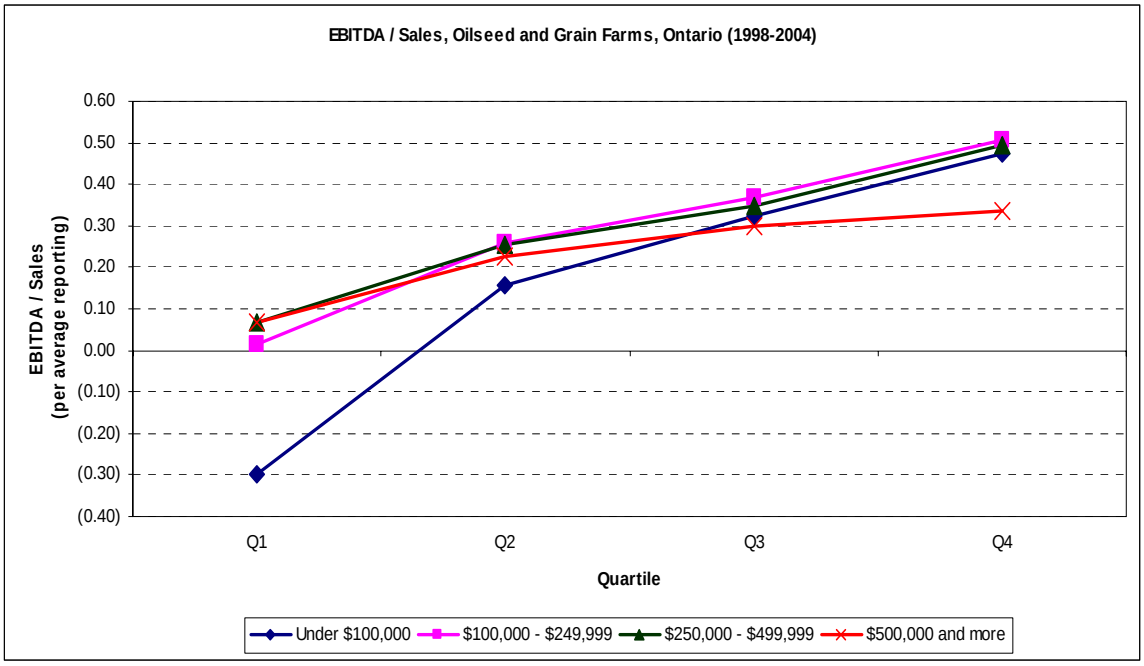
EBITDA/Sales, Quebec Hog Farms, 1998-2004



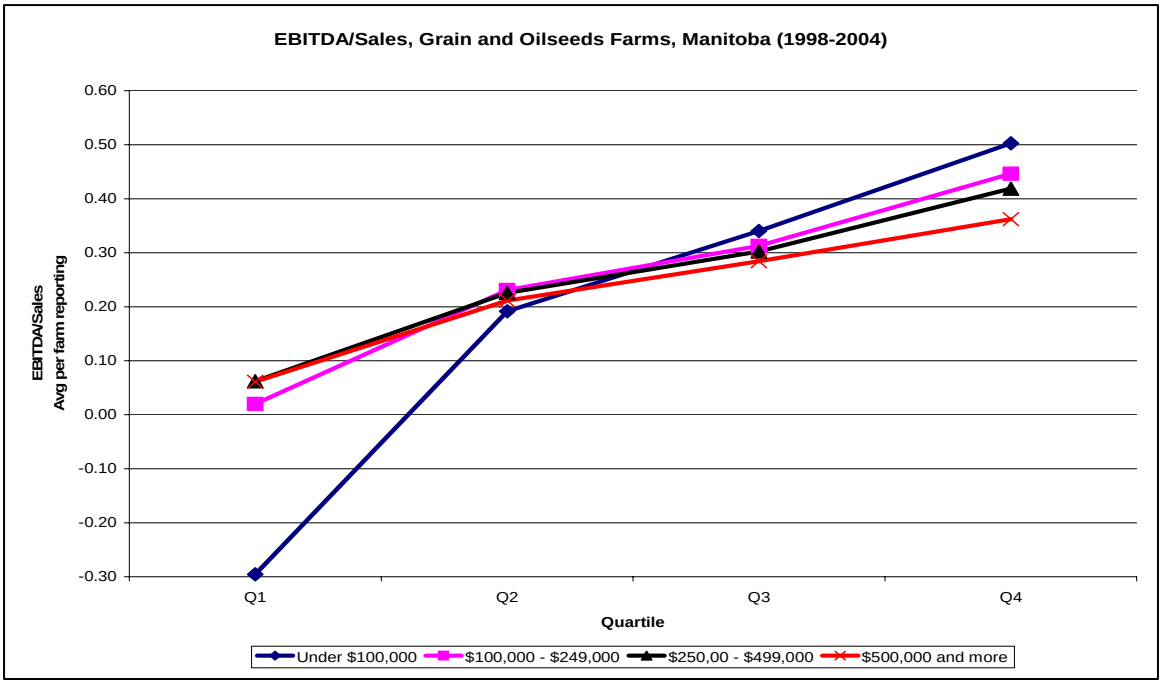
EBITDA/Sales, Ontario Dairy Farms, 1998-2004



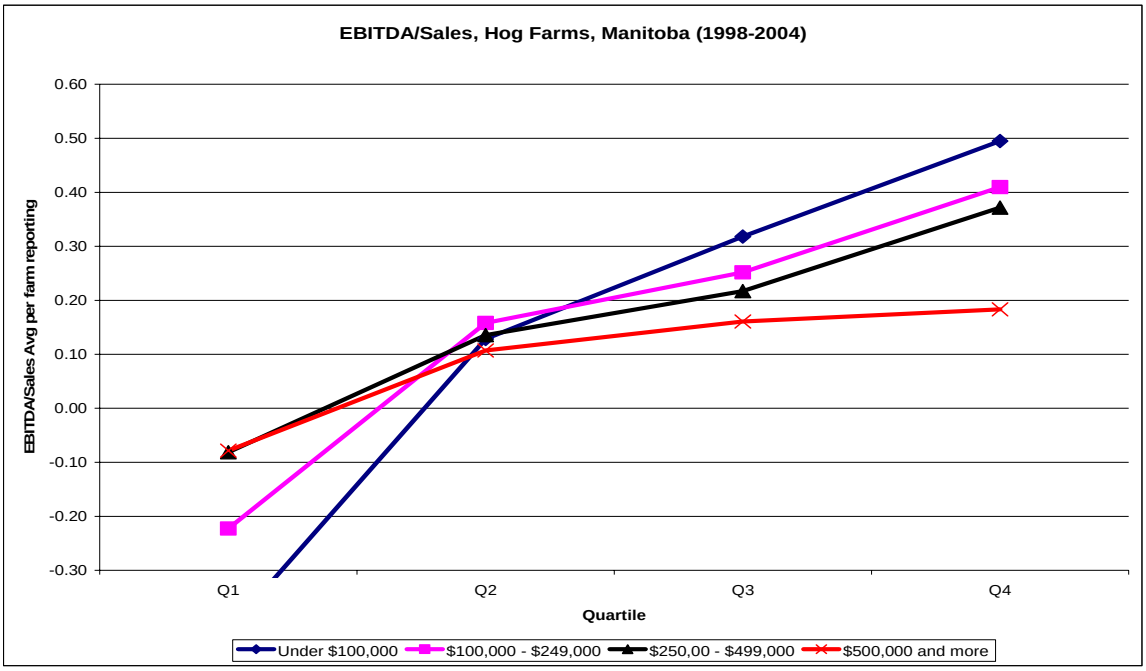
EBITDA/Sales, Ontario Grain and Oilseed Farms, 1998-2004



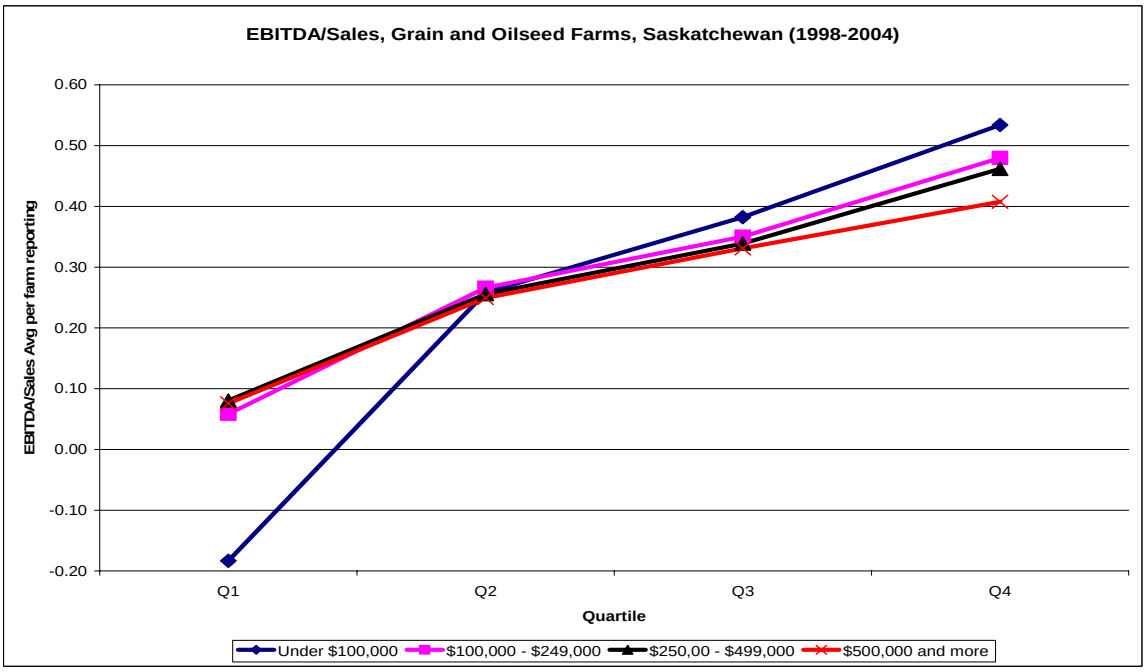
EBITDA/Sales, Manitoba Grain and Oilseed Farms, 1998-2004



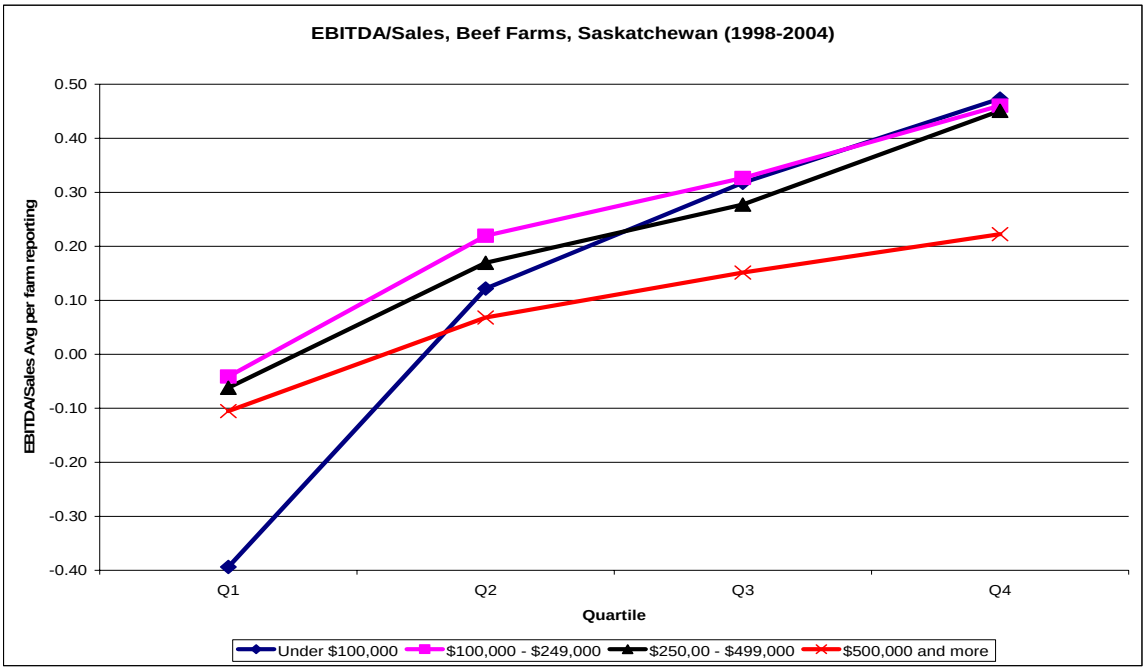
EBITDA/Sales, Manitoba Hog Farms, 1998-2004



EBITDA/Sales, Saskatchewan Grain and Oilseed Farms, 1998-2004



EBITDA/Sales, Saskatchewan Beef Farms, 1998-2004



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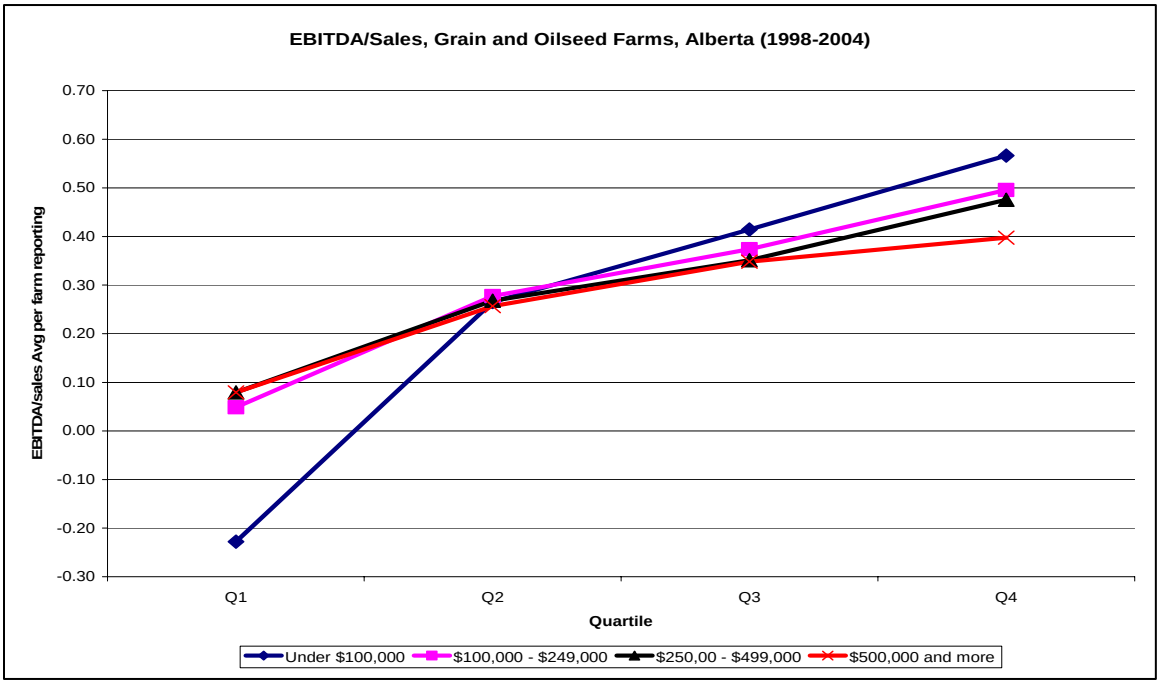
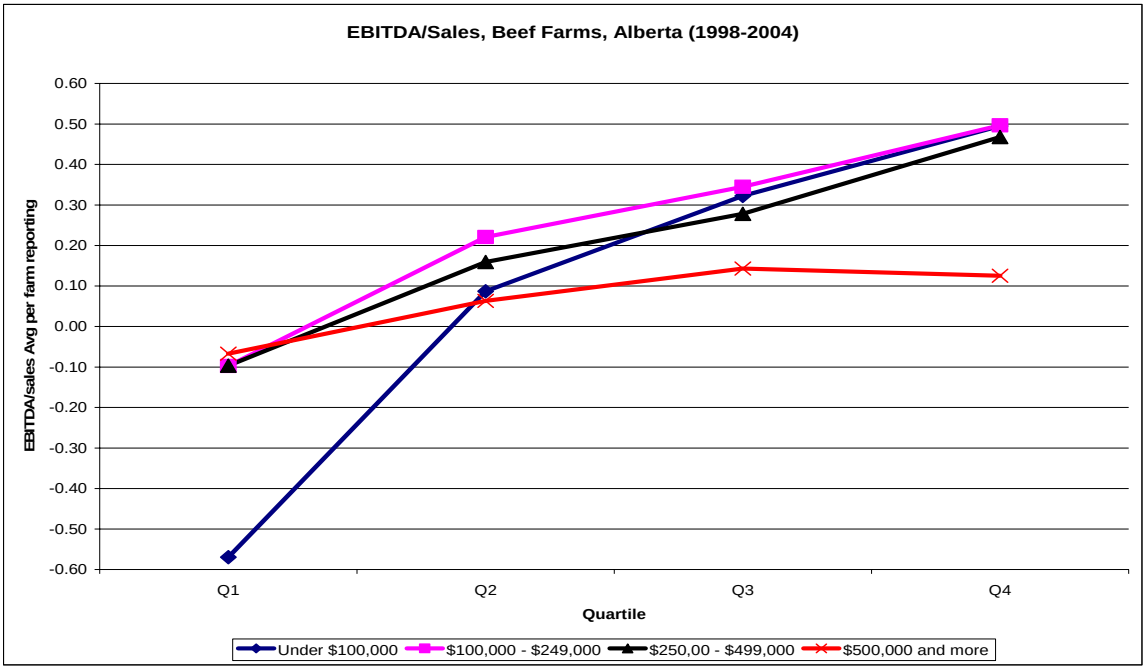
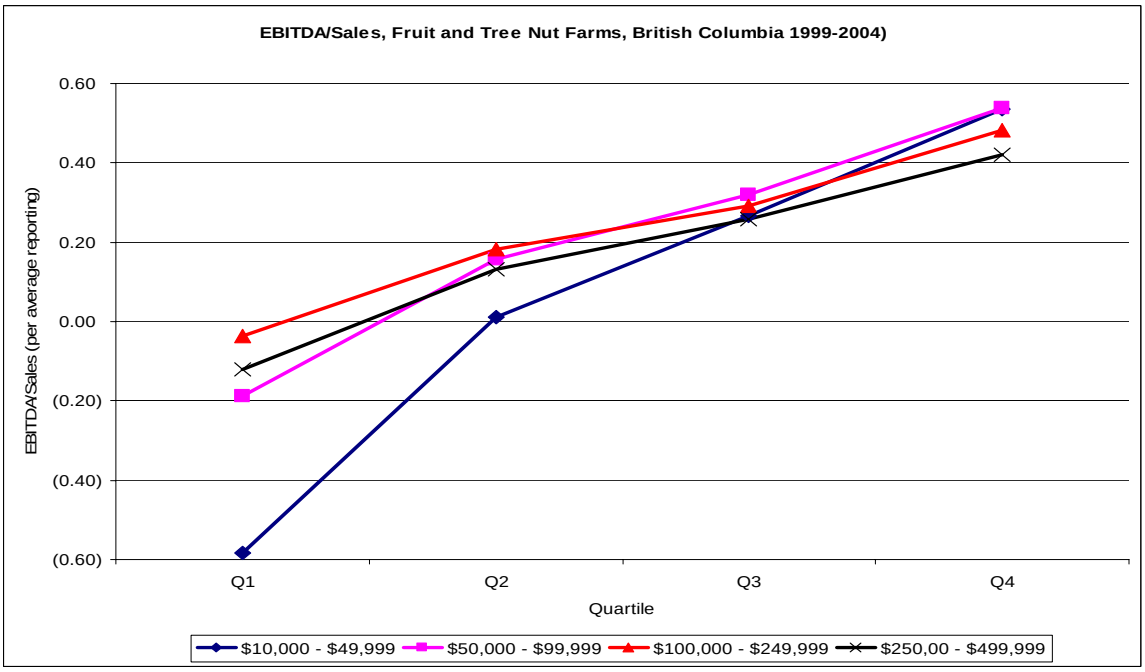


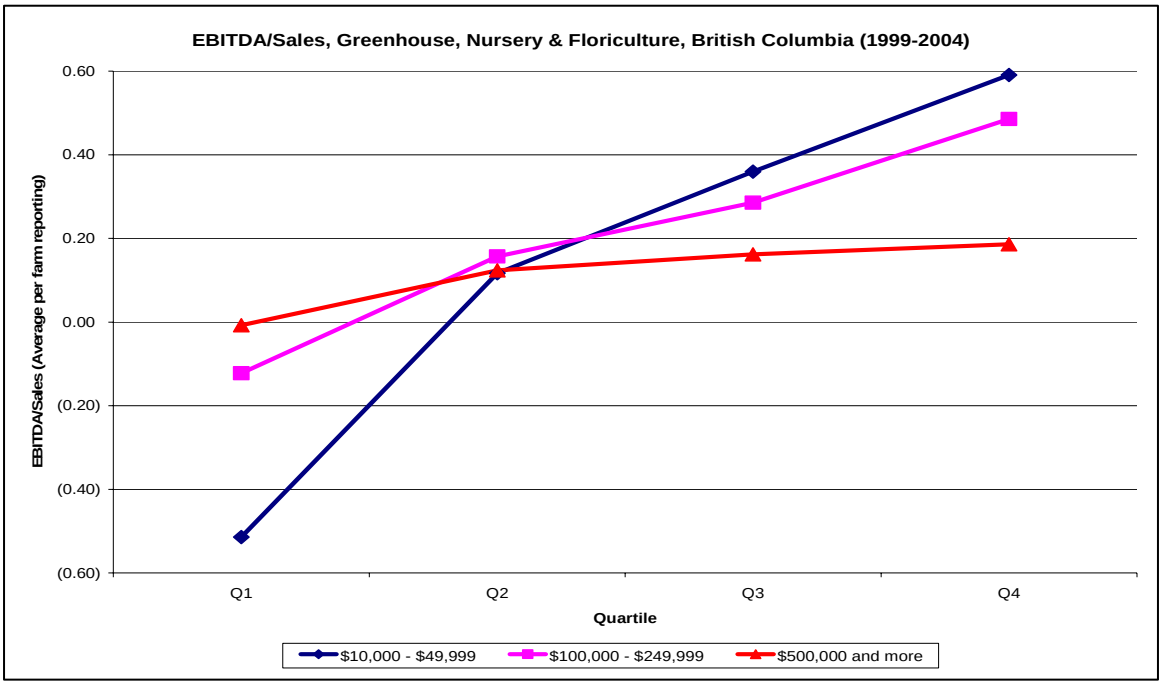
EBITDA/Sales, Alberta Beef Farms, 1998-2004



EBITDA/Sales, British Columbia Fruit and Tree Nut Farms, 1998-2004



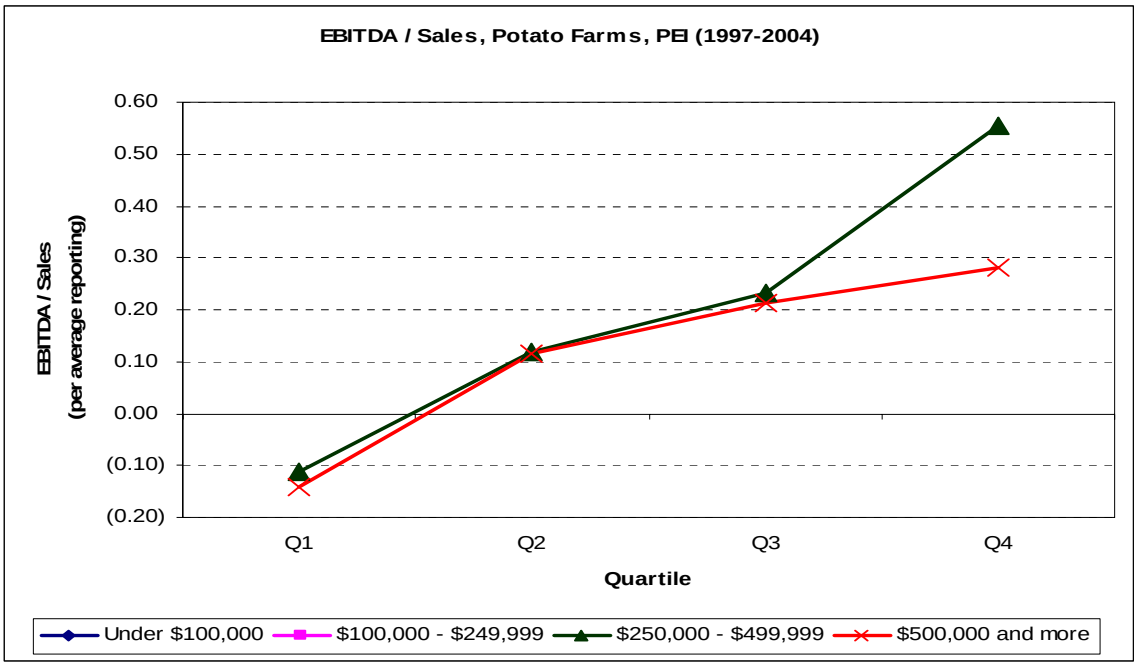
EBITDA/Sales, British Columbia Greenhouse Establishments, 1998-2004



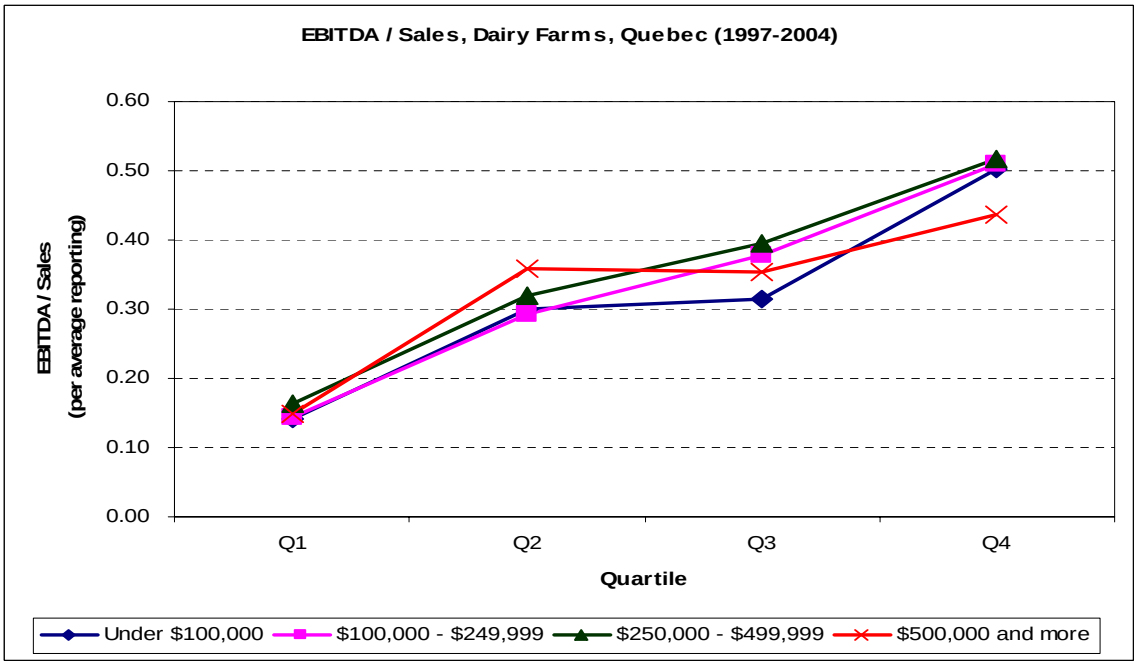
Appendix B

EBITDA/Sales Results from the Farm Financial Survey Database

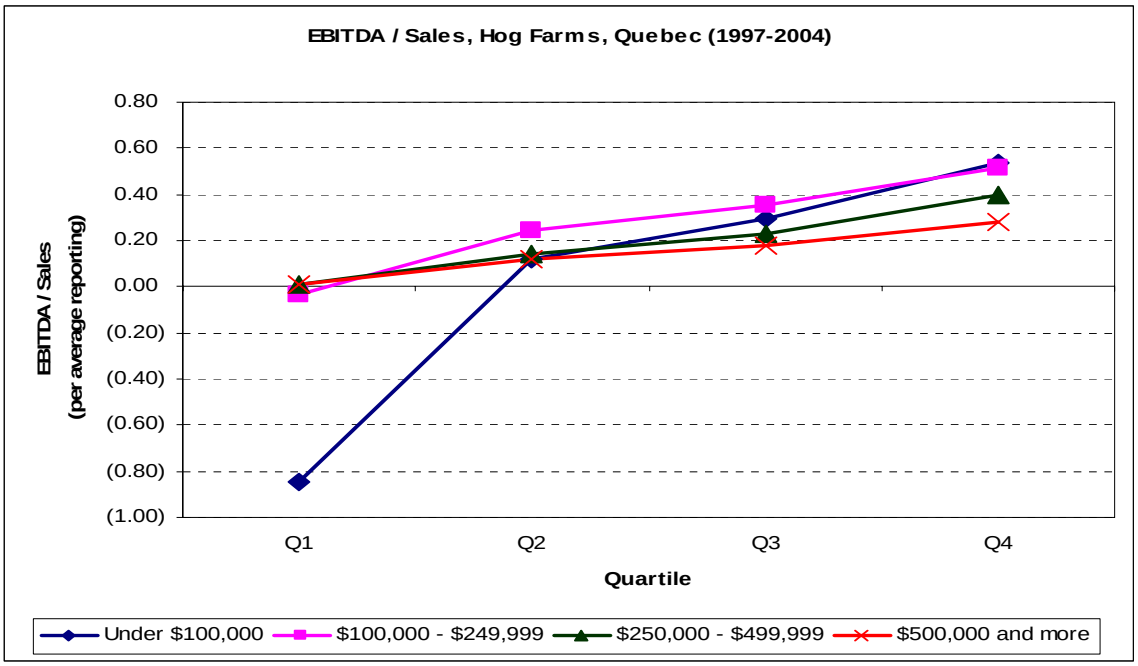
EBITDA/Sales, PEI Potato Farms, 1997-2004



EBITDA/Sales, Quebec Dairy Farms, 1997-2004



EBITDA/Sales, Quebec Hog Farms, 1997-2004



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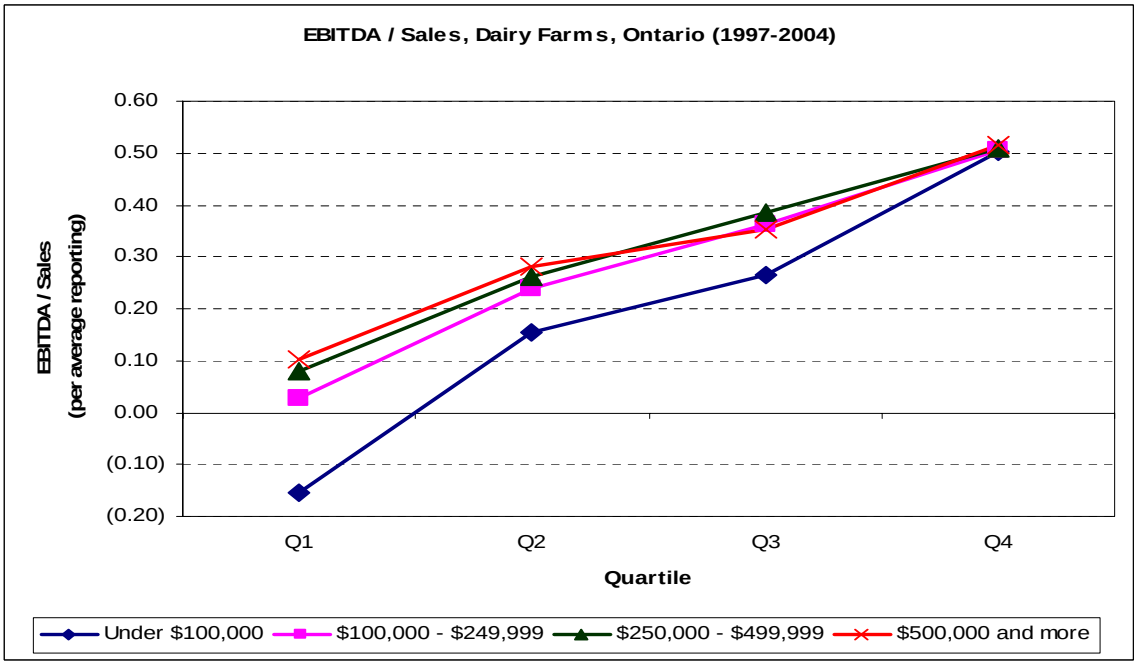
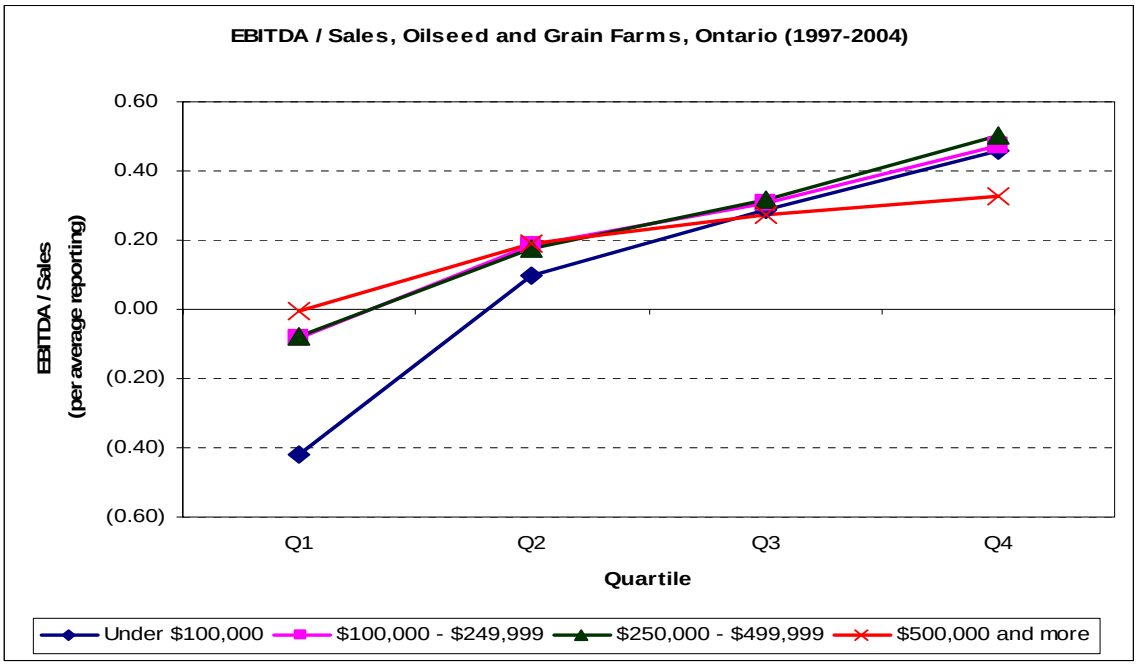
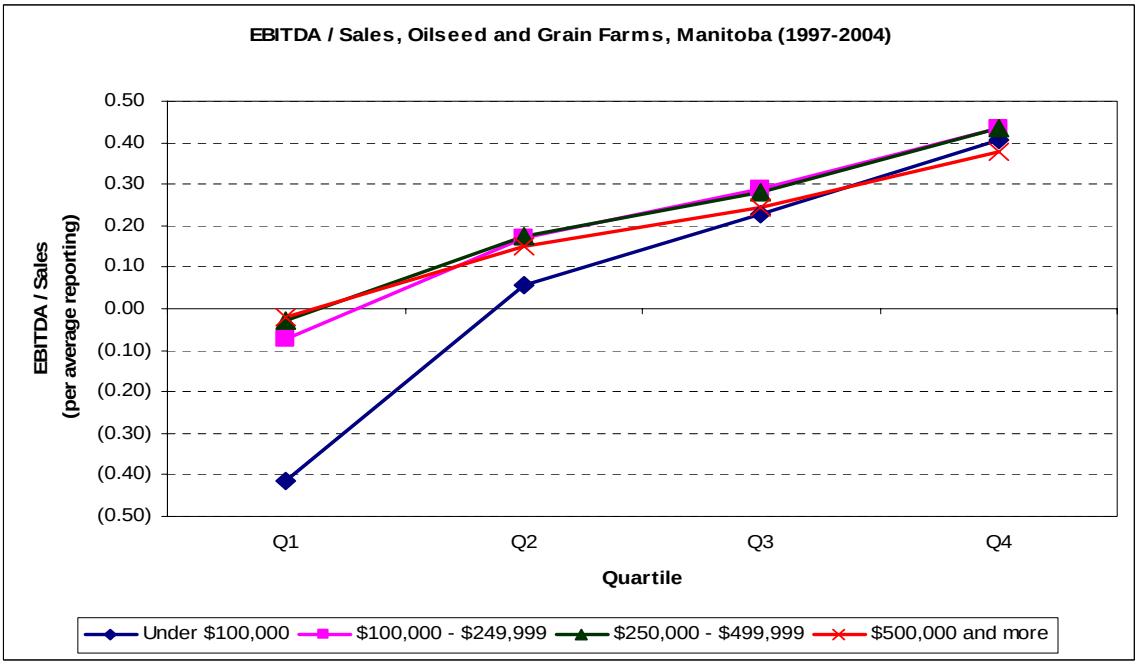


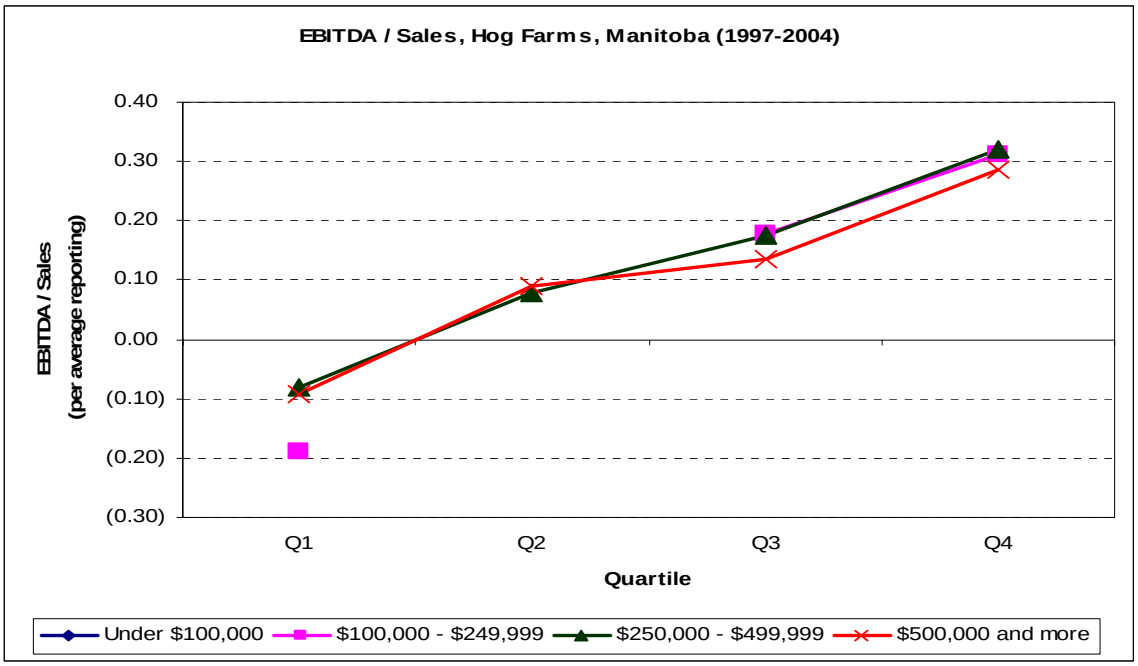
EBITDA/Sales, Ontario Grain and Oilseed Farms, 1997-2004



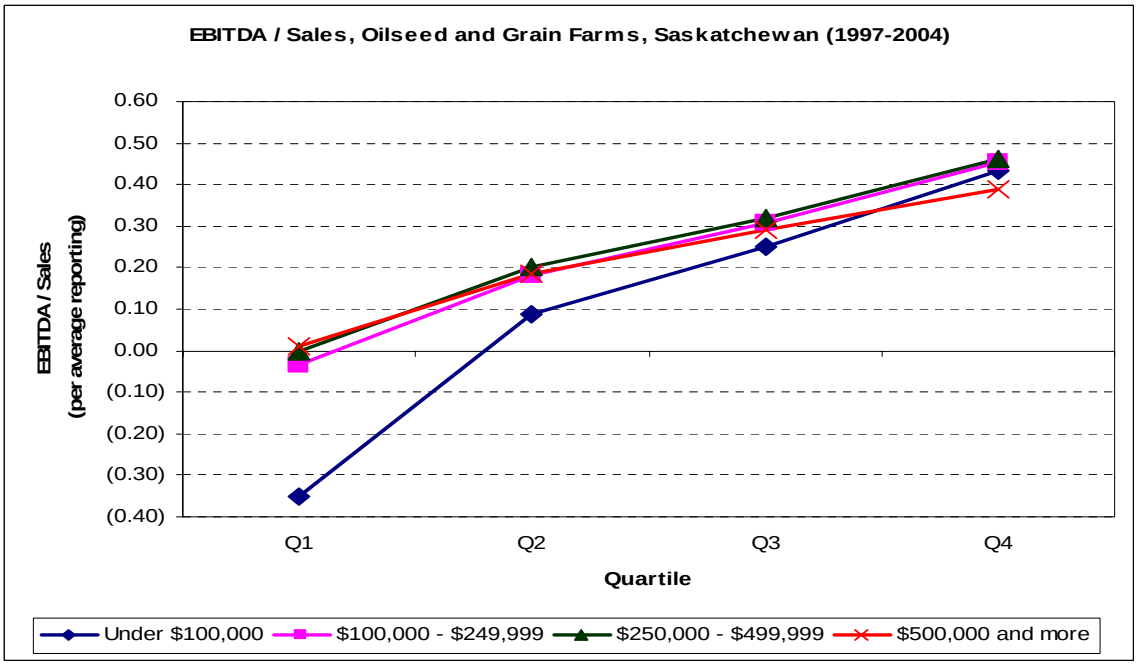
EBITDA/Sales, Manitoba Grain and Oilseed Farms, 1997-2004



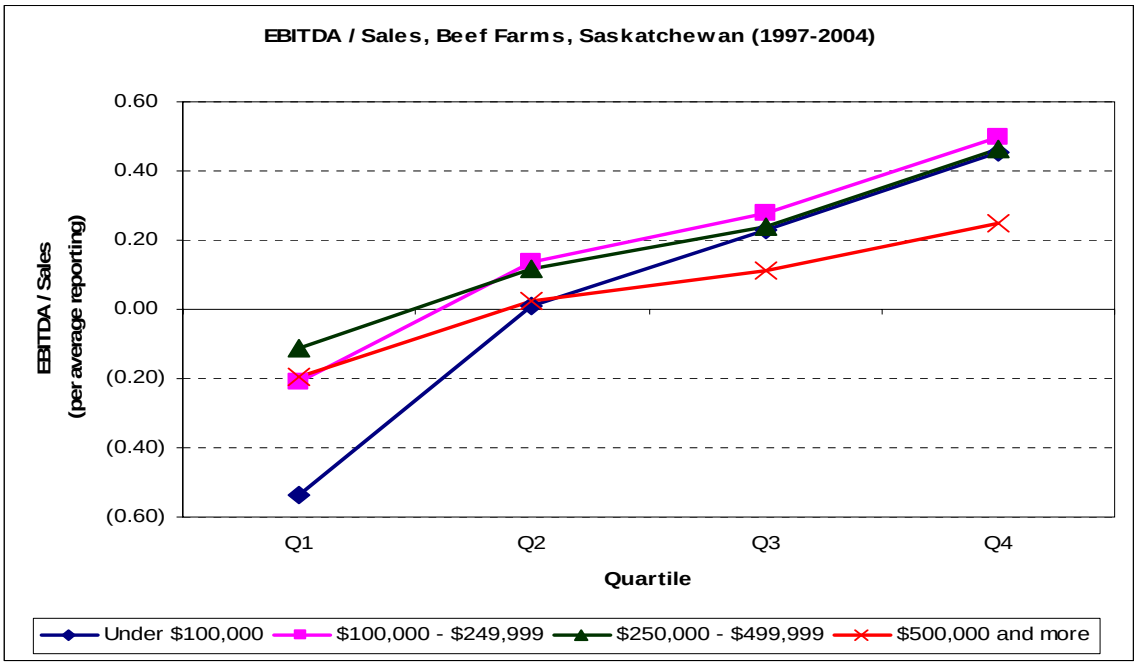
EBITDA/Sales, Manitoba Hog Farms, 1997-2004



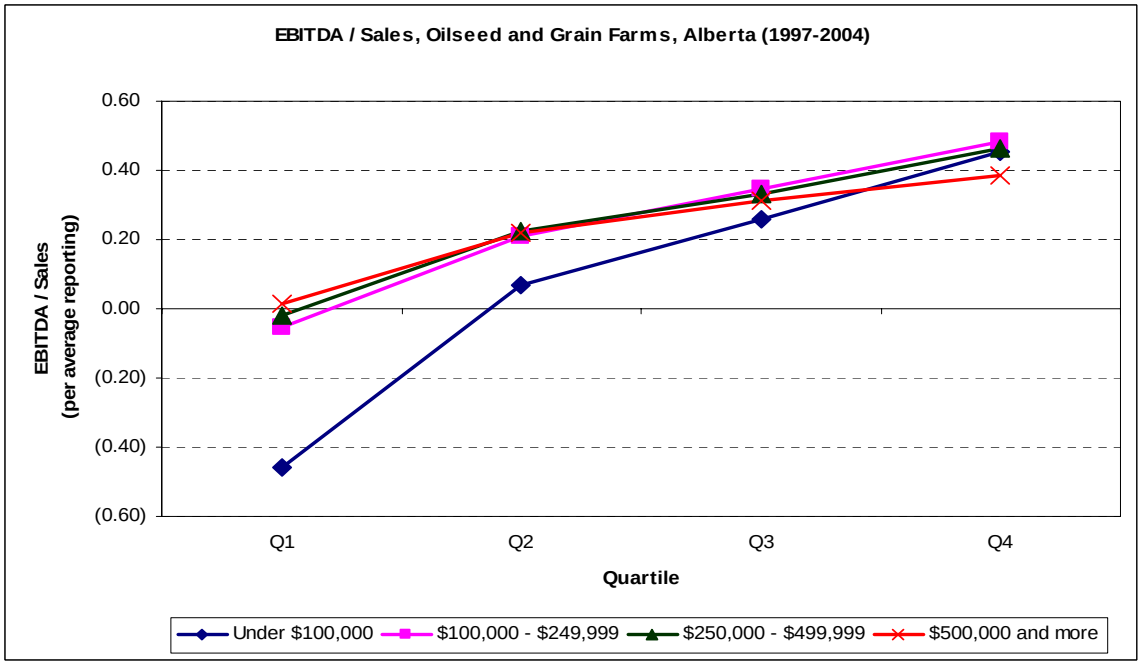
EBITDA/Sales, Saskatchewan Grain and Oilseed Farms, 1997-2004



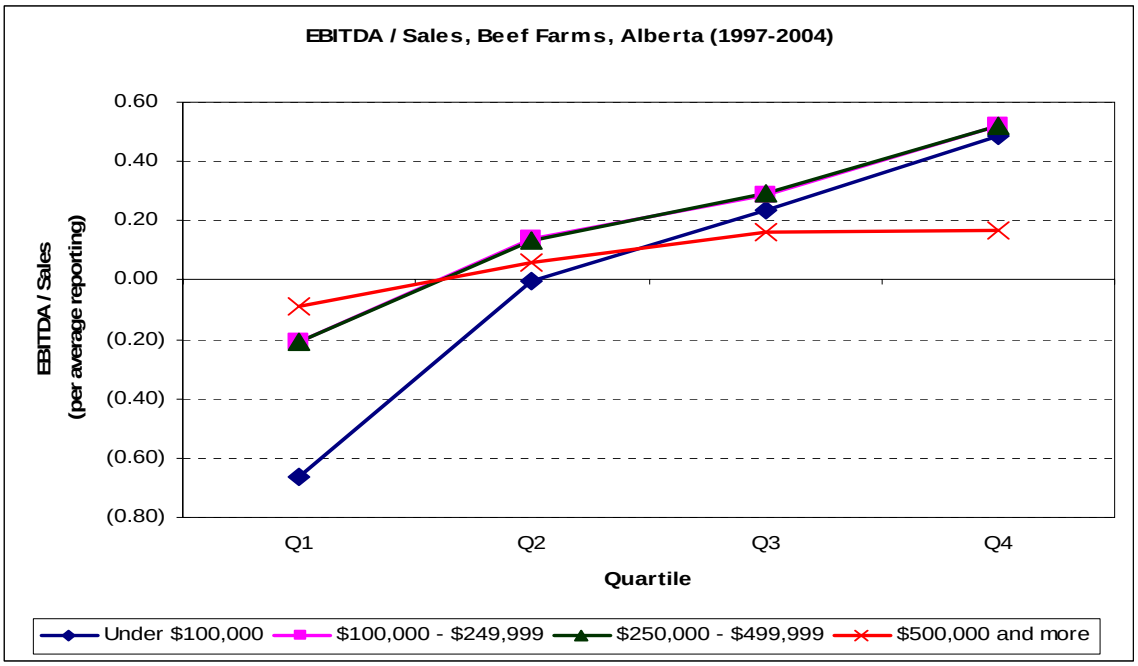
EBITDA/Sales, Saskatchewan Beef, 1997-2004



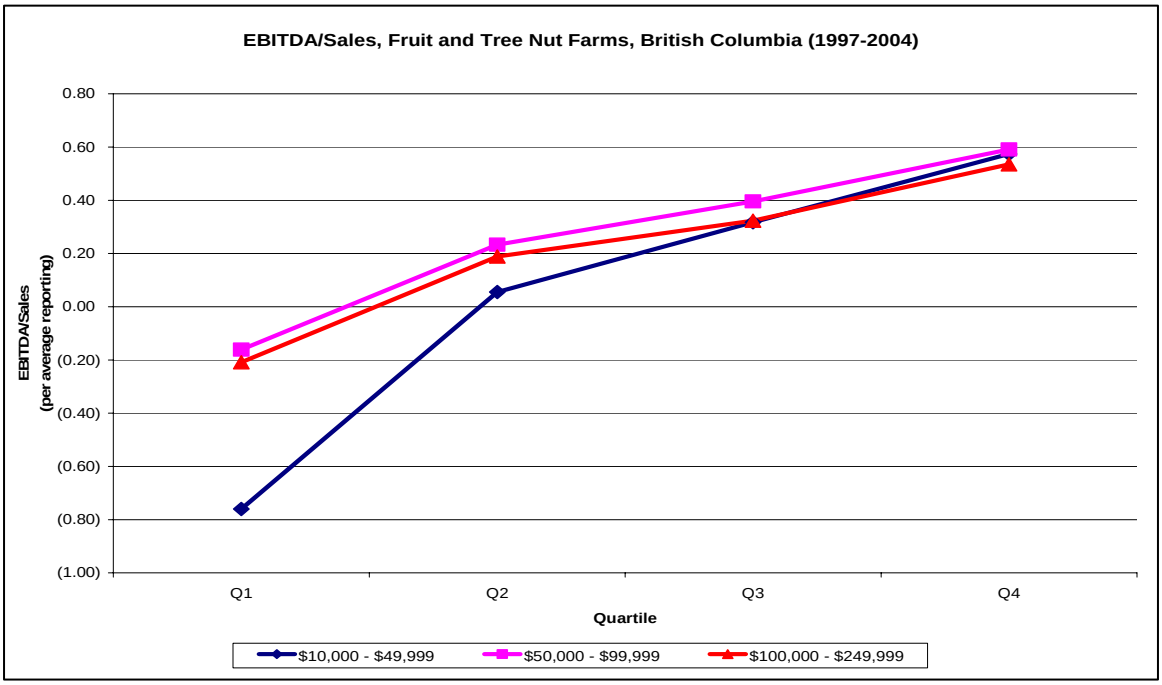
EBITDA/Sales, Alberta Grain and Oilseeds Farms, 1997-2004



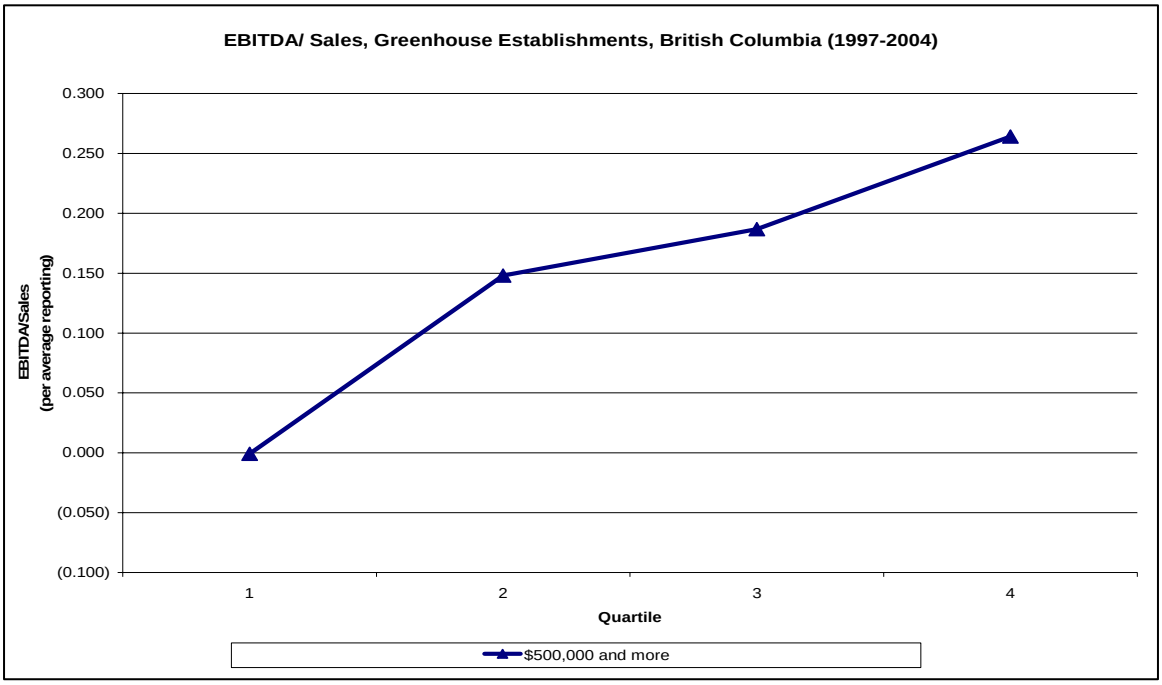
EBITDA/Sales, Alberta Beef Farms, 1997-2004



EBITDA/Sales, British Columbia Fruit and Tree Nut Farms, 1997-2004



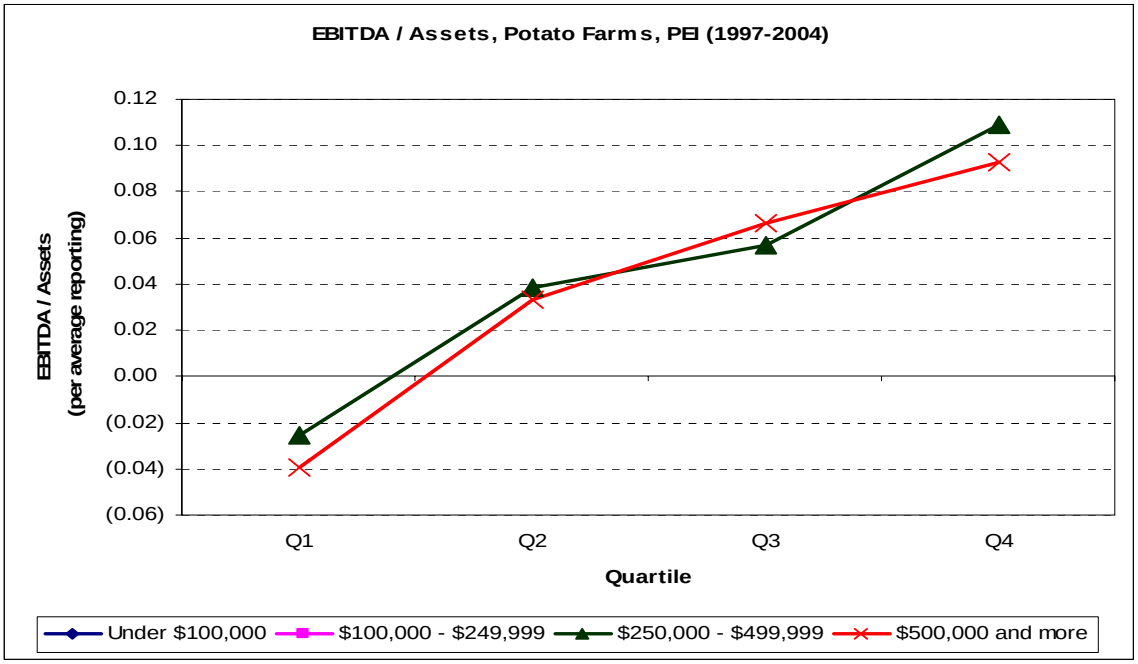
EBITDA/Sales, British Columbia Greenhouse Farms, 1997-2004



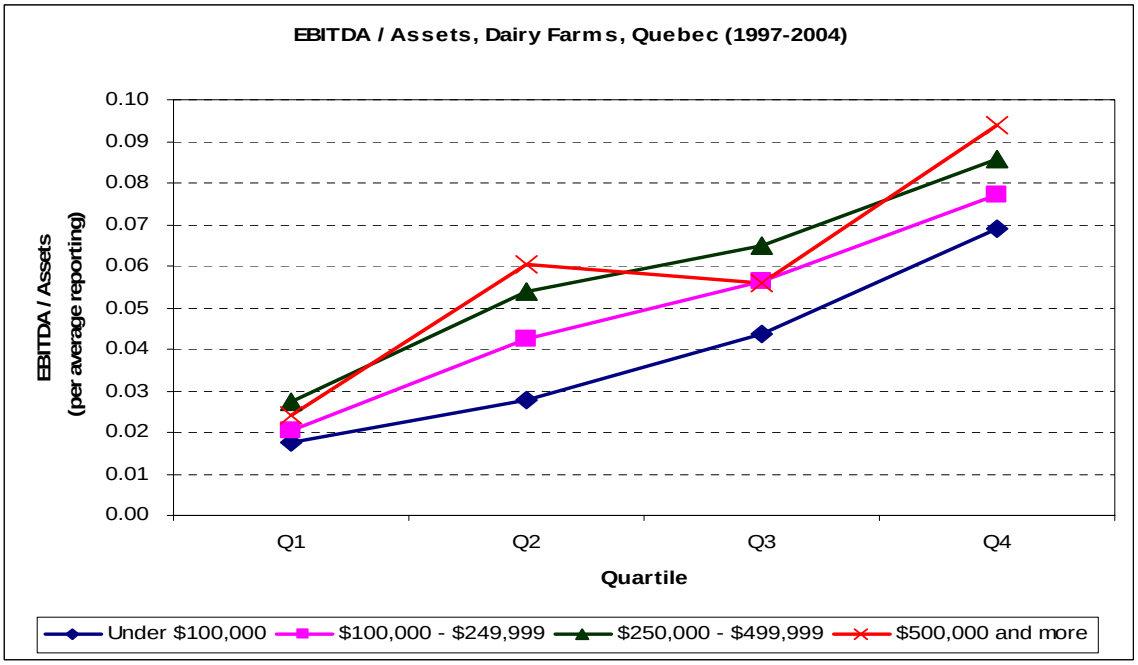
Appendix C

EBITDA/Assets Results from the Farm Financial Survey Database

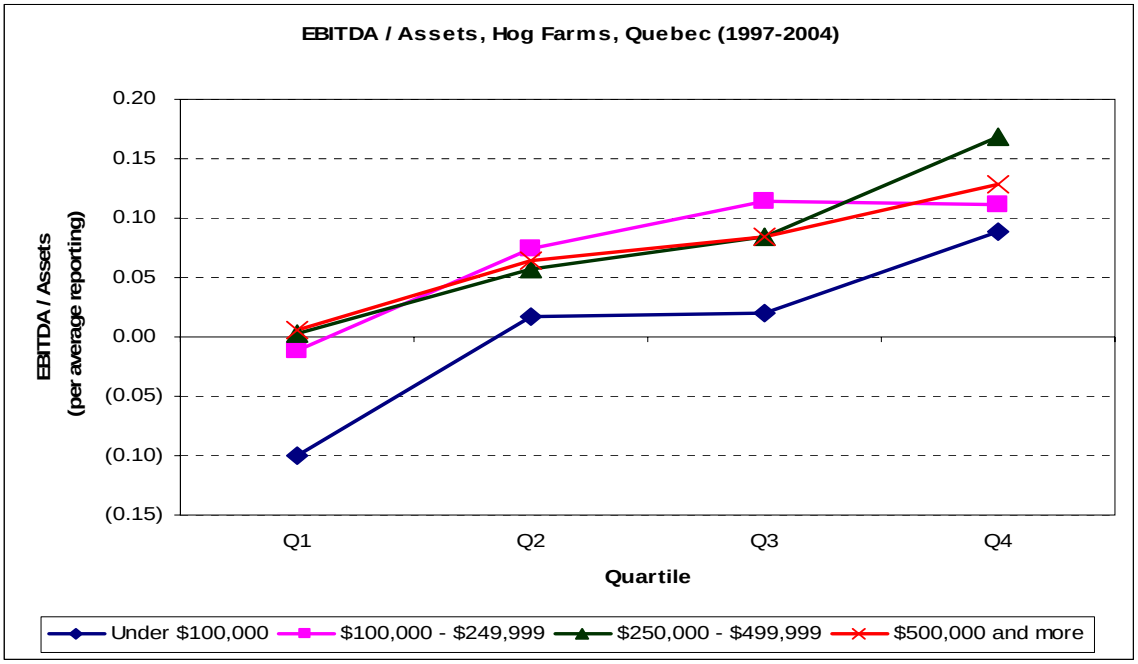
EBITDA/Assets, PEI Potato Farms, 1997-2004



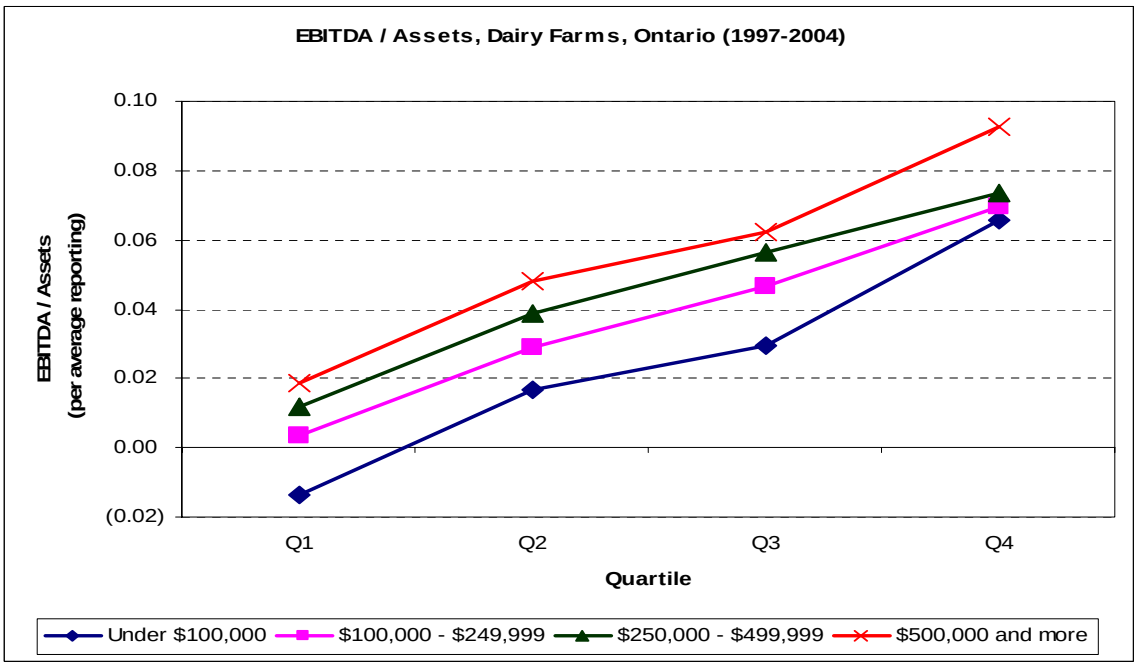
EBITDA/Assets, Quebec Dairy Farms, 1997-2004



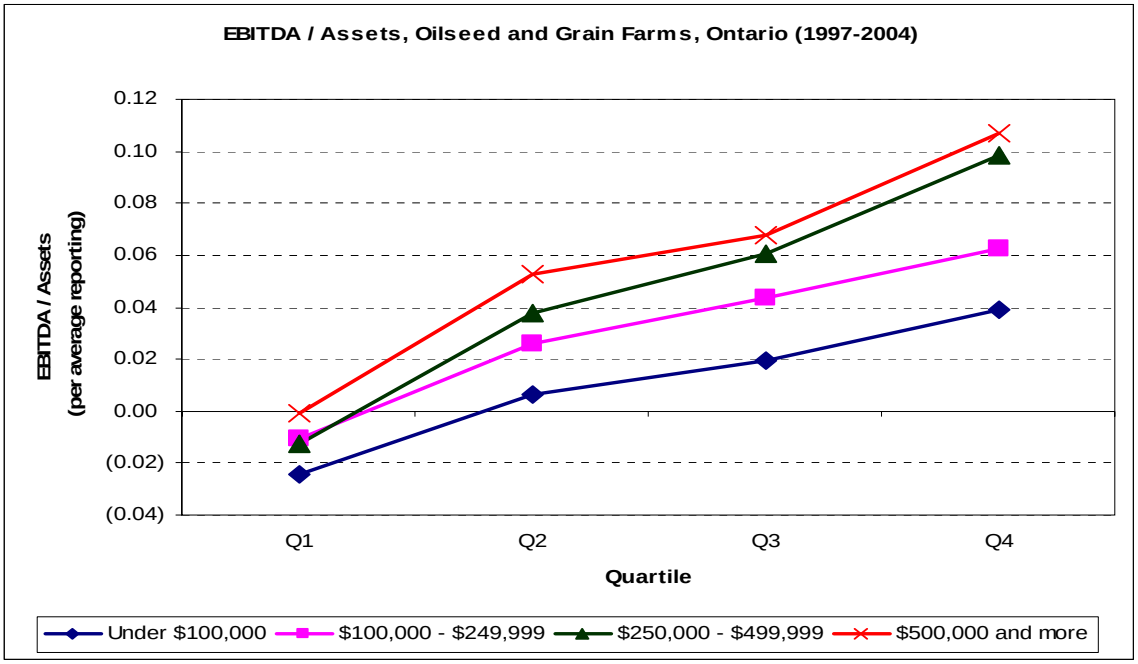
EBITDA/Assets, Quebec Hog Farms, 1997-2004



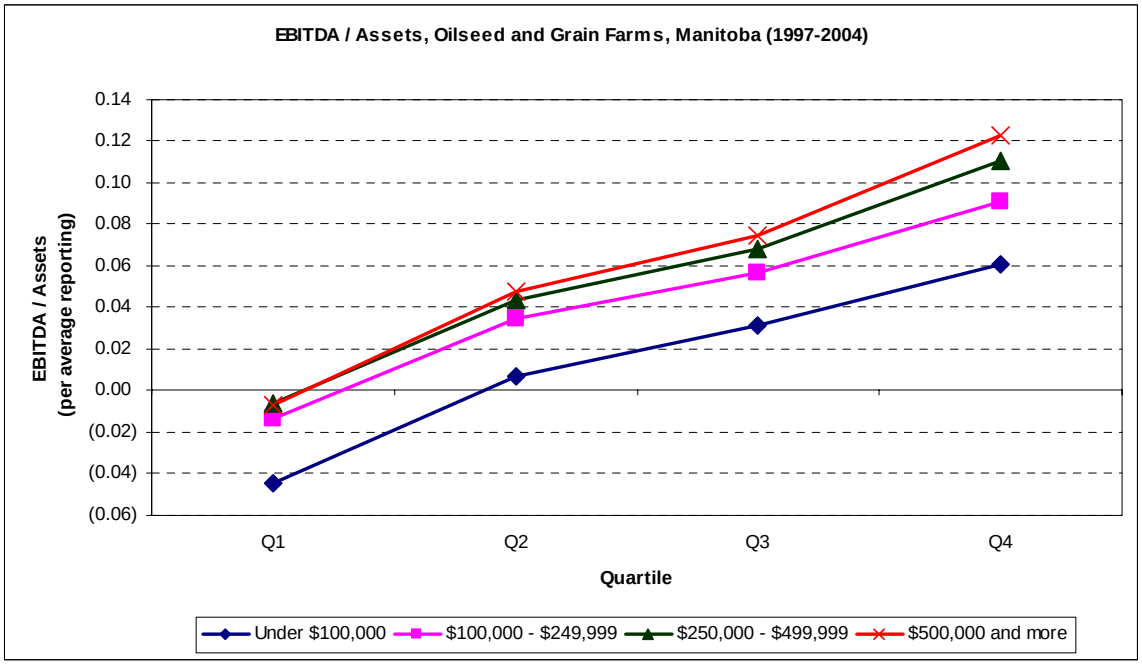
EBITDA/Assets, Ontario Dairy Farms, 1997-2004



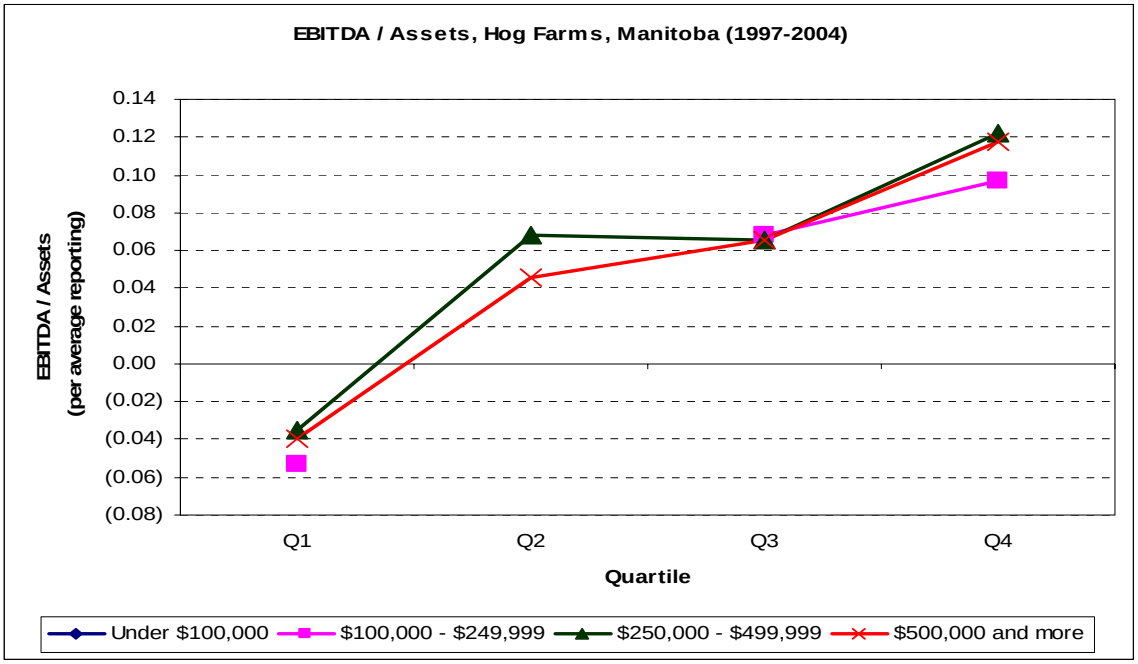
EBITDA/Assets, Ontario Grain and Oilseed Farms, 1997-2004



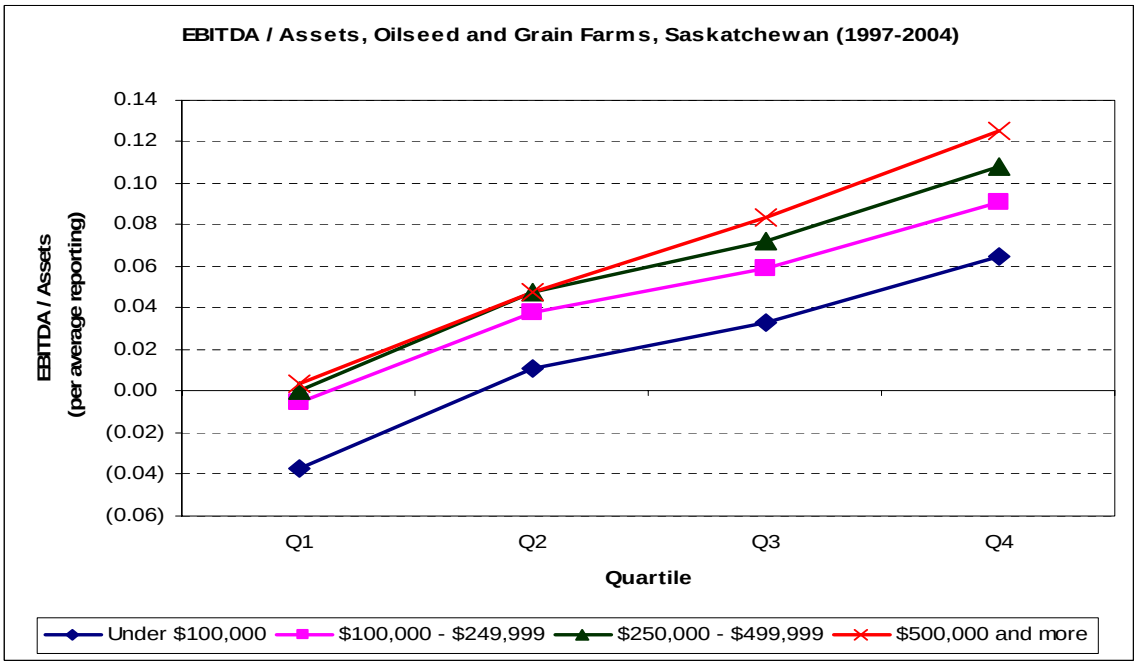
EBITDA/Assets, Manitoba Grain and Oilseed Farms, 1997-2004



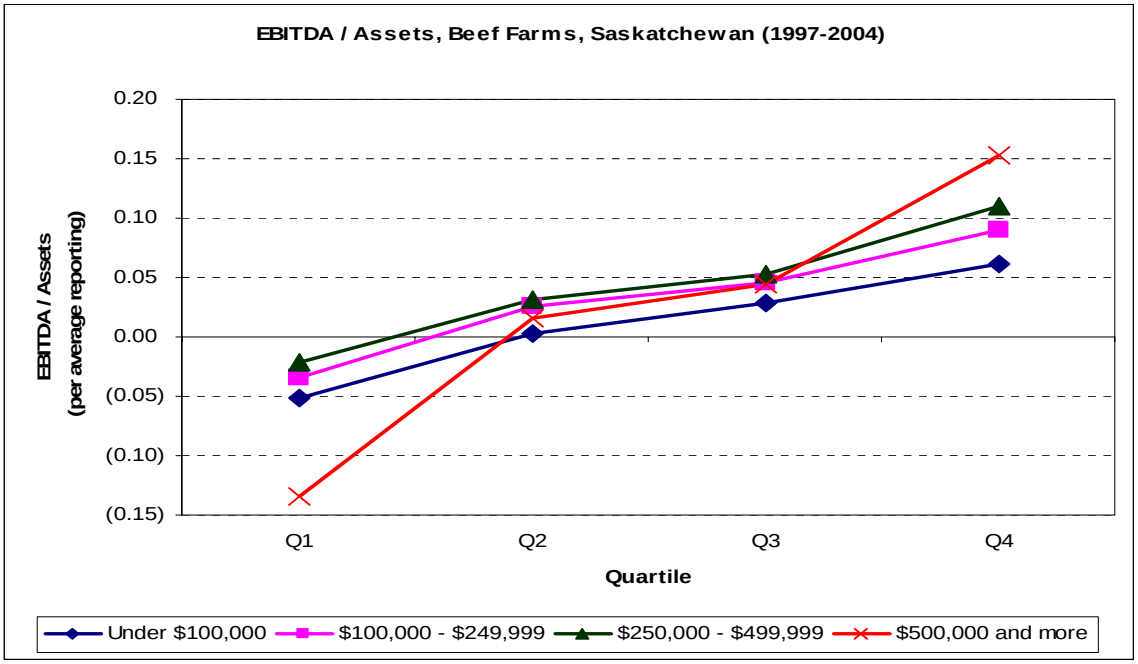
EBITDA/Assets, Manitoba Hog Farms, 1997-2004



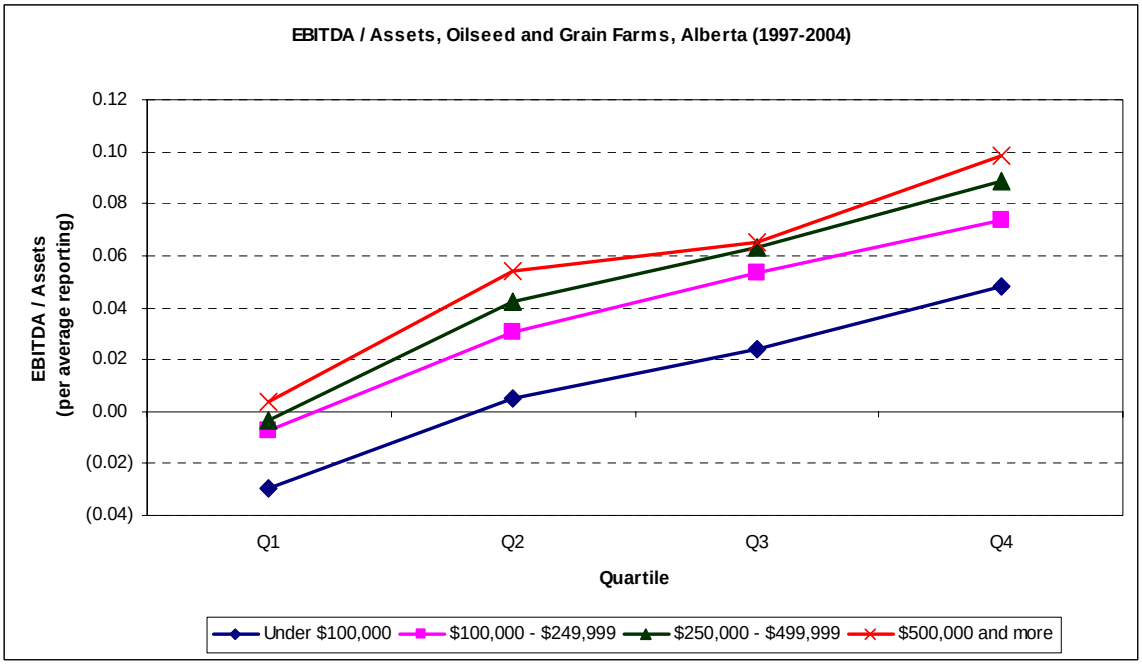
EBITDA/Assets, Saskatchewan Grain and Oilseed Farms, 1997-2004



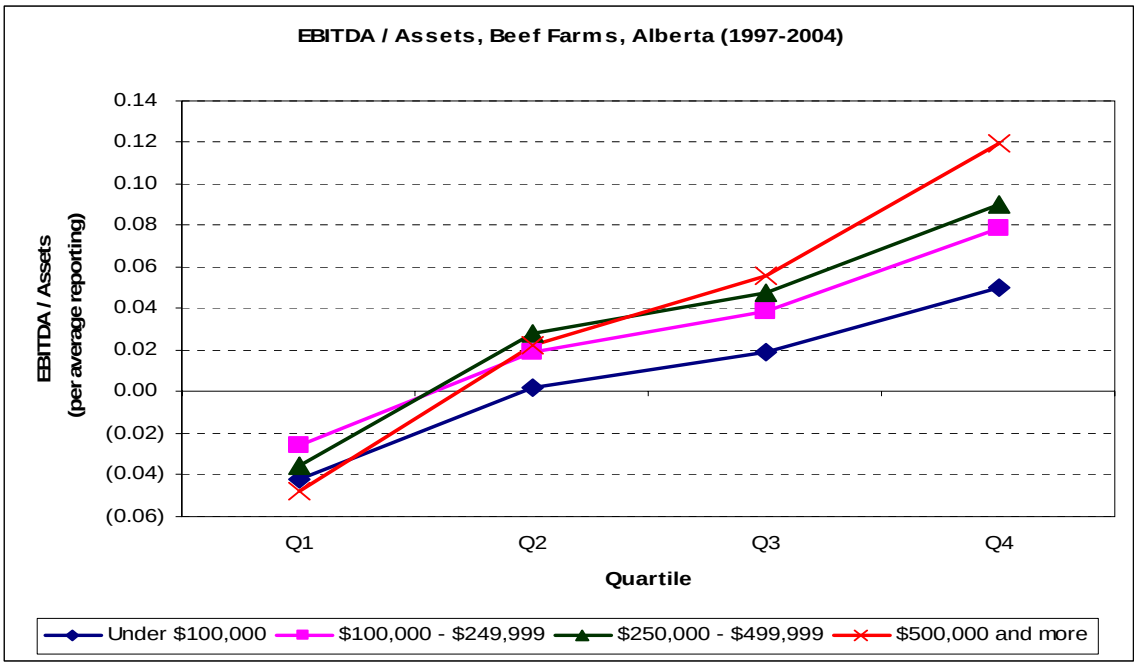
EBITDA/Assets, Saskatchewan Beef Farms, 1997-2004



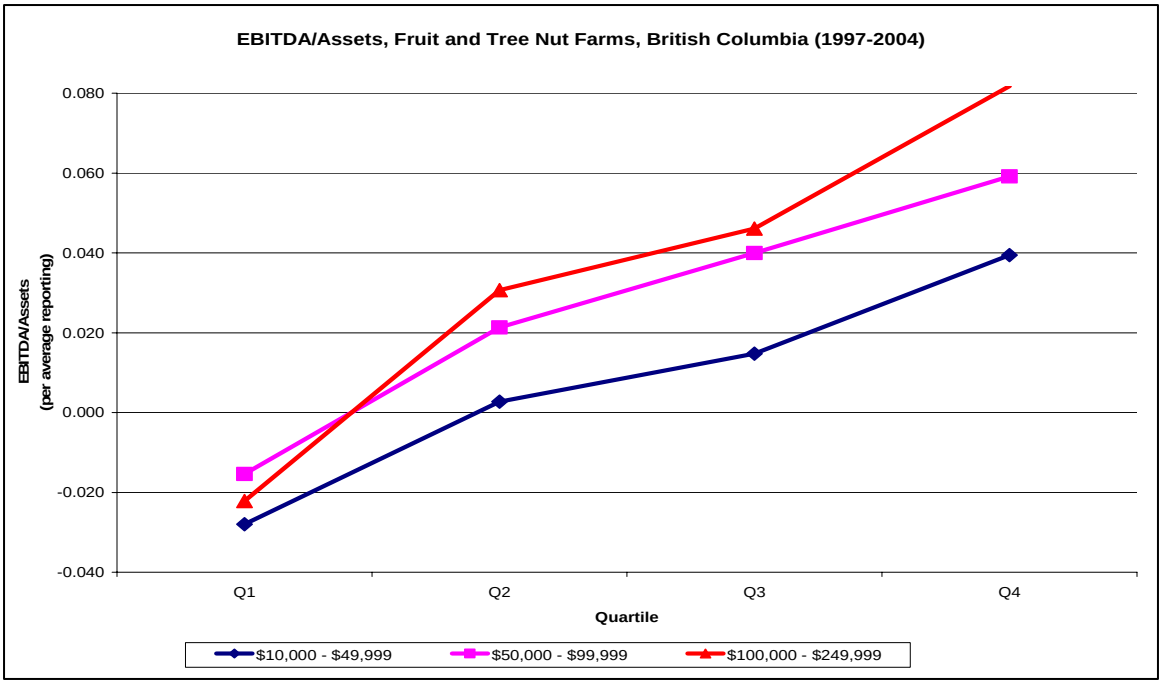
EBITDA/Assets, Alberta Grain and Oilseed Farms, 1997-2004



EBITDA/Assets, Alberta Beef Farms, 1997-2004



EBITDA/Assets, British Columbia Fruit and Tree Nut Farms, 1997-2004



EBITDA/Assets, British Columbia, Greenhouse Establishments, 1997-2004