Porcine Reproductive and Respiratory Syndrome Virus

Impact on a Benchmark Farm

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Executive Summary

The impact of disease on Canadian swine farms is challenging in terms of both animal care and farm profitability. Disease can range from a few pigs experiencing lower growth rates to high mortality rates within a production stage or across the herd. Porcine Reproductive and Respiratory Syndrome (PRRS) is globally recognized as a disease of concern due to the long-term effects it has on the farm operation. Farms with PRRS tend to have higher mortality and morbidity rates across all production stages and lower productivity. Each farm situation is unique and the potential financial impact of PRRS at the farm level in Canada is not well understood.

The purpose of this project is to estimate the economic impacts of PRRS by analysing changes in farm revenues and costs on benchmark 1,200 sow-farrow-to-finish operations in Manitoba and Ontario. The baseline farm models were constructed using provincial cost of production swine budgets from the years 2019 to 2023. Using 5 years considered annual variability in revenues and costs. Information gleaned from a literature review on PRRS was used to adjust the baseline data. Percentage change adjustments were made to accommodate differences in productivity, farm size, etc. in farms represented in the literature as well as differences between the 2 provincial farm models.

Financial impacts were assessed on an annual basis taking into account changes in production and revenue as well as expenses. Production impacts reflected changes in litters per year, pigs born alive and mortality rates across all stages of growth. PRRS decreased feed efficiency and pigs took longer to grow. These were additional costs resulting from PRRS. Labour costs increased due to managing mortalities, cleaning facilities and providing additional pig care. To control PRRS, additional veterinary costs were incurred.

Manitoba Model

For the Manitoba farm model, it was estimated that PRRS-related mortalities lead to a reduction in annual revenue potential of between $1.2 million and $1.8 million. A corresponding reduction in feed expenses of $1.1 million to $1.6 million offset some of this annual revenue reduction. However, additional feed and facilities expenses were calculated to be $334,492 to $350,760 due to sick pigs taking longer to grow. Routine veterinary costs declined due to fewer pigs raised on an annual basis but extra costs of $48,764 to $52,080 were incurred to control PRRS. Marketing and transportation costs were lower relative to baseline since fewer market hogs were shipped. Other farm expenses such as utilities, taxes, insurance, etc. remained at baseline levels. On the model 1,200 sow farrow-to-finish farm in Manitoba, the net impact of a PRRS outbreak is estimated to range from $588,709 to $631,602 or $491 to $526 on a per sow basis.

Ontario Model

Using the Ontario farm model shows that the decline in annual hog marketings results in an estimated $2.3 million to $2.8 million lower revenue potential. A corresponding decrease in feed costs of $1.5 million to $1.9 million due to fewer pigs sold results, however, additional feed and

facilities costs of $203,830 to $213,728 are incurred due to lower feed efficiency and average daily gain. Routine veterinary costs declined by $53,262 to $65,514 but increased costs to control PRRS range from $68,219 to $72,557 and additional labour costs could amount to $20,924 to $24,173. Marketing and transportation costs would be lower by $99,821 to $122,781 due to fewer hogs sold while other farm costs (e.g. utilities, taxes, insurance, etc.) remained the same as baseline. In total, the net estimated impact of PRRS on the model Ontario farm ranges from $914,680 to $1,041,789 or $762 to $868 per sow.

In conclusion, PRRS is a disease of global concern due to the production and financial implications. Potential productivity and cost impacts were estimated for Manitoba and Ontario 1,200 sow farrow-to-finish farm models. Reductions in hog marketings and changes in costs such as feed, veterinary, labour and marketing were key impacts. For the Manitoba model the estimated impacts of PRRS range from $588,709 to $631,602 or $491 to $526 per sow. For the Ontario model the impact ranges from $914,680 to $1,041,789 or $762 to $868 per sow. Impacts at the individual farm level may differ from these modelled scenarios.

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1.0 Background

Market prices and the cost of inputs (e.g. feed, labour, etc.) are well documented factors affecting swine farm profitability. However, another variable is the impact that disease can have. Depending on the disease, the effects may range from a few animals experiencing lower growth rates to high mortality rates within a particular growth stage or even throughout the herd. The type of disease and severity can therefore impact profitability by reducing revenue and/or increasing costs.

Porcine Reproductive and Respiratory Syndrome Virus (PRRS) is a disease of particular interest to swine producers globally. PRRS tends to have a long-term effect on the farm operation with elevated mortality and morbidity rates across production stages, lower productivity in terms of pigs born alive, lower feed efficiency, lower daily gains, etc.

The financial impact of PRRS at the farm level in Canada is not well documented. Analysis could be helpful by providing insight into the estimated economic impacts of this disease.

1.1 Objectives

The primary objective of this project was to assess the impact of PRRS on a Canadian swine farm. More specifically, the financial impacts of PRRS were estimated based on changes to farm revenue and costs (i.e. feed, veterinary, labour, marketing) for benchmark 1,200-sow farrow-to-finish operations in two provinces, namely Manitoba and Ontario.

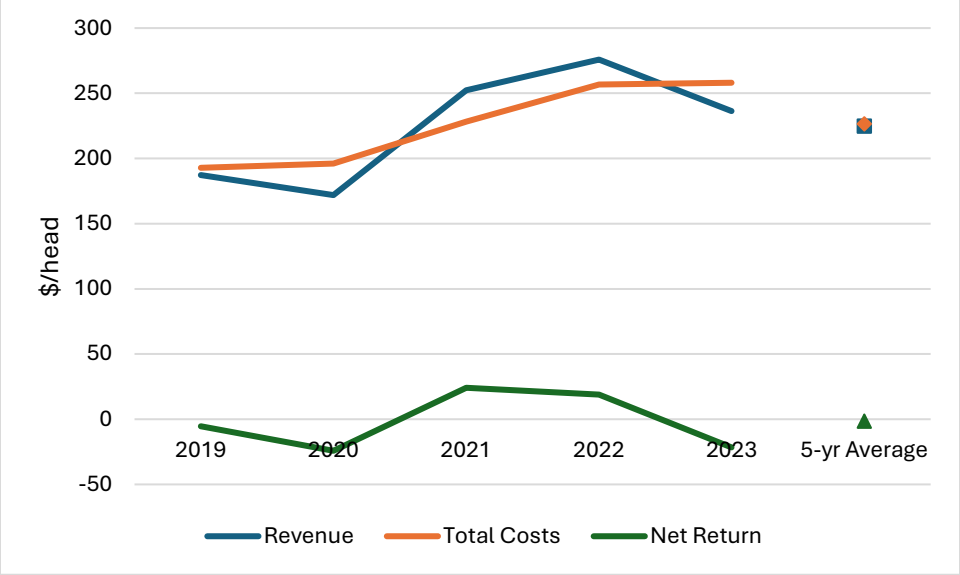
1.2 Methodology

The steps taken to conduct this analysis are outlined below.

1) Conduct literature review – In order to understand the impacts of PRRS on farm revenues and costs, various sources of publicly available information were sought out. This included an internet search of peer-reviewed journal articles, magazine articles, and other industry sources (e.g. factsheets).
2) Analyse disease impacts – The averages of 5 years of data (i.e. 2019 to 2023) from Manitoba and Ontario cost of production swine budgets were used to establish the two baseline farms. The impact of PRRS at the farm level was estimated based on findings in the literature review. The baseline data was adjusted by a percentage change based on the literature, rather than the absolute difference. This approach was used due to differences in production variables between the provincial benchmarks (e.g. market hog weights) as well as differences in productivity, farm size, etc. in farms represented in the literature. Data from US sources was used primarily as it is representative of Canadian production. When possible, two scenarios are included (i.e. low and high impact) to demonstrate how impacts may vary. A 1,200-sow farrow-to-finish farm model was used to provide perspective at the farm level.
3) Write report – The findings are documented.

As stated, the baseline model farms were constructed using 5-year average cost of production data. This was done to incorporate the variability that exists within the swine industry, particularly as it relates to market prices and input costs (e.g. feed). Figure 1 shows revenue, costs, and net returns per pig for Ontario over time. Between 2019 and 2023 Ontario revenue per hog ranged from $171.90 to $275.83 and the 5-year average revenue is $224.76/pig. Total costs ranged from $192.84 to $258.07/pig during this time while the 5-year average is $226.41.

Figure 1: Ontario Revenue, Costs, Net Return ($/pig)



Source: OMAFRA Annual Swine Budgets

1.3 Limitations

There are some limitations associated with this project and they are discussed below.

One limitation is that for some of the variables, no data was found pertaining to US pig production. When this occurs, it is noted in the analysis and international data is used.

A second limitation is that the literature reports information from various sources and there are differences with respect to the following: number of herds/animals in each study; methods used to estimate economic impact; geographical locations; study period length; herd health status before the study period; availability of data; and market prices and cost of inputs at the time of the study. Still, the information is considered useful in advancing discussion of the financial impact of PRRS on Canadian farms. Every farm situation is unique and individual farm impacts will vary.

A third limitation is the baseline numbers that were used in the analysis are constructed from the cost of production or swine enterprise benchmarks published by Manitoba Agriculture and Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).[3] These numbers don't

[3] It's important to note that there are significant differences between the two provincial swine enterprise budgets regarding hog weights and market prices, costs and productivity.

necessarily represent an average farm in each province but they do provide a starting point for analysis. The baseline budgets are provided in Appendix A.

2.0 Literature Review

PRRS is characterized as a chronic or endemic disease that is difficult to control [18]. It affects reproduction in the breeding herd and causes respiratory disease across all pig stages [18]. It's believed that PRRS is prevalent in a significant portion of swine herds globally. Estimates range from 20% to 75% [16] but 40% could be close to the number of herds affected annually in the US [9].

In the US, losses incurred due to PRRS were estimated to be $664 million per year in an analysis published in 2013 [3] while recent information indicates that losses amounted to $1.2 billion per year during the years 2016 to 2020 [20].

Assessing the impacts of PRRS has been undertaken in various countries typically using either an enterprise or partial budget analysis. A budget approach is useful in that it accounts for both changes in production and financial measures [16]. PRRS-related changes in production may include a decrease in the number of litters per sow [2,3,7] and the number of pigs born alive while the number of stillborn pigs increases, and mortality rates are higher across all growth stages [2,4,5].

The financial impacts of this disease are reflected in both revenue and costs. Revenue is lower due to fewer pigs sold, however, offsetting this is a corresponding reduction in feed, routine veterinary and marketing costs. It also results in increased costs due to lower daily gain [2,3,4,14], veterinary costs related to managing the disease [3,4,5,6] and possibly an increase in labour costs [4,6] due to removing fatalities, cleaning facilities, and providing additional pig care. The literature stressed the importance of biosecurity and cleaning [9,18], however cleaning costs were not readily available. This may be because biosecurity and cleaning strategies and the associated costs vary by farm.

Most analysis looked at impacts by stage of production. In the farrow-to-wean stage, losses ranged from US$45.20/weaned pig [7] to US$52.19/breeding female/year [3] to US$74.16/litter [2] to US$300/sow/year [19] depending on the methodology used and variables included in each analysis.

In the nursery stage, losses were estimated at US$6.01/pig [2] while losses in grow-finish varied from US$7.67/hog [2] to US$13.64/hog [9]. In Germany, it was estimated that PRRS negatively impacted farm profits by an average of –19.1% [16].

The length of time a farm's production may be affected by PRRS will vary depending on the type or strain of PRRS and the control strategies used [7].

3.0 Results

Results for the estimated impact of PRRS in Manitoba and Ontario are discussed below. As stated previously, the analysis uses the Manitoba and OMAFRA budget assumptions (i.e. productivity and financial). The baseline financial data is the 5-year average for each region and is intended to represent a farm with no disease present. The PRRS-related impact on production and farm revenue is considered first followed by analysis of feed, veterinary, and labour expense impacts. The analysis incorporates low and high impact scenarios to recognize a range of potential outcomes associated with PRRS. However, impacts at the individual farm level are unique and may differ from the results presented here.

3.1 Production and Revenue Impacts

Tables 1 and 2 for Manitoba and Ontario respectively, display the estimated impacts on productivity due to PRRS. The baseline numbers are in the column "Baseline (A)". Numbers found under the column heading "Result with PRRS (B)" are based on the percentage change obtained through the literature review. For reference purposes, the percentage change values that were used are included in Appendix B. These numbers were applied to the baseline farm numbers. In the column heading "Difference vs baseline (C)" the values reflect column (B) minus column (A) (e.g. the difference in the number of litters/sow/year due to PRRS versus the baseline).

Tables 1 and 2 show that the number of litters/sow/year is likely to decline slightly due to PRRS. A decrease in the number of pigs born alive/litter is indicative of increases in the number of stillborn and mummified piglets. The declines of 0.8 and 0.7 pigs born alive per litter in Manitoba and Ontario respectively based on US literature closely match two international studies [1,6]. Pre-weaning mortality rate changes due to PRRS varied widely in the literature. The US data indicated an increase of 21.1% [3] but it was up to more than 30% in other countries [1,4]. The absolute change in pre-weaning mortality rates in Manitoba is 3.1% and in Ontario it is 2.5%. These values also align with data from The Netherlands and Germany [1,6].

The number of pigs weaned/sow/year is calculated based on data in each table. The impact of PRRS is estimated to be a loss of 3 to 5 pigs weaned/sow/year (down 12% to 17%) in Manitoba and a loss of 3 to 4 weaned pigs/sow/year in Ontario (down 12% to 16%).

Mortality rates in the nursery and grow-finish stages of production also varied considerably in the literature. It should be noted that the nursery mortality rate of change used in the calculation in Tables 1 and 2 was based on a US study reporting an average increase in mortality of 644%[4] [2]. This clearly impacts the mortality rates shown in column B (e.g. in Table 1 baseline nursery mortality of 1% is adjusted to 7.1% with PRRS). The literature did show though, that there are significant increases in nursery mortality rates globally with a range reported from 133% to 644% higher based on data including Germany and Korea [2,6,14].

[4] This is based on a 2-farm sample with changes in mortality rates of 1,041% and 246% [2, Table 4].

It's important to note that the analysis highlights differences in the baseline mortality rates between Manitoba and Ontario particularly when the rates are increased due to PRRS. For example, the Manitoba baseline nursery mortality is 1.0% and when a change of 664% due to PRRS is applied, the mortality rate becomes 7.1%. The Ontario baseline nursery farm has mortality of 4.0% and with the same adjustment for PRRS, the adjusted mortality rate is 29.8%.

In the grow-finish stage, there was also a rather significant increase in mortality rates due to PRRS (i.e. low = 40%, high = 166% increase). The resulting total hogs marketed/sow/year is down 5 to 7.3 pigs in Manitoba (i.e. 19.1% to 28.1% lower) and 8.6 to 10.5 pigs/sow/year in Ontario (i.e. 36.9% to 45.4% lower) relative to baseline. Therefore, the decrease in revenue is estimated to range from $1,039 to $1,529/sow for the benchmark Manitoba farm and $1,926 to $2,369/sow for the Ontario benchmark farm. The PRRS adjusted mortality rates, especially in the nursery and grow-finish stages, are key components of the reduction in revenue.

Table 1: Productivity Impacts Due to PRRS - Manitoba

	Baseline A	**Result with PRRS B**		**Difference vs baseline C=B-A**	
		Lower Impact	Higher Impact	Lower Impact	Higher Impact
# litters/sow/year	2.38	2.30	2.17	-0.08	-0.21
# pigs born alive/litter	13.5	12.7	12.7	-0.8	-0.8
Pre-wean mortality/morbidity (%)	14.9	18.0	18.0	3.1	3.1
# pigs weaned/sow/year placed in nursery*	27.3	24.0	22.6	-3.3	-4.7
Nursery mortality/morbidity (%)	1.0	7.1	7.1	6.1	6.1
Finisher mortality/morbidity (%)	4.3	6.1	11.5	1.7	7.2
# hogs marketed/sow/year*	25.9	21.0	18.6	-5.0	-7.3
Change in average revenue/sow (@ $209.68/hog)				**-$1,039**	**-$1,529**

*Calculated based on preceding information. Finisher mortality includes lightweight hogs. Numbers may not add due to rounding.

Table 2: Productivity Impacts Due to PRRS - Ontario

	Baseline A	Result with PRRS B		Difference vs baseline C=B-A	
		Lower Impact	Higher Impact	Lower Impact	Higher Impact
# litters/sow/year	2.35	2.27	2.14	-0.08	-0.21
# pigs born alive/litter	12.5	11.7	11.7	-0.7	-0.7
Pre-wean mortality/morbidity (%)	12.0	14.5	14.5	2.5	2.5
# pigs weaned/sow/year placed in nursery*	25.7	22.8	21.5	-3.0	-4.2
Nursery mortality/morbidity (%)	4.0	29.8	29.8	25.8	25.8
Finisher mortality/morbidity (%)	6.0	8.4	16.0	2.4	10.0
# hogs marketed/sow/year*	23.2[5]	14.7	12.7	-8.6	-10.5
Change in average revenue/sow (@$224.76/hog)				**-$1,926**	**-$2,369**

*Calculated based on preceding information. Numbers may not add due to rounding.

3.2 Feed Cost Impacts

Disease impact on feed costs in the nursery and grow-finish stages is shown in Tables 3 (Manitoba) and 4 (Ontario). The percentage change per variable based on the literature is used to calculate the impact of reduced feed efficiency. One US data source had this level of detail. The methodology is the same as was used in a frequently cited US study on the impact of PRRS [17,2]. Diseased-compromised pigs grow slower, therefore requiring additional feed and time in the barn.

Tables 3 and 4 show that in the nursery, feed efficiency is reduced by 11.7% [2] due to PRRS resulting in an additional 3.3 and 3.9 kg of feed required for the Manitoba and Ontario farms respectively. The extra nursery feed cost is estimated to be $2.97/pig (Manitoba) and $2.41/pig (Ontario). In the grow-finish stage, feed efficiency declines by 7.6% [2] and therefore pigs need an extra 21.4 kg of feed for both Manitoba and Ontario farm models. The added feed cost per pig in this stage is estimated to be $9.80 (Manitoba) and $8.44 (Ontario).

It is assumed that pigs are in the nursery stage for 42 and 56 days in the Manitoba and Ontario models respectively but PRRS results in lower average daily gain (ADG). This increases the days in the nursery by 25.3% [2] or 10.6 and 14.2 days in Manitoba and Ontario respectively. Similarly, lower ADG in the grow-finish stage results in additional days for growing. This ranges from 2.6 to 14 days for the Manitoba farm and 2.5 to 13.5 days for the Ontario farm. Therefore, increased facilities costs of $0.95/nursery pig and $0.23 to $1.25/grow-finish pig are incurred for the Manitoba farm. For the Ontario farm, additional facilities costs are $1.02/nursery pig and $0.28 to $1.51/grow-finish pig in Ontario.

In total, additional costs due to reduced feed efficiency and lower ADG amount to $3.92/nursery pig in Manitoba and $3.43/nursery pig in Ontario. In the grow-finish production stage the extra

[5] Anecdotal evidence indicates that many commercial scale farms in Ontario market more than 23.2 hogs/sow/year.

costs range from $10.03 to $11.05/grow-finish pig in Manitoba and $8.72 to $9.95/grow-finish pig in Ontario.

Table 3: Impact of PRRS on Feed Costs ($/head) - Manitoba

Cost of reduced feed efficiency	Nursery	Grow-Finish	
Feed/pig (kg)	28.5	283.3	
Decreased feed efficiency (%) by stage	11.7	7.6	
Additional feed required (kg)	3.3	21.4	
Cost of feed/kg* by stage	$0.89	$0.46	
Increased feed cost/pig	$2.97	$9.80	
		Grow-Finish Range	
Cost of reduced ADG		Lower Impact	Higher Impact
Typical # of days in stage	42	116	116
Increased days in stage (%)	25.3	2.2	12.0
Increased # of days	10.6	2.6	14.0
Average fixed costs/day by stage[6]	$0.09	$0.09	$0.09
Increased cost/pig from lower ADG	$0.95	$0.23	$1.25
Total higher feed costs from reduced feed efficiency and ADG	$3.92	$10.03	$11.05

Table is based on Neumann et al, 2005, Table 6 [2].

*Purchased feed is assumed; Numbers may not add due to rounding.

Table 4: Impact of PRRS on Feed Costs ($/head) - Ontario

Cost of reduced feed efficiency	**Nursery**	**Grow-Finish**	
Feed/pig (kg)	33.5	283.3	
Decreased feed efficiency (%) by stage	11.7	7.6	
Additional feed required (kg)	3.9	21.4	
Average cost of feed/kg* by stage	$0.61	$0.39	
Increased feed cost/pig	$2.41	$8.44	
		Grow-Finish Range	
Cost of reduced ADG		Lower Impact	Higher Impact
Typical # of days in stage	56	112	112
Increased days in stage (%)	25.3	2.2	12.0
Increased # of days	14.2	2.5	13.5
Average fixed costs/day by stage[7]	$0.07	$0.11	$0.11
Increased cost/pig from lower ADG	$1.02	$0.28	$1.51
Total higher feed costs from reduced feed efficiency and ADG	**$3.43**	**$8.72**	**$9.95**

Table is based on Neumann et al, 2005, Table 6 [2].

*Purchased feed is assumed; Numbers may not add due to rounding.

[6] Fixed costs are based on average capital costs for 2018/19 and 2023.

[7] Fixed costs are based on average capital costs for 2019 and 2023.

3.3 Veterinary and Labour Cost Impacts

There are increased veterinary costs when disease is present. No data was found regarding changes to US veterinary costs in the literature so the impacts are based on international data. The literature showed that veterinary costs related to PRRS have different levels of impact across the three production stages ranging from an average increase of 43% in the breeding and farrowing herd [5,6] to 95% in the nursery [5,6,13] and 35% in grow-finish [5,6]. Table 5 displays the adjusted veterinary costs based on the benchmark farm models.

Similarly, labour costs may increase during a disease outbreak due to managing mortalities, cleaning facilities, and providing additional pig care. Again, there was limited information in the literature regarding the impact on the cost of labour in the US, but international literature reported increases generally around 10% [4,6]. The baseline farrow-to-finish farm labour costs were adjusted to account for potentially higher labour costs.

The impact on veterinary and labour costs is displayed in Table 5 with Manitoba shown first followed by Ontario. These additional costs amounted to $3.65/pig in Manitoba and $4.72/pig in Ontario.

Table 5: Impact on Veterinary and Labour Costs ($/pig)

		Baseline $/pig	% Change	Adjusted Cost $/pig	Difference $/pig
Manitoba	Veterinary Costs				
	Farrow to wean	0.63	43	0.90	$0.27
	Nursery	1.48	95	2.88	$1.40
	Grow-finish	0.77	35	1.04	$0.27
	Labour cost	$17.13	10	$18.85	$1.71
	Total				**$3.65**
Ontario	Veterinary Costs				
	Sow	$2.42	43	$3.45	$1.03
	Nursery	$2.27	95	$4.42	$2.15
	Grow-finish	$0.49	35	$0.66	$0.17
	Labour cost	$13.74	10	$15.11	$1.37
	Total				**$4.72**

*Farrow-to-finish veterinary costs are allocated by stage of production. Numbers may not add due to rounding.

Table 6 summarizes the extra costs related to feed, vet, and labour. The estimated additional costs range from $17.60 to $18.62/pig for the Manitoba farm model and $16.87 to $18.10/pig for the Ontario farm model. Although farms may incur extra costs related to cleaning during a PRRS outbreak, this has not been included.

Table 6: Summary of Additional Costs ($/pig)

		Difference Versus Baseline	
		Lower Impact	Higher Impact
Manitoba	Feed cost (nursery + grow-finish)	$13.95	$14.97
	Vet cost	$1.94	$1.94
	Labour	$1.71	$1.71
	Total	**$17.60**	**$18.62**
Ontario	Feed cost (nursery + grow-finish)	$12.15	$13.38
	Vet cost	$3.35	$3.35
	Labour	$1.37	$1.37
	Total	**$16.87**	**$18.10**

Numbers may not add due to rounding.

3.4 Estimated Farm Impact

Tables 7 and 8 combine the preceding information to estimate the total impact of PRRS relative to the Manitoba and Ontario baseline farms. The results reflect annual production on the 1,200-sow farrow-to-finish model farms (i.e. baseline) and the estimated effects related to changes in the number of hogs marketed under low and high impact scenarios. Additional PRRS-related costs for feed, veterinary, and labour are also included. It's important to mention that significant differences exist between the two provincial baseline farms with respect to hog weights and market prices, feed costs, and mortality rates. These are key factors that contribute to the differences in estimated impacts between the model farms. While these differences exist, they do not take away from the impact of PRRS on productivity and changes in farm income and expenses.

The tables show total annual revenue based on the number of market hogs sold in each scenario. In the expense section of the tables, the rows containing the word 'Additional' (e.g. Additional feed cost, Additional veterinary cost, Additional labour cost) represent the estimated costs that are incurred due to PRRS (e.g. lower feed efficiency and ADG, extra veterinary and labour costs). These were discussed in Sections 3.2 and 3.3. Other line items such as veterinary and marketing costs are baseline costs per pig and reflect the number of hogs sold in each scenario. It is assumed that the normal labour supply, and therefore baseline cost, is maintained during a PRRS outbreak. The category 'Total other expenses' includes all other farm expenses such as utilities, fixed costs, etc. that are incurred regardless of the level of production.

In Table 7, for Manitoba, it is important to note the decrease in annual revenue due to selling fewer hogs. This results in $1.2 million to $1.8 million in lost revenue potential. Recall that fewer pigs born and increased mortality rates across all growth stages were contributing factors. Although a corresponding reduction in feed costs does offset some of this (i.e. $1.1 to $1.6 million less), the additional feed and facilities expenses associated with lower feed efficiency and average daily gain amount to $334,492 to $350,760. Similarly, routine veterinary and health costs decline due to fewer total pigs but extra costs of $48,764 to $52,080 are incurred specifically to control

PRRS. Extra labour that may be required could cost $38,271 to $43,072. Shipping fewer market hogs does result in a reduction in marketing and transportation costs relative to baseline (i.e. $31,880 to $46,900 less). The net impact of PRRS on a 1,200-sow farrow-to-finish farm in Manitoba is estimated to range from $588,709 to $631,602. This equates to $491 to $526 on a per sow basis.

Table 7: Estimated Annual Impact of PRRS on a Benchmark Farm – Manitoba

	Baseline	Lower Impact	Higher Impact	Difference Versus Baseline	
				Lower Impact	Higher Impact
	A	B	C	B-A	C-A
Market hog price ($/ckg)	199.91				
Avg weight (kg lw)	118.1				
Market hog (incl $2/hd premium)	209.68				
# hogs marketed/sow	25.9	21.0	18.6	-5.0	-7.3
# hogs marketed/farm	31,089	25,141	22,339	-5,948	-8,750
Total revenue	**6,518,694**	**5,271,582**	**4,684,015**	**-1,247,112**	**-1,834,680**
Expenses					
Feed cost	5,516,117	4,460,811	3,963,612	-1,055,306	-1,552,505
Additional feed & facilities cost		350,760	334,492	350,760	334,492
Veterinary cost	89,536	72,407	64,336	-17,129	-25,200
Additional vet cost		52,080	48,764	52,080	48,764
Labour cost	532,616	532,616	532,616	0	0
Additional labour cost		43,072	38,271	43,072	38,271
Marketing/transportation cost	166,637	134,757	119,737	-31,880	-46,900
Total other expenses	1,619,394	1,619,394	1,619,394	0	0
Total expenses	**7,924,300**	**7,265,896**	**6,721,222**	**-658,403**	**-1,203,078**
Net return	**-1,405,605**	**-1,994,314**	**-2,037,207**	**-588,709**	**-631,602**
Net return/sow	-1,171	-1,662	-1,698	-491	-526

Numbers are based on production per stage and may not add due to rounding.

Table 8 provides estimates for the Ontario benchmark farm. The decrease in the number of pigs marketed is reflected in $2.3 million to $2.8 million less annual revenue. There is a corresponding reduction in feed costs due to fewer pigs sold (i.e. $1.5 million to $1.9 million less in feed costs) but surviving pigs do require more feed because of lower feed efficiency and average daily gain. The added feed and facilities costs are estimated to be $203,830 to $213,728. Routine health costs decline due to producing fewer pigs (i.e. $53,262 to $65,514 less) but additional costs to control PRRS are estimated to be $68,219 to $72,557 and extra labour may cost $20,924 to $24,173. However, money spent on marketing and transportation declines by $99,821 to $122,781 relative to baseline. Overall, the total estimated impact of PRRS on the benchmark Ontario farm may range from $914,680 to $1,041,789 or $762 to $868 per sow.

Table 8: Estimated Annual Impact of PRRS on a Benchmark Farm – Ontario

	Baseline	Lower Impact	Higher Impact	Difference Versus Baseline	
				Lower Impact	Higher Impact
	A	B	C	B-A	C-A
Market hog price ($/ckg)	189.34				
Avg weight (kg lw)	132.2				
Average market hog (incl $2/hd premium)	224.76	224.76	224.76		
# hogs marketed/sow	23.2	14.7	12.7	-8.6	-10.5
# hogs marketed/farm	27,880	17,598	15,233	-10,282	-12,647
Total revenue	**6,266,554**	**3,955,451**	**3,423,853**	**-2,311,103**	**-2,842,701**
Feed cost	4,200,752	2,651,516	2,295,162	-1,549,236	-1,905,590
Additional feed & facilities cost		213,728	203,830	213,728	203,830
Veterinary cost	144,421	91,158	78,907	-53,262	-65,514
Additional vet cost		72,557	68,219	72,557	68,219
Labour cost	382,966	382,966	382,966	0	0
Additional labour cost		24,173	20,924	24,173	20,924
Marketing/transportation cost	270,664	170,843	147,882	-99,821	-122,781
Total other expenses	1,313,672	1,313,672	1,313,672	0	0
Total expenses	**6,312,475**	**4,916,052**	**4,511,563**	**-1,396,423**	**-1,800,912**
Net return	**-45,921**	**-960,601**	**-1,087,710**	**-914,680**	**-1,041,789**
$/sow	-38	-801	-906	-762	-868

Numbers are based on production per stage and may not add due to rounding.

It is important to recall that using a 5-year average for the baseline incorporates variability in revenue and costs over time. Yearly impact could vary from the results presented here depending on market hog prices and input costs. As a result, it's possible that the financial outcome could be different. To demonstrate this, data for the years 2019 to 2023 for low and high impact scenarios is provided in Appendix C.

4.0 Conclusion

PRRS is a disease of global concern due to production and financial implications. Information on the impacts on productivity and costs obtained through the literature review varied depending on the length of the study, number of farms included, as well as production and expense variables considered. However, this still provided an opportunity to assess potential impacts on farrow-to-finish farms in Manitoba and Ontario. Provincial swine enterprise data was used to construct the baseline models and average percentage changes from the literature review were applied to estimate impacts related to PRRS. Reductions in the number of hogs marketed and costs related to health, feed, labour, and marketing reflect key impacts. The impact of PRRS on a benchmark 1,200-sow farrow-to-finish farm in Manitoba is estimated to range from $588,709 to $631,602 or $491 to $526 per sow. For a benchmark Ontario farm, the impact of PRRS is estimated to range from $914,680 to $1,041,789 per farm or $762 to $868 per sow on an annual basis. Impacts at the individual farm level may differ from these results.

Appendix A - Manitoba and Ontario Benchmark Farm Models, 5-year average

			Manitoba	Ontario
			$/pig	$/pig
Revenue	Market hog price ($/ckg)		199.91	189.34
	Avg weight (kg lw)		118.1	132.2
	Market hog (incl $2/hd premium)		209.68	224.76
Expenses				
	Feed	Sow	22.53	18.56
		Nursery	25.37	20.59
		Finish	129.52	111.52
	Veterinary, health	Sow	0.63	2.42
		Nursery	1.48	2.27
		Finish	0.77	0.49
	Labour		17.13	13.74
	Marketing, transportation		5.36	9.71
	Other variable costs (e.g. utilities, operating loan interest, etc)		28.02	20.39
	Total variable costs		230.82	199.69
Fixed	Total fixed costs (excl. land)		24.07	26.72
Total Expenses			254.89	226.41
Net Return			-45.21	-1.65

Source: Manitoba Agriculture, OMAFRA and OMAFA Swine Budgets

Appendix B - % Change Due to PRRS

	% Change due to PRRS		Sources Used
	Lower Impact	Higher Impact	
# litters/sow/year	-3.3	-8.7	2,3,7
# pigs born alive/litter	-5.8	-5.8	3
% pre-wean mortality/morbidity	21.1	21.1	3
% nursery mortality/morbidity	644.0	644.4	2
% finisher mortality/morbidity	40.0	166.0	2,3

Appendix C - Annual Impact Due to PRRS, Manitoba and Ontario

Table C1: Manitoba Lower Impact Scenario by Year

	Baseline	2019	2020	2021	2022	2023
Market hog price ($/ckg)	199.91	170.90	165.57	211.55	235.55	216.00
Avg weight (kg lw)	118.1	118.1	118.1	118.1	118.1	118.1
Market hog revenue (incl $2/hd premium)	209.68	179.54	174.00	221.77	246.70	226.39
# pigs weaned/sow	27.34	24.0	24.0	24.0	24.0	24.0
# nursing pigs/sow	27.08	22.3	22.3	22.3	22.3	22.3
# hogs marketed/sow	26	21.0	21.0	21.0	21.0	21.0
# hogs marketed/farm	31,089	25,141	25,141	25,141	25,141	25,141
Total revenue	**6,518,694**	**4,513,802**	**4,374,595**	**5,575,488**	**6,202,313**	**5,691,712**
Feed costs	5,516,117	2,987,785	3,686,209	4,743,398	5,688,960	5,197,700
Additional feed costs		244,735	295,006	371,100	439,160	403,800
Veterinary costs	89,536	72,407	72,407	72,407	72,407	72,407
Additional vet costs		52,080	52,080	52,080	52,080	52,080
Labour cost	532,616	459,495	511,725	563,954	563,954	563,954
Additional labour cost		37,159	41,382	45,606	45,606	45,606
Marketing/transportation costs	166,637	128,472	134,757	134,757	134,757	141,042
Total other expenses	1,619,394	1,415,170	1,591,911	1,637,612	1,652,224	1,800,052
Total expenses	**7,924,300**	**5,397,303**	**6,385,477**	**7,620,914**	**8,649,147**	**8,276,641**
Net return	**-1,405,605**	**-883,500**	**-2,010,882**	**-2,045,426**	**-2,446,834**	**-2,584,929**
Net return/sow	-1,171	-736	-1,676	-1,705	-2,039	-2,154

Table C2: Manitoba Higher Impact Scenario by Year

	Baseline	2019	2020	2021	2022	2023
Market hog price ($/ckg)	199.91	170.90	165.57	211.55	235.55	216.00
Avg weight (kg lw)	118.1	118.1	118.1	118.1	118.1	118.1
Market hog revenue (incl $2/hd premium)	209.68	179.54	174.00	221.77	246.70	226.39
# pigs weaned/sow	27.3	22.6	22.6	22.6	22.6	22.6
# nursing pigs/sow	27.1	21.0	21.0	21.0	21.0	21.0
# hogs marketed/sow	25.9	18.6	18.6	18.6	18.6	18.6
# hogs marketed/farm	31,089	22,339	22,339	22,339	22,339	22,339
Total revenue	**6,518,694**	**4,010,697**	**3,887,005**	**4,954,048**	**5,511,007**	**5,057,317**
Feed costs	5,516,117	2,654,769	3,275,346	4,214,702	5,054,872	4,618,368
Additional feed costs		240,285	284,952	352,565	413,039	381,620
Veterinary costs	89,536	64,336	64,336	64,336	64,336	64,336
Additional vet costs		48,764	48,764	48,764	48,764	48,764
Labour cost	532,616	459,495	511,725	563,954	563,954	563,954
Additional labour cost		33,017	36,770	40,523	40,523	40,523
Marketing/transportation costs	166,637	114,152	119,737	119,737	119,737	125,322
Total other expenses	1,619,394	1,415,170	1,591,911	1,637,612	1,652,224	1,800,052
Total expenses	**7,924,300**	**5,029,988**	**5,933,542**	**7,042,193**	**7,957,449**	**7,642,939**
Net return	**-1,405,605**	**-1,019,291**	**-2,046,536**	**-2,088,145**	**-2,446,441**	**-2,585,621**
Net return/sow	-1,171	-849	-1,705	-1,740	-2,039	-2,155

Table C3: Ontario Lower Impact Scenario by Year

	Baseline	2019	2020	2021	2022	2023
Market hog price ($/ckg)	189.34	161.00	145.27	210.46	230.93	199.04
Avg weight (kg lw)	132.2	129.5	131.6	133.8	133.4	132.5
Market hog revenue (incl $2/hd premium)	224.76	187.36	171.90	252.33	275.83	236.40
# pigs weaned/sow	25.75	22.8	22.8	22.8	22.8	22.8
# nursing pigs/sow	24.72	16.0	16.0	16.0	16.0	16.0
# hogs marketed/sow	23	14.7	14.7	14.7	14.7	14.7
# hogs marketed/farm	27,880	17,598	17,598	17,598	17,598	17,598
Total revenue	**6,266,554**	**3,297,263**	**3,025,133**	**4,440,525**	**4,854,101**	**4,160,232**
Feed costs	4,200,752	2,164,398	2,181,821	2,732,995	3,154,647	3,023,717
Additional feed costs*	0	179,079	179,649	221,057	227,556	238,490
Veterinary costs	144,421	88,519	88,519	88,519	94,326	95,910
Additional vet costs	0	70,699	70,699	70,699	74,641	76,047
Labour cost	382,966	361,889	361,889	392,000	399,527	399,527
Additional labour cost	0	22,842	22,842	24,743	25,218	25,218
Marketing/transportation costs	270,664	153,808	153,808	167,359	178,973	200,267
Total other expenses	1,313,672	1,201,649	1,265,495	1,235,384	1,329,899	1,535,936
Total expenses	**6,312,475**	**4,242,883**	**4,324,721**	**4,932,755**	**5,484,788**	**5,595,111**
Net return	**-45,921**	**-945,620**	**-1,299,588**	**-492,230**	**-630,687**	**-1,434,879**
Net return/sow	-38	-788	-1,083	-410	-526	-1,196

Table C4: Ontario Higher Impact Scenario by Year

	Baseline	2019	2020	2021	2022	2023
Market hog price ($/ckg)	189.34	161.00	145.27	210.46	230.93	199.04
Avg weight (kg lw)	132.2	129.5	131.6	133.8	133.4	132.5
Market hog revenue (incl $2/hd premium)	224.76	187.36	171.90	252.33	275.83	236.40
# pigs weaned/sow	25.7	21.5	21.5	21.5	21.5	21.5
# nursing pigs/sow	24.7	15.1	15.1	15.1	15.1	15.1
# hogs marketed/sow	23.2	12.7	12.7	12.7	12.7	12.7
# hogs marketed/farm	27,880	15,233	15,233	15,233	15,233	15,233
Total revenue	**6,266,554**	**2,854,123**	**2,618,567**	**3,843,735**	**4,201,728**	**3,601,112**
Feed costs	4,200,752	1,873,511	1,888,592	2,365,691	2,730,674	2,617,341
Additional feed costs		173,838	174,330	210,173	235,543	225,263
Veterinary costs	144,421	76,622	76,622	76,622	81,649	83,020
Additional vet costs		66,487	66,487	66,487	70,158	71,479
Labour cost	382,966	361,889	361,889	392,000	399,527	399,527
Additional labour cost		19,772	19,772	21,418	21,829	21,829
Marketing/transportation costs	270,664	133,137	133,137	144,866	154,920	173,352
Total other expenses	1,313,672	1,201,649	1,265,495	1,235,384	1,329,899	1,535,936
Total expenses	**6,312,475**	**3,906,904**	**3,986,324**	**4,512,640**	**5,024,199**	**5,127,747**
Net return	**-45,921**	**-1,052,781**	**-1,367,758**	**-668,906**	**-822,471**	**-1,526,635**
Net return/sow	-38	-877	-1,140	-557	-685	-1,272

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