A Descriptive Study of Energy Use in the Hog Industry in Canada

A Report to Natural Resources Canada (NRCan)

Prepared for

The Canadian Agricultural Energy End Use Data and Analysis Centre (CAEEDAC)

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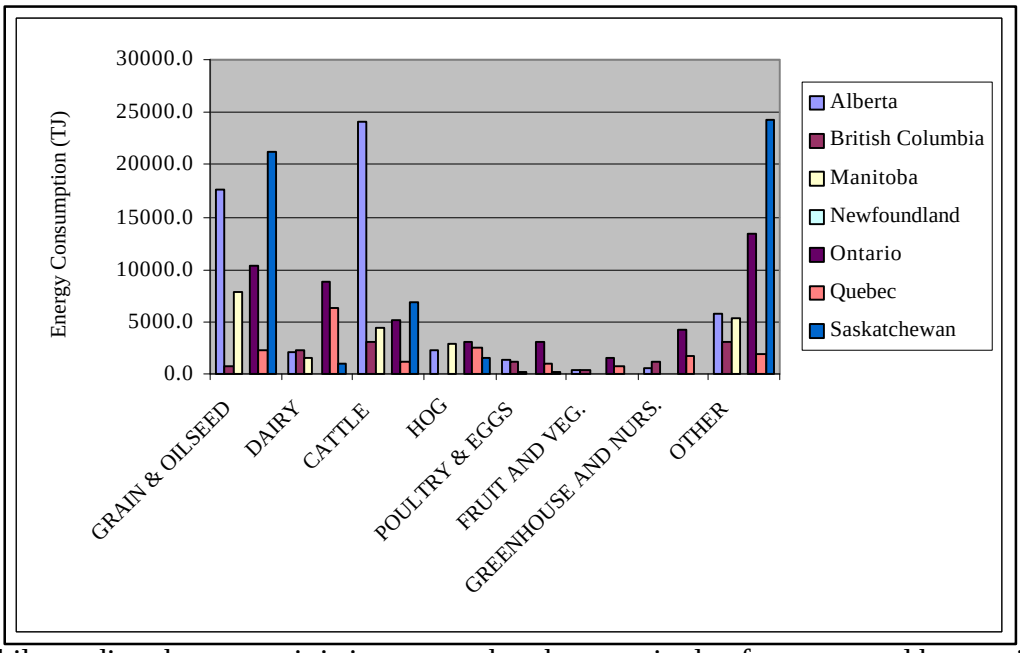
1. Introduction

The objective of this appendix is to provide a descriptive analysis of energy consumption in hog farming activities by energy type, and by usage type in Canada in 1997. The analysis will discuss the relation of the energy type to usage type in Canada in total and in each province. Comparisons will be made throughout the appendix which will describe energy use in the different sectors of agriculture and where and what energy is used. This appendix makes use of data obtained from Statistics Canada and it makes extensive used of percentages calculated from the 1997 Farm Energy Use Survey, a telephone survey conducted by Statistics Canada.

The appendix will review five energy types including gasoline, diesel, natural gas, electricity, and liquid petroleum gas or propane (LPG). The unit of energy types has been converted to a uniform unit of terajoules and a conversion table appears in Appendix B. Usage types are represented by energy use in different farming activities: truck and automobiles, heat and light, farm machinery, other, and includes a category for non-farm use.

The first part of the appendix provides a general descriptive analysis of energy use in the Canadian hog farming activities. This general overview of energy use includes the agricultural sector of seven provinces of Canada. As data was as yet unavailable for three of the Maritime provinces - Nova Scotia, New Brunswick, and Prince Edward Island - only Newfoundland is included. The three other provinces will be incorporated in the next version of the report. Then, a detailed study of energy use in hog sector of these seven provinces is provided in the second part of the appendix. It should be noted that



while reading the report, it is important that the magnitude of energy used be considered when tables and figures are compared among provinces.

2. Energy Use in the Hog Farming Activities in Canada

Table 1 and Figures 1 and 2 show energy use by farm type in Canada. The grain and oilseed sector is the main consumer of energy in Canada (30%) followed by the cattle industry (21%). The category "other" is the second highest user of energy at 25% and consists of energy used in specialty crop and hay production, irrigation, grain drying, heat of houses and barns, and personal use of vehicles. Other large energy user is the dairy (10%) industry. Hog industry in Canada consumed only 6% of total energy or 12253.7 TJ of energy.

Table 1. Energy Consumption by Farm Type in Canada in 1997 (TJ).

Farm Type	Alberta	BC	Manitoba	N'land	Ontario	Quebec	Sask.	Total
Grain & oilseed	17638.6	714.3	7918.1	57.7	10382.7	2378.7	21248.2	60338.5
Dairy	2116.5	2243.4	1517.7	84.7	8697.8	6235.9	1026.5	21922.5
Cattle	24041.4	2973.2	4364.7	13.6	5195.7	1161.4	6936.7	44686.8
Hog	2271.3	0.0	2841.1	67.6	3126.2	2495.5	1492.1	12293.7

Poultry & eggs	1340.8	1066.1	155.6	40.1	3029.9	1019.3	253.4	6905.1
Fruit and veg.	405.1	320.3	0.0	10.4	1522.4	784.1	0.0	3042.3
Greenhouse and nurs.	664.5	1236.3	0.0	20.4	4262.8	1773.8	0.0	7957.8
Other	5762.7	2971.3	5410.7	40.5	13325.5	1930.4	24330.0	53771.3
Total	54241.0	11525.0	22208.0	335.0	49543.0	17779.0	55287.0	210918.0

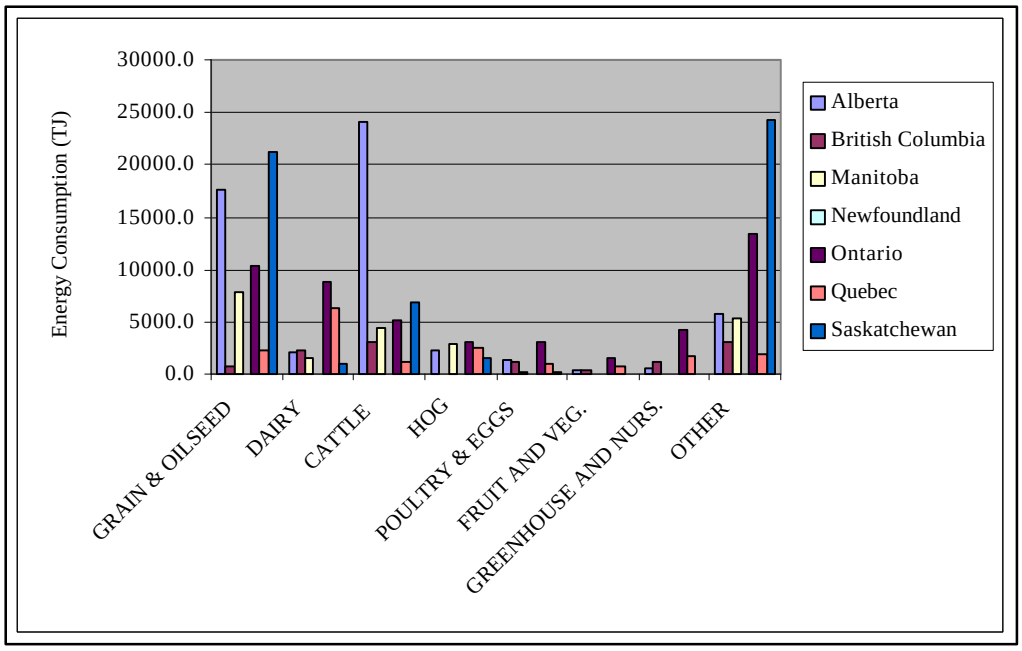


Figure 1. Energy Consumption by Farm Type by Province in 1997 (TJ).

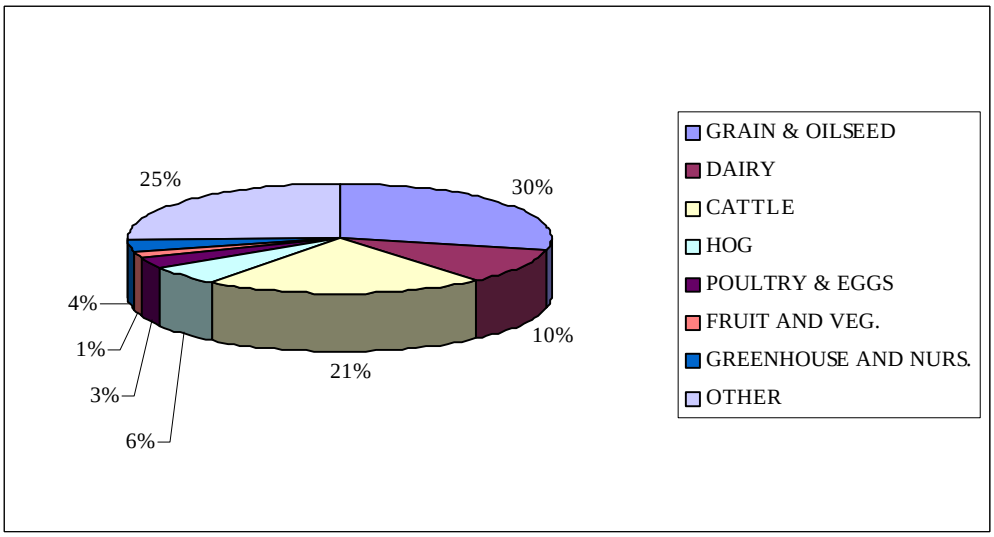


Figure 2. Energy Consumption by Farm Type in Canada (sum of above mentioned seven provinces) in 1997.

Livestock industry in Canada (sum of above mentioned seven provinces) consumed 78903 TJ of energy in 1997 (Table 2 and Figures 3). For the dairy sector, Ontario and Quebec lead in energy consumption and these provinces contain the highest concentration of dairies. In the cattle industry, Alberta is by far first in terms of energy use in comparison with other provinces. In fact, it is four times as high as the second highest consumer - Saskatchewan. Ontario and Manitoba lead the energy consumption in the hog industry, followed by Quebec and Alberta. It can be seen from Table 2 and Figure 3 that, for example, of total 17019.7 TJ energy consumed in livestock sector in Ontario, 18.4% were consumed by hog industry of this province. This percentage is 8%, 32.6%, 40.7%, 25.2%, and 15.8% for Alberta, Manitoba, Newfoundland, Quebec, and Saskatchewan, respectively. Hog activities in British Columbia and Newfoundland are

very small and energy consumption in hog industries of these two provinces is insignificant.

Table 2. Energy Consumption in Livestock industry in Canada in 1997 (TJ).

Farm Type	Alberta	BC	Manitoba	N'land	Ontario	Quebec	Sask.	Total
Dairy	2116.5	2243.4	1517.7	84.7	8697.8	6235.9	1026.5	21922.5
Cattle	24041.4	2973.2	4364.7	13.6	5195.7	1161.4	6936.7	44686.8
Energy Used in Hog farms	2271.3	0.0	2841.1	67.6	3126.2	2495.5	1492.1	12293.7
Livestock (sum of above)	28429.1	5216.6	8723.5	165.9	17019.7	9892.8	9455.3	78903
% of Hog to Livestock	8.0	0.0	32.6	40.7	18.4	25.2	15.8	15.6

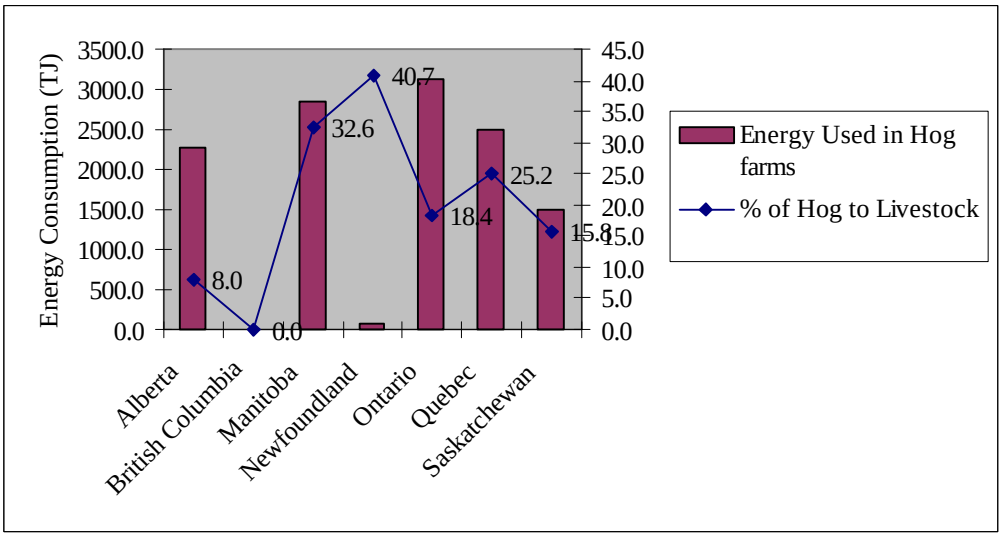


Figure 3. Energy Consumption in Livestock industry in Canada in 1997 (TJ).

Figure 4 illustrate the percentage of energy consumed by hog industry of each province in 1997. Ontario and Manitoba (26% and 23%, respectively) lead the energy consumption in the hog industry, followed by Quebec and Alberta (20% and 18%, respectively).

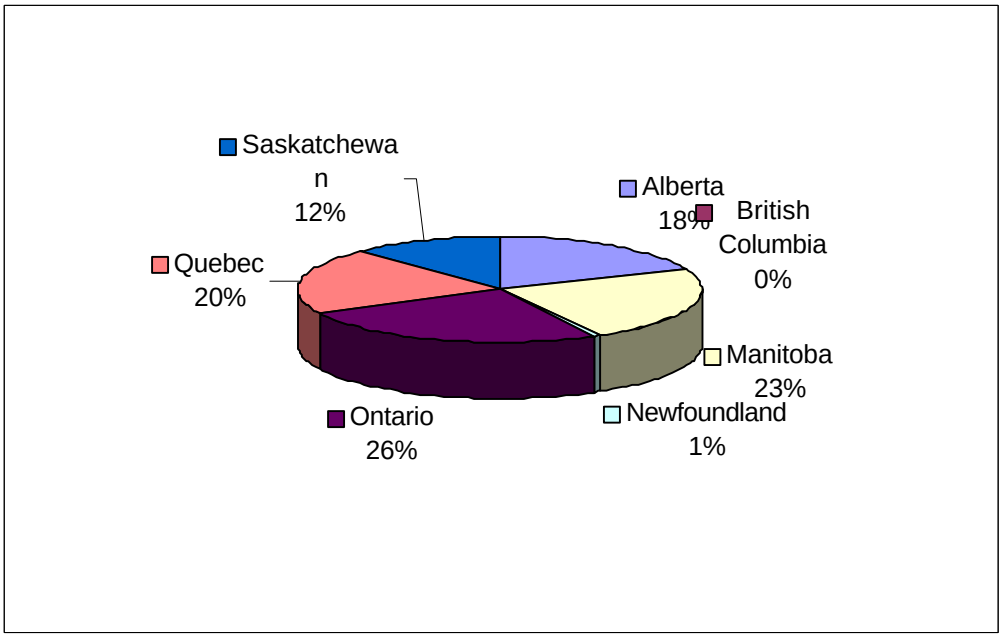


Figure 4. Energy Consumption in Hog industry by Province in Canada in 1997 (%).

3. Energy Used in the Hog Sector of Canadian Provinces in 1997

Analysis of energy use in the hog sector of each Canadian province is provided in this section.

3.1. Energy Use in Hog Industry of Alberta

The hog industry in Alberta consumed about 18% of total energy consumed by the hog sector in Canada in 1997. Table 3 and Figures 5-7 provide a detailed account of energy consumption in livestock industry in Alberta by usage type and energy type. The

cattle industry is the main consumer of energy (85%) in the livestock sector of Alberta. The hog industry consumed only 2271.3 TJ of energy or 8% of the total energy consumed in the livestock sector. In terms of energy type, the diesel followed by natural gas are the main type of energy used for hog activities in this province (39% and 23%, respectively).

Among usage types for hog activities, farm machinery accounted for 924.2 TJ of total of 2271.3 TJ energy used in hog industry of Alberta in 1997. Heating and lighting usage is the next main user of energy in hog sector in this province.

Table 3. Energy Consumption by Energy Type in Hog Industry in Alberta in 1997 (TJ).

Energy Consumption in Alberta						
Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	TOTAL
Dairy	372.4	1084.9	295.7	357.3	6.2	2116.5
Cattle	5512.1	13924.8	2108.9	2371.4	124.4	24041.4
Hog	378.0	906.8	511.5	466.3	8.7	2271.3
Livestock (sum of above)	6262.5	15916.4	2916.0	3194.9	139.3	28429.1
% of Hog to Livestock	6.0	5.7	17.5	14.6	6.3	8.0

Table 4. Energy Consumption in Hog Industry by Usage Type in Alberta in 1997 (TJ).

Farm type (ab)	**All usage**	**For trucks and auto.**	**For heat and light**	**For other uses**	**For farm machine**	**For non-farm**
Dairy	2116.5	278.0	373.9	67.2	1090.6	264.3
Cattle	24041.4	4728.7	1770.4	375.5	13217.0	3727.9
Hog	2271.3	279.7	617.3	19.7	924.2	372.7
Livestock	28429.1	5286.4	2761.6	462.4	15231.7	4364.8
% of Hog to Livestock	8.0	5.3	22.4	4.3	6.1	8.5

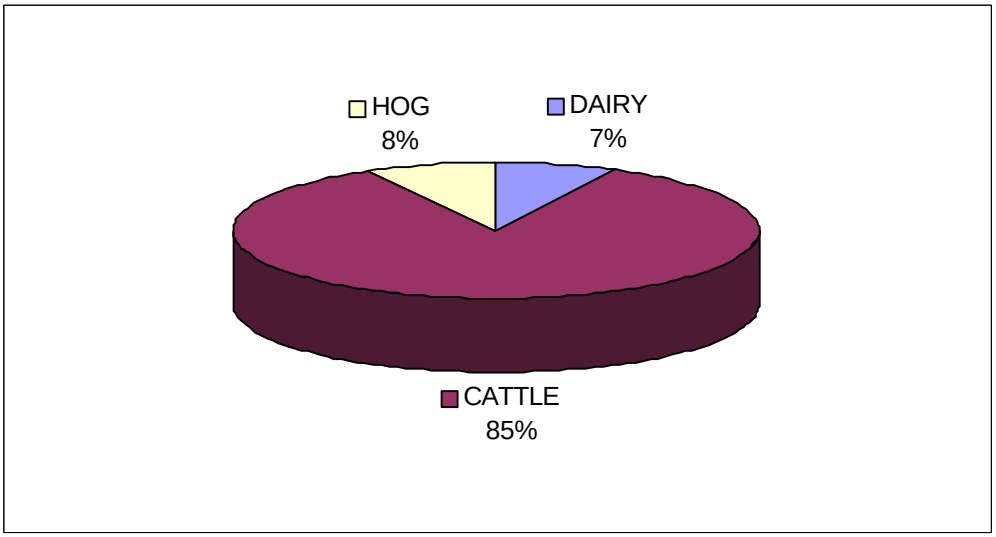


Figure 5. Energy Consumption in Livestock Activities in Alberta in 1997 (%).

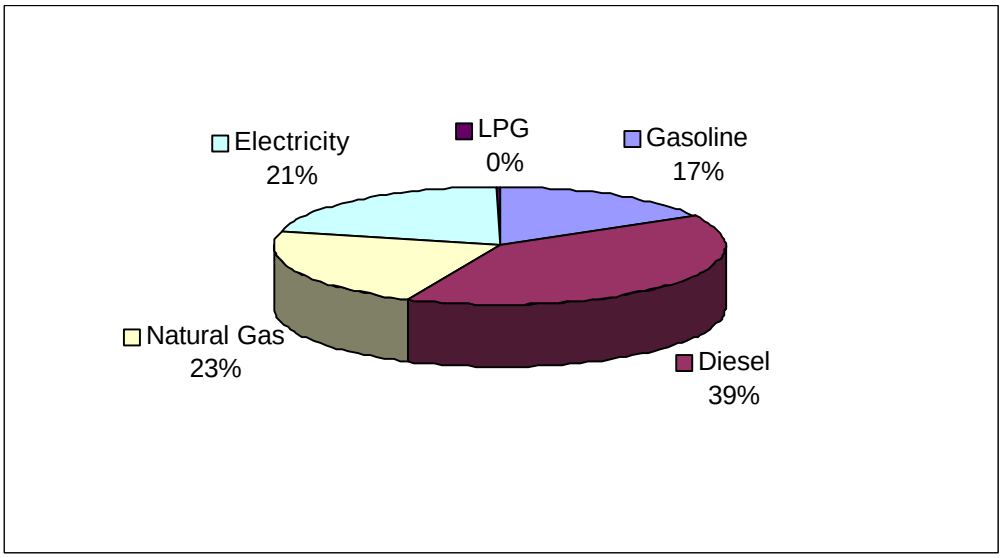


Figure 6. Energy Consumption by Energy Type in Hog Industry in Alberta in 1997 (TJ).

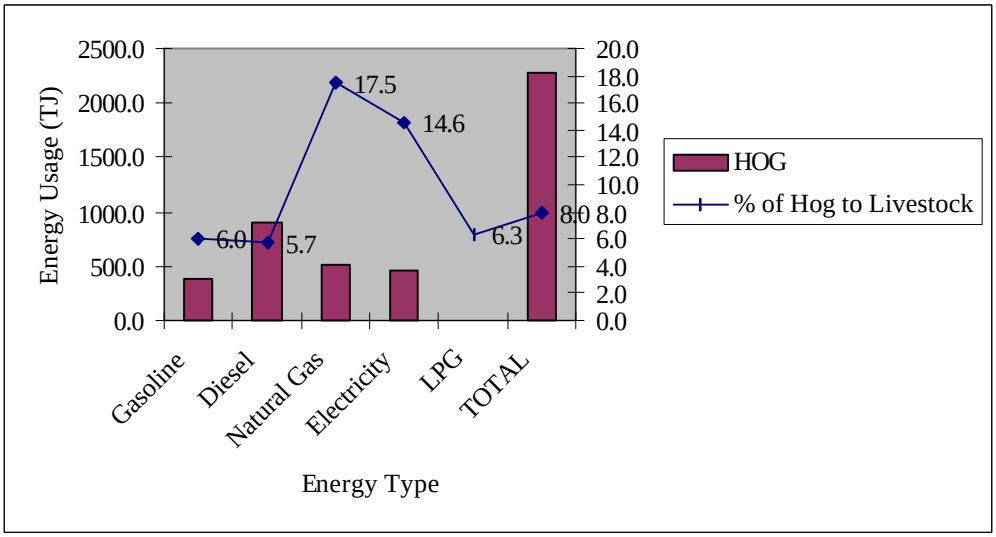


Figure 7. Energy Consumption in Hog Industry in Alberta in 1997 (TJ and %).

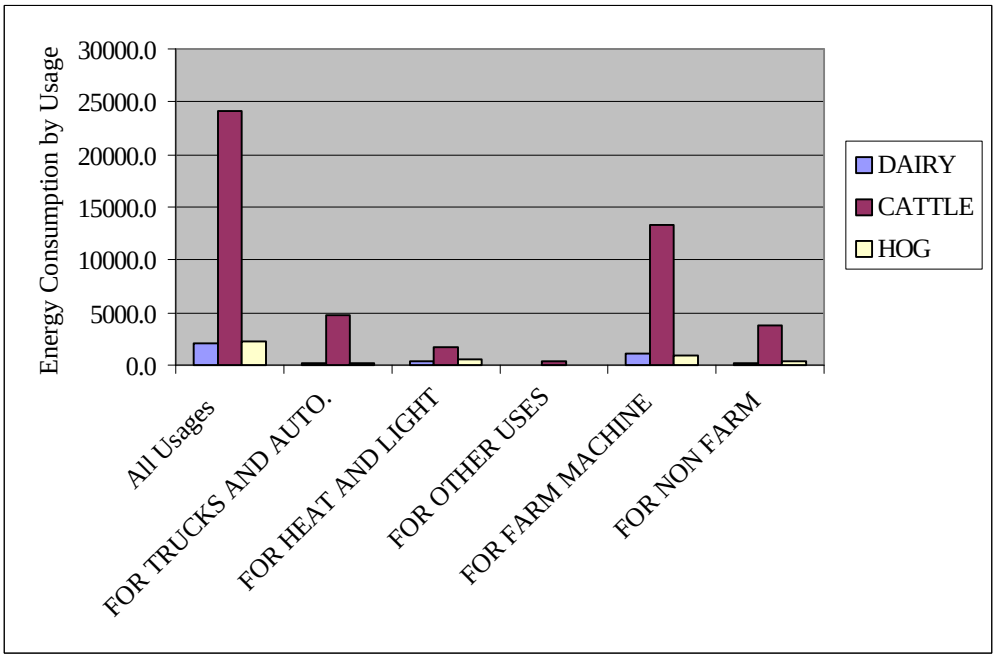


Figure 8. Energy Consumption by Usage Type in Livestock Activities in Alberta in 1997 (TJ).

3.2. Energy Use in Hog Industry of British Columbia

Hog activity in BC is relatively very small, so no data are reported here. In 1997, livestock industry in BC consumed 5216.6 TJ of energy, 57% of this, is consumed by cattle farmers and the rest by dairy farmers.

Table 5. Energy Consumption by Energy Type in Hog Industry in British Columbia in 1997 (TJ).

Energy Consumption in BC						
Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	TOTAL
Dairy	296.3	1457.3	196.0	293.8	0.0	2243.4
Cattle	666.9	2025.1	0.0	241.7	39.5	2973.2
Hog	0.0	0.0	0.0	0.0	0.0	0.0
Livestock	963.2	3482.4	196.0	535.5	39.5	5216.6
% of Hog to Livestock	0.0	0.0	0.0	0.0	0.0	0.0

Table 6. Energy Consumption in Hog Industry by Usage Type in British Columbia in 1997 (TJ).

Farm type (bc)	**All usage**	**For trucks and auto.**	**For heat and light**	**For other uses**	**For farm machine**	**For non-farm**
Dairy	2243.4	189.6	270.4	82.3	1369.9	215.3
Cattle	2973.2	386.8	96.9	52.5	1976.2	263.2
Hog	0.0	0.0	0.0	0.0	0.0	0.0
Livestock	5216.6	576.4	367.3	134.8	3346.1	478.5
% of Hog to Livestock	0.0	0.0	0.0	0.0	0.0	0.0

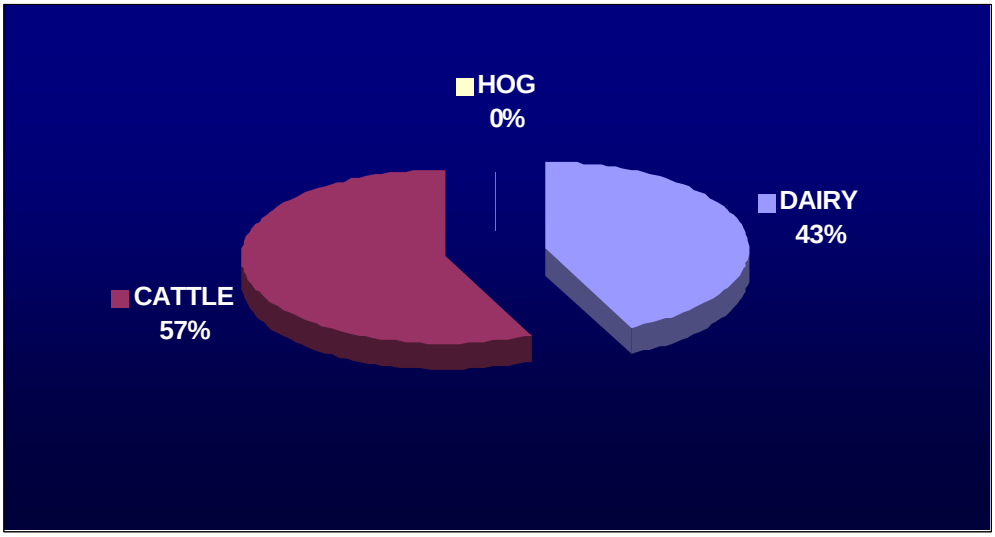


Figure 9. Energy Consumption in Livestock Activities in British Columbia in 1997 (%).

3.3. Energy Use in Hog Industry of Manitoba

Hog farming is a relatively significant farming activity in the livestock industry in Manitoba. Hog farmers consumed about 33% of total energy. Of total energy consumption in hog farming in Canada in 1997, Manitoba hog farmers consumed 23%, ranking second after Ontario hog farmers. Electricity is the main type of energy used by hog farmers in Manitoba. In 1997, electricity provided about 32% of hog farmers' energy needs. Diesel was next, but other types of energy such as LPG, gasoline, and natural gas equally helped hog farmers to run their activities. Table 7 and Figures 10-12 indicate the consumption of energy type in hog farming sector in Manitoba in 1997. For example, total electricity consumed in livestock industry in Manitoba was 2587.4 TJ; of this total, 910.6 TJ or 35.2% is consumed by hog activities, the rest are consumed by cattle and dairy farmers. Similar analysis can be shown for other energy type.

In terms of usage type in hog farming activity, energy used for heating and lighting purposes is the number one usage type (Table 8 and Figure 13). Energy usage for farm machinery steps down to second place - recall that in Alberta, energy used for hog machinery was ranked first among usage types of energy.

Table 7. Energy Consumption by Energy Type in Hog Industry in Manitoba in 1997 (TJ).

Energy Use in Manitoba						
Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	TOTAL
Dairy	323.3	560.9	0.0	633.6	0.0	1517.7
Cattle	1370.4	1935.5	0.0	1043.3	15.6	4364.7
Hog	388.8	721.4	425	910.6	395.2	2841.1
Livestock	2082.6	3217.7	425.0	2587.4	410.8	8723.5
% of Hog to Livestock	18.7	22.4	100.0	35.2	96.2	32.6

Table 8. Energy Consumption in Hog Industry by Usage Type in Manitoba in 1997 (TJ).

Farm type (man)	**All usage**	**For trucks and auto.**	**For heat and light**	**For other uses**	**For farm machine**	**For non-farm**
Dairy	1517.7	188.8	266.1	392.8	567.7	299.7
Cattle	4364.7	767.4	514.6	90.3	2186.9	717.4
Hog	2841.1	299.9	1104.3	232.5	679.8	519.7
Livestock	8723.5	1256.2	1885.0	715.6	3434.5	1536.8
% of Hog to Livestock	32.6	23.9	58.6	32.5	19.8	33.8

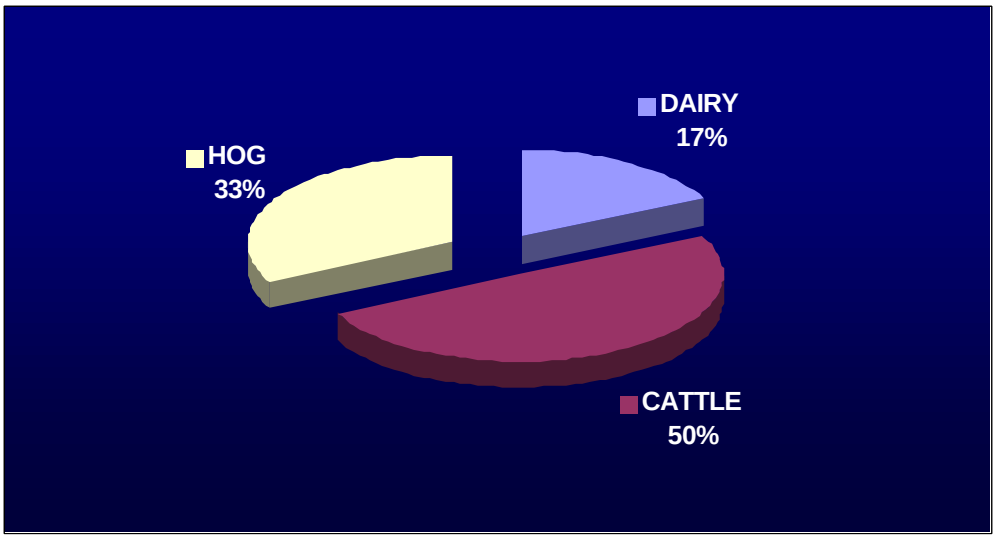


Figure 10. Energy Consumption in Livestock Activities in Manitoba in 1997 (%).

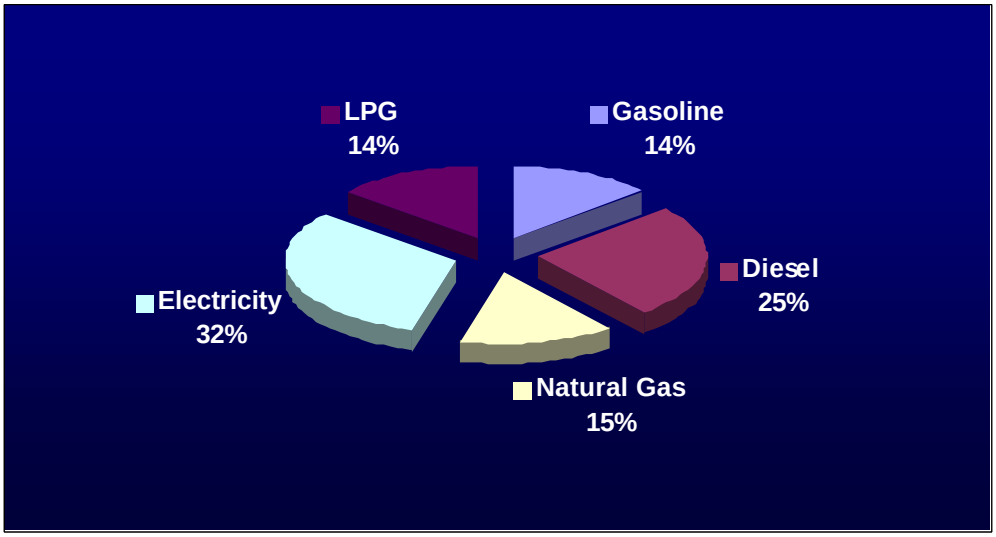


Figure 11. Energy Consumption by Energy Type in Hog Industry in Manitoba in 1997 (TJ).

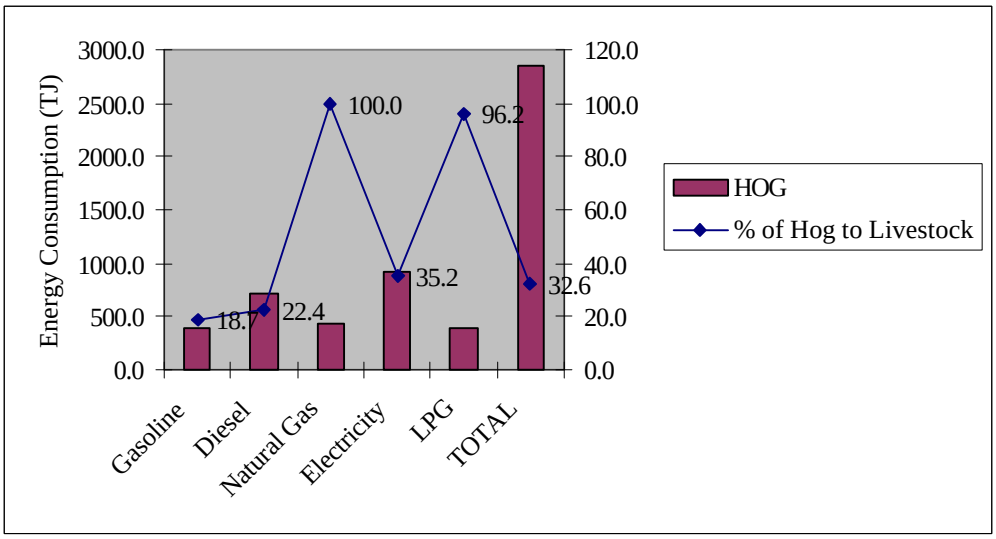


Figure 12. Energy Consumption in Hog Industry in Manitoba in 1997 (TJ and %).

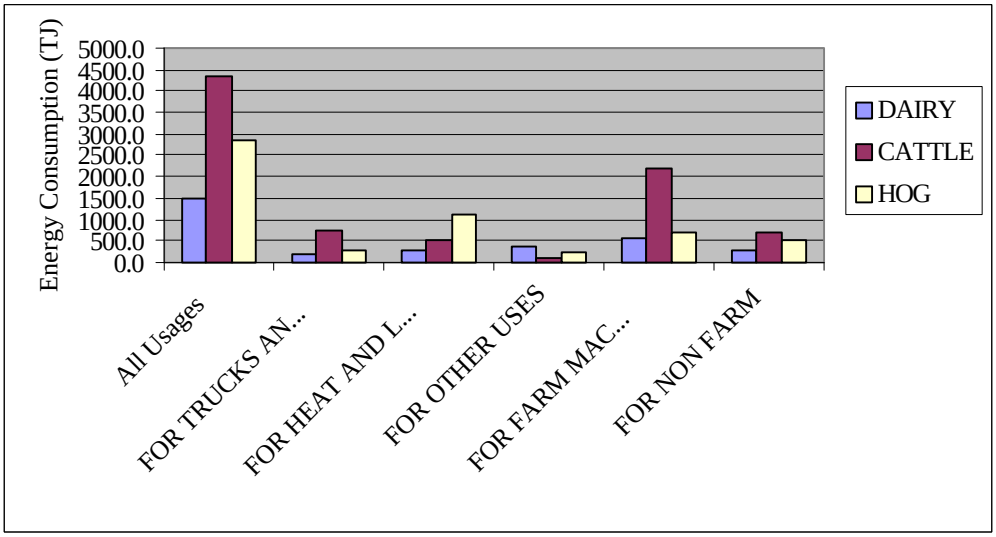


Figure 13. Energy Consumption by Usage Type in Livestock Activities in Manitoba in 1997 (TJ).

3.4. Energy Use in Agricultural Sector of Newfoundland

Energy used in the livestock sector of Newfoundland is the lowest in terms of magnitude among the provinces. Total energy consumption in the livestock sector in Newfoundland was only 165.9 TJ in 1997. Of this total, dairy sector (51%) ranked first followed by the hog industry (41%, though negligible in terms of magnitude) (Table 9 and Figures 14-16).

In terms of energy types, LPG is the main source (71%) of energy type used for hog farming activities. Similar to livestock and hog activities in Manitoba, energy used for heating purposes is the main usage type of energy relative to other usage types (Table 10 and Figure 17).

Table 9. Energy Consumption by Energy Type in Hog Industry in Newfoundland in 1997 (TJ).

Energy Use in Newfoundland						
Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	TOTAL
Dairy	28.9	13.7	0.0	20.7	21.5	84.7
Cattle	7.4	3.0	0.0	3.2	0.0	13.6
Hog	8.8	2.9	0.0	8.1	47.9	67.6
Livestock	45.0	19.5	0.0	32.0	69.4	165.9
% of Hog to Livestock	19.4	14.7	0.0	25.4	69.0	40.7

Table 10. Energy Consumption in Hog Industry by Usage Type in Newfoundland in 1997 (TJ).

Farm type (N'fld)	**All usage**	**For trucks and auto.**	**For heat and light**	**For other uses**	**For farm machine**	**For non-farm**
Dairy	84.7	15.3	13.0	21.6	13.2	17.5
Cattle	13.6	3.7	1.2	1.6	3.3	3.6
Hog	67.6	5.3	44.3	9.0	2.5	4.9
Livestock	165.9	24.3	58.5	32.3	19.0	26.0
% of Hog to Livestock	40.7	21.9	75.7	28.0	13.1	18.7

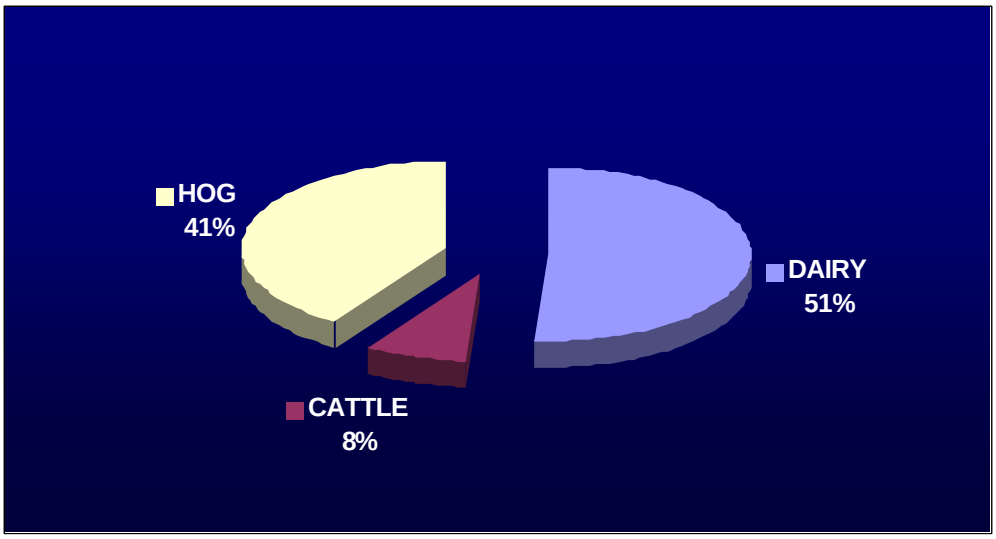


Figure 14. Energy Consumption in Livestock Activities in Newfoundland in 1997 (%).

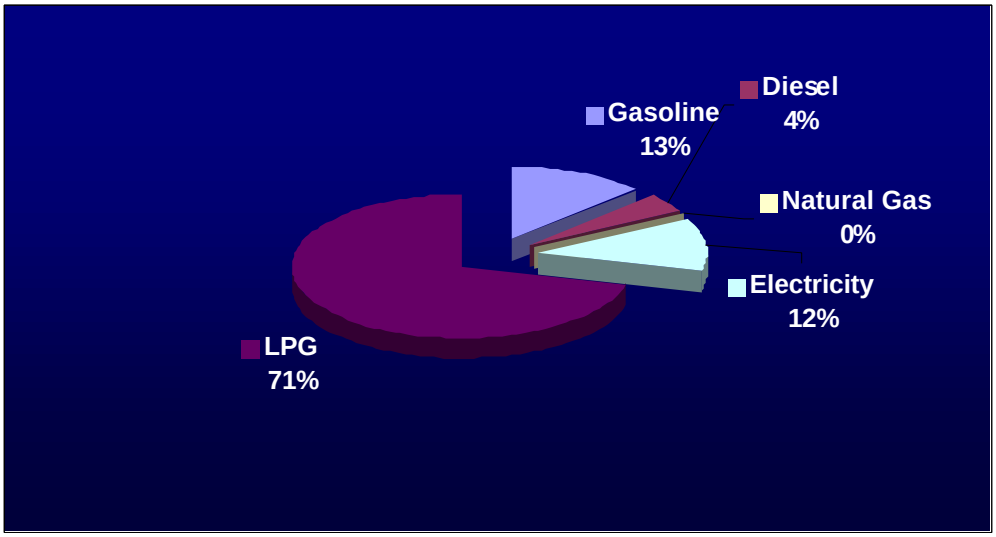


Figure 15. Energy Consumption by Energy Type in Hog Industry in Newfoundland in 1997 (TJ).

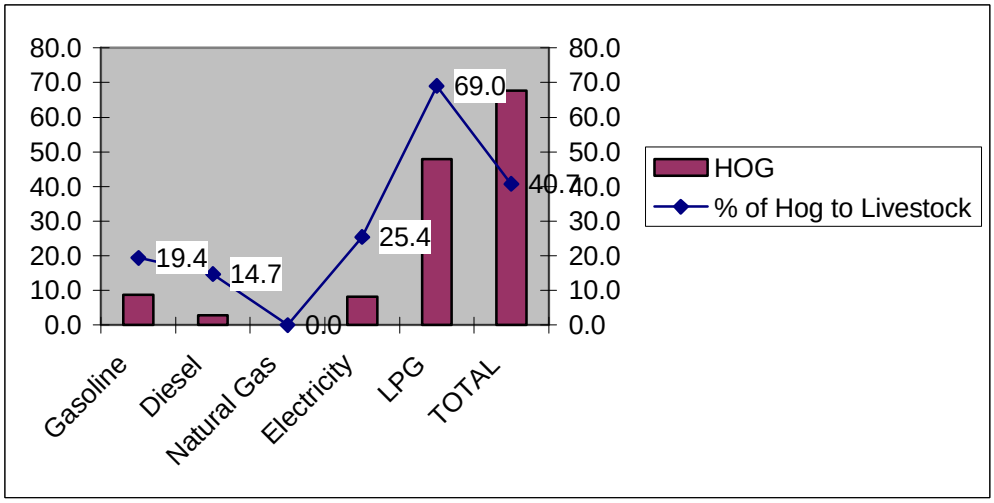


Figure 16. Energy Consumption in Hog Industry in Newfoundland in 1997 (TJ and %).

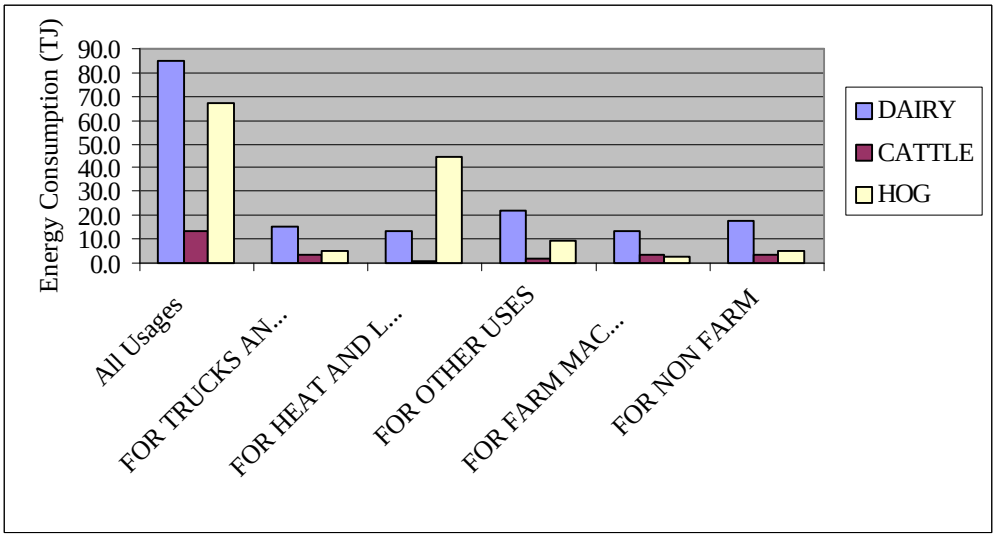


Figure 17. Energy Consumption by Usage Type in Livestock Activities in Newfoundland in 1997 (TJ).

3.5. Energy Use in Hog Industry of Ontario

Ontario's livestock and hog activities are the largest in terms of magnitude among the other provinces. Dairy is the main livestock activity in Ontario, therefore, 51% of energy consumption in the livestock industry is consumed by this sector. Energy

consumption is followed by cattle (31%) and hog (18%). Electricity and diesel (31% each) are equal as the source of energy for hog farmers in Ontario. Gasoline is the next main energy type used by hog farmers in this province. Other energy types, such as natural gas and LPG, are used equally (10% each) to help farmers run their barns (Table 11 and figures 18-20)

Farm machinery usage (974.1 TJ) is the main usage type of energy in hog farming activity. This is followed by energy used for heating and lighting purposes (828.1 TJ) (Table 12 and Figure 21).

Table 11. Energy Consumption by Energy Type in Hog Industry in Ontario in 1997 (TJ).

Energy Use in Ontario						
Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	TOTAL
Dairy	1853.9	3681.8	142.3	2711.9	307.9	8697.8
Cattle	1379.8	2518.9	127.4	1083.1	86.4	5195.7
Hog	561.5	958.6	306.6	977.4	322.2	3126.2
Livestock	3795.3	7159.4	576.2	4772.3	716.5	17019.7
% of Hog to Livestock	14.8	13.4	53.2	20.5	45.0	18.4

Table 12. Energy Consumption in Hog Industry by Usage Type in Ontario in 1997 (TJ).

Farm type (ont.)	**All usage**	**For trucks and auto.**	**For heat and light**	**For other uses**	**For farm machine**	**For non-farm**
Dairy	8697.8	834.0	1249.0	1041.5	4016.3	1393.1
Cattle	5195.7	634.1	467.0	162.9	2676.2	1138.4
Hog	3126.2	332.0	828.1	295.2	974.1	562.0
Livestock	165.9	24.3	58.5	32.3	19.0	26.0
% of Hog to Livestock	40.7	21.9	75.7	28.0	13.1	18.7

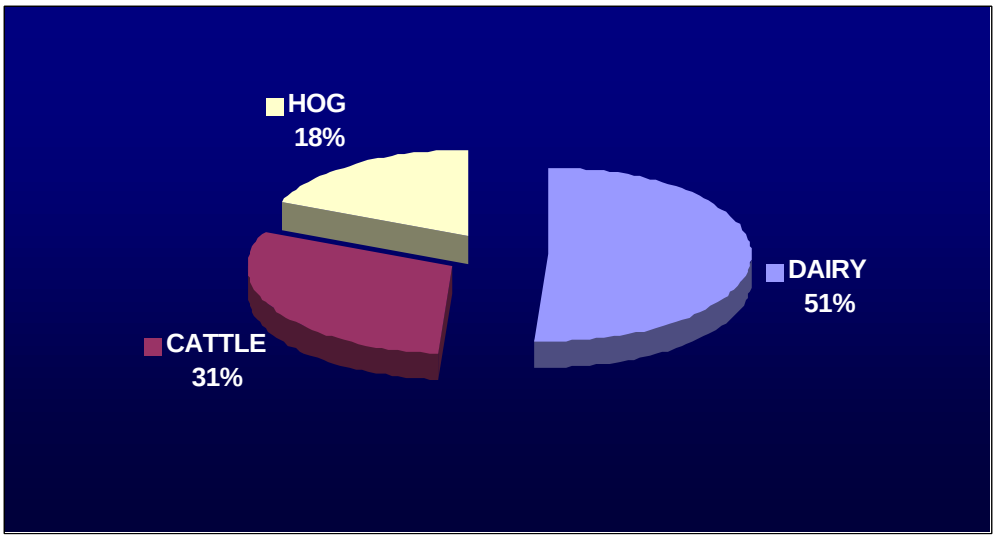


Figure 18. Energy Consumption in Livestock Activities in Ontario in 1997 (%).

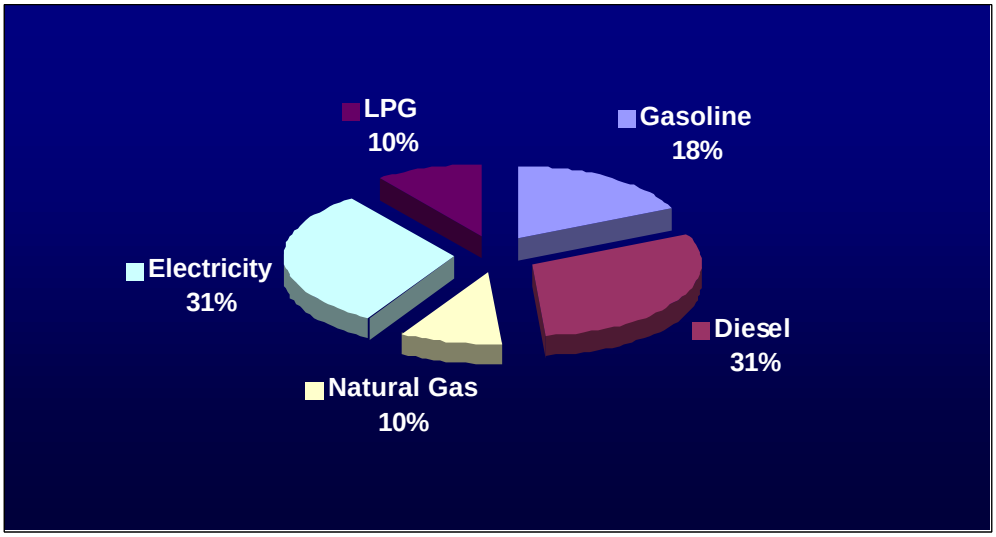


Figure 19. Energy Consumption by Energy Type in Hog Industry in Ontario in 1997 (TJ).

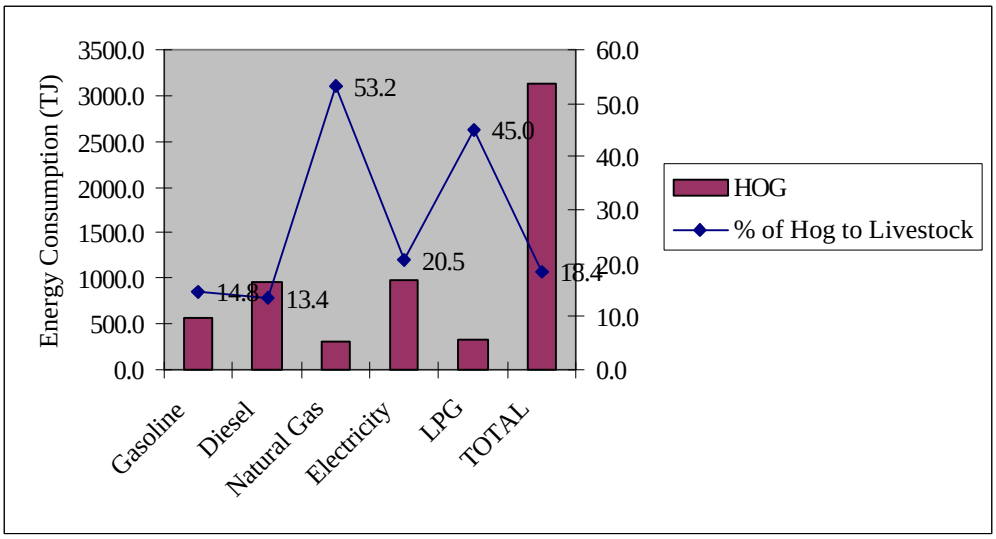


Figure 20. Energy Consumption in Hog Industry in Ontario in 1997 (TJ and %).

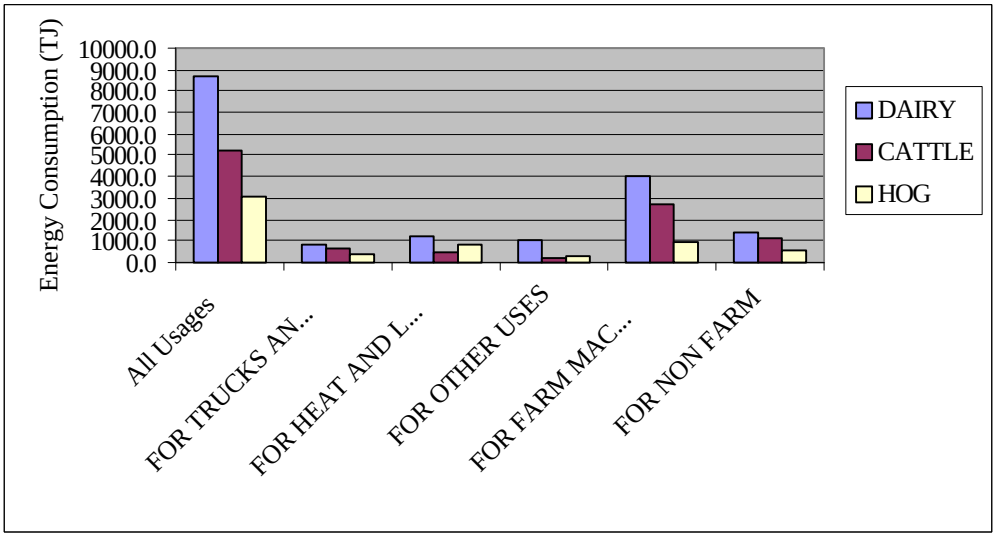


Figure 21. Energy Consumption by Usage Type in Livestock Activities in Ontario in 1997 (TJ).

3.6. Energy Use in Agricultural Sector of Quebec

In Quebec's livestock sector, the dairy industry is the main consumer of energy, using the highest amount of energy (63%). Hog activity is ranked second in terms of usage of energy (25%) followed by cattle (only 12%) (Table 13 and Figures 22-24).

Together, electricity and LPG provide 70% of total energy needs of hog farmers in Quebec. Electricity at 43% is the main energy type used in hog industry of this province, followed by LPG at 27%. Of total 991.6 TJ LPG livestock consumption, 69% is consumed by hog industry in Quebec in 1997. It is interesting to note that natural gas is not a highly used energy type in Quebec hog farming activity. Diesel is relatively another source of energy for hog farmers in Quebec (20%) (Table 13 and Figures 22-24).

Energy for heating and lighting usage is the main usage of energy in hog activity in Quebec (1099 TJ of total 2495.5 TJ). This is followed by "other" hog usage type (450.9 TJ) and hog machinery (439 TJ) (Table 14 and Figure25).

Table 13. Energy Consumption by Energy Type in Hog Industry in Quebec in 1997 (TJ).

FARM TYPE	Gasoline	Diesel	Natural Gas	Electricity	LPG	TOTAL
Dairy	851.4	2409.7	0.0	2667.5	307.4	6235.9
Cattle	218.9	529.3	0.0	413.2	0.0	1161.4
Hog	258.0	504.6	0.0	1048.7	684.1	2495.5
Livestock	1328.3	3443.6	0.0	4129.4	991.6	9892.8
% of Hog to Livestock	19.4	14.7	0.0	25.4	69.0	25.2

Table 14. Energy Consumption in Hog Industry by Usage Type in Quebec in 1997 (TJ).

Farm type (Quebec)	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Dairy	6235.9	490.9	993.0	1391.7	2337.4	890.5
Cattle	1161.4	109.4	152.9	115.2	524.3	241.4
Hog	2495.5	195.1	1099.0	450.9	439.0	274.7
Livestock	9892.8	795.4	2244.9	1957.8	3300.7	1406.6
% of Hog to Livestock	25.2	24.5	49.0	23.0	13.3	19.5

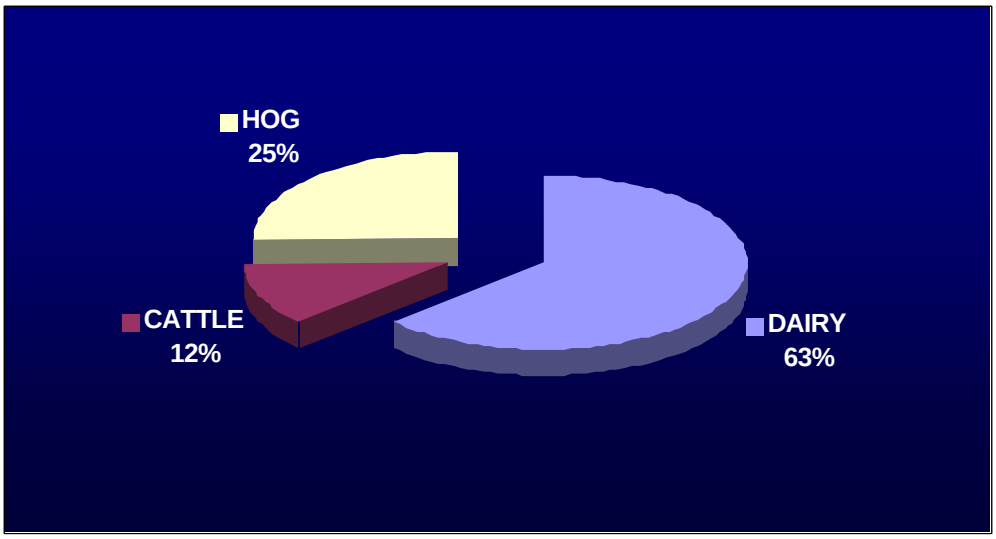


Figure 22. Energy Consumption in Livestock Activities in Quebec in 1997 (%).

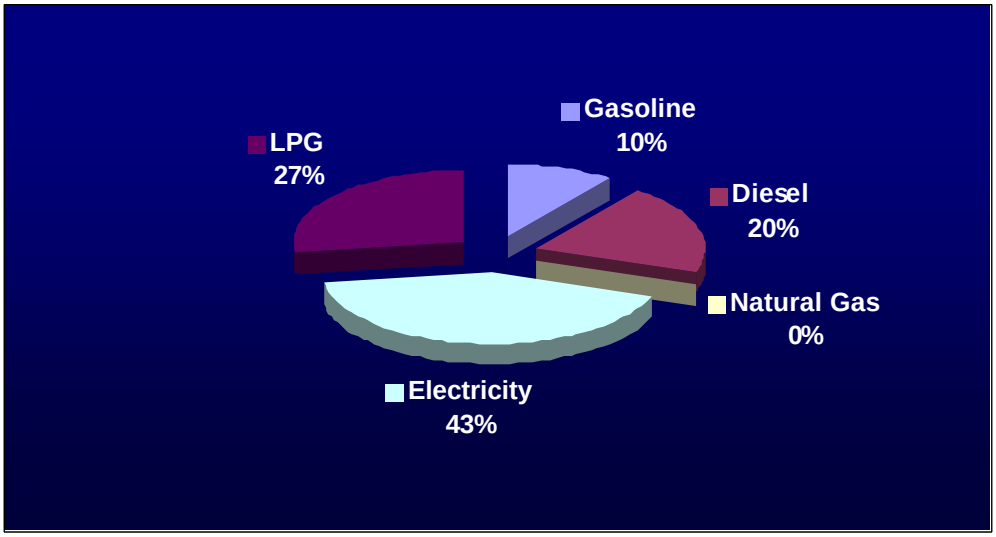


Figure 23. Energy Consumption by Energy Type in Hog Industry in Quebec in 1997 (TJ).

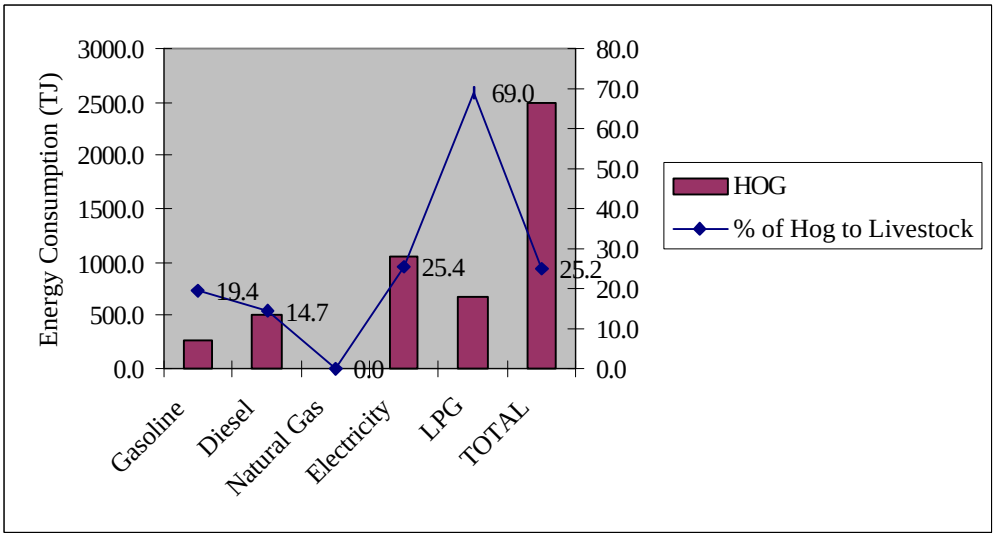


Figure 24. Energy Consumption in Hog Industry in Quebec in 1997 (TJ and %).

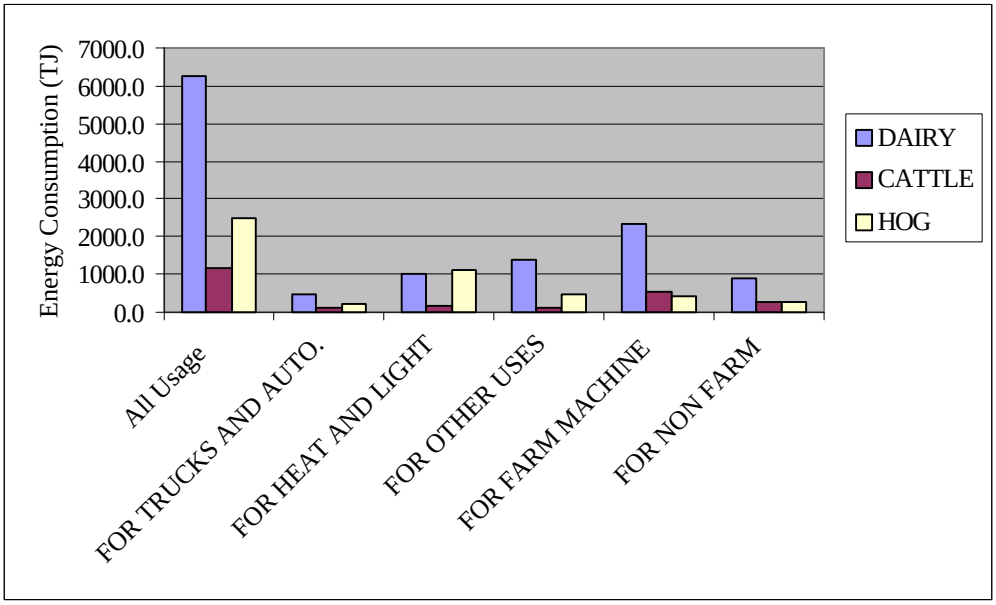


Figure 25. Energy Consumption by Usage Type in Livestock Activities in Quebec in 1997 (TJ).

3.7. Energy Use in Hog Sector of Saskatchewan

The cattle industry is ranked second after Alberta in terms of magnitude. It consumes 73% of total energy consumed by the livestock industry in the province. As a

whole, the hog sector is the second largest consumer of energy in livestock activities (16%). Natural gas (heating source) followed by diesel (farm machinary) together contributes significant amount to the total energy consumption of hog farmers in Saskatchewan (34% and 33%, respectively). Electricity and gasoline both equally help hog farmers to run their farms, but LPG does not play significant role in fulfilling hog farmers energy needs (Table 15 and Figures 26-28). Of a total 1539.4 TJ of energy used by livestock farmers in 1997, 33.4% are used by hog farmers to run their farms.

Energy used for heating and lighting usage (575.6 TJ of total 1492.1 TJ) and for hog farm machinery (471 TJ of total 1492.1 TJ) are two main usage of energy in hog farming industry in the province (Table 16 and Figure 29).

Table 15. Energy Consumption by Energy Type in Hog Industry in Saskatchewan in 1997 (TJ).

Energy Use in Sask.						
Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	TOTAL
Dairy	142.5	560.3	66.4	257.3	0.0	1026.5
Cattle	1799.0	3312.2	958.1	826.3	41.1	6936.7
Hog	233.8	492.0	514.9	251.4	0.0	1492.1
Livestock	2175.4	4364.5	1539.4	1335.0	41.1	9455.3
% of Hog to Livestock	10.7	11.3	33.4	18.8	0.0	15.8

Table 16. Energy Consumption in Hog Industry by Usage Type in Saskatchewan in 1997 (TJ).

Farm type (sk)	**All usage**	**For trucks and auto.**	**For heat and light**	**For other uses**	**For farm machine**	**For non-farm**
Dairy	1026.5	146.9	183.9	61.7	519.0	111.9
Cattle	6936.7	1209.0	553.3	133.8	3473.3	1558.6
Hog	1492.1	202.9	575.6	27.7	471.0	189.7
Livestock	9455.3	1558.8	1312.8	223.1	4463.3	1860.2
% of Hog to Livestock	15.8	13.0	43.8	12.4	10.6	10.2

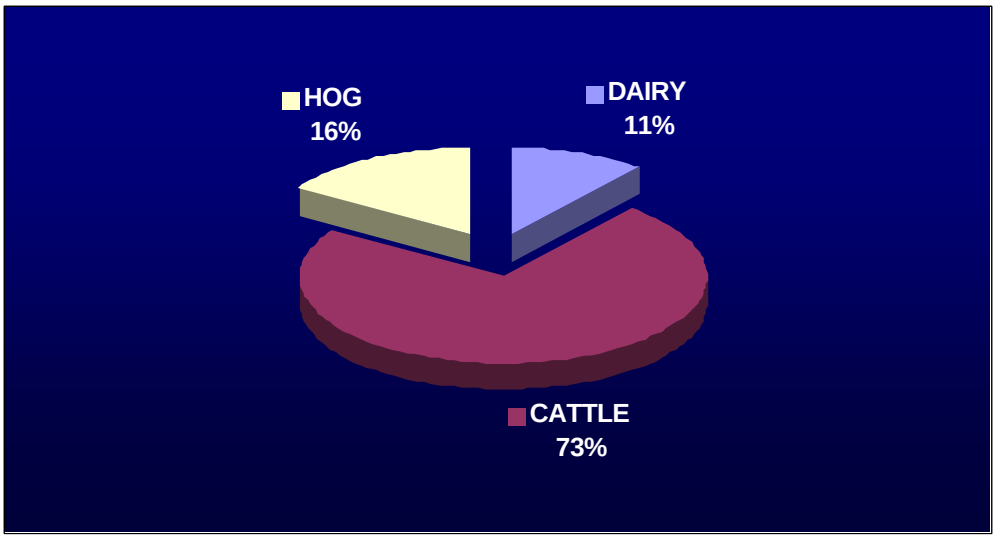


Figure 26. Energy Consumption in Livestock Activities in Saskatchewan in 1997 (%).

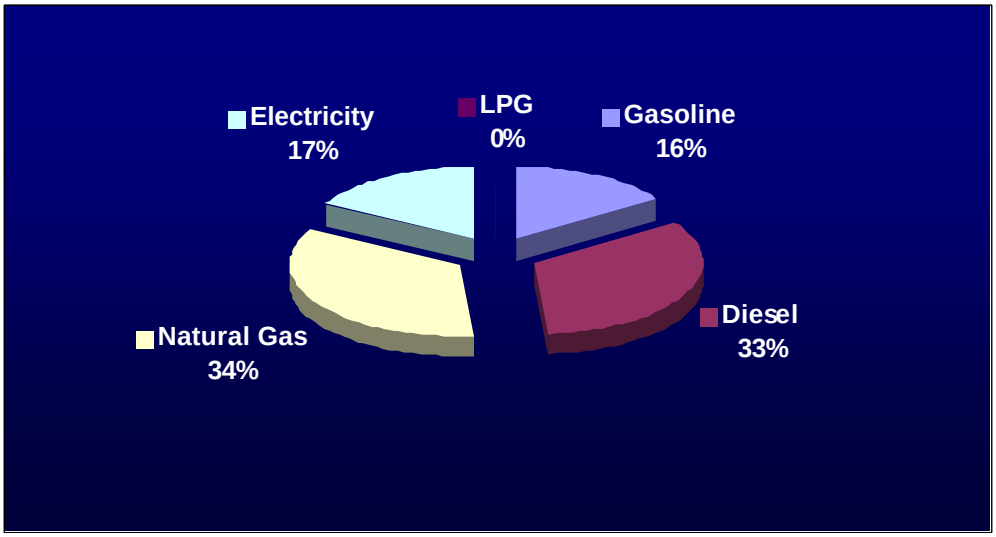


Figure 27. Energy Consumption by Energy Type in Hog Industry in Saskatchewan in 1997 (TJ).

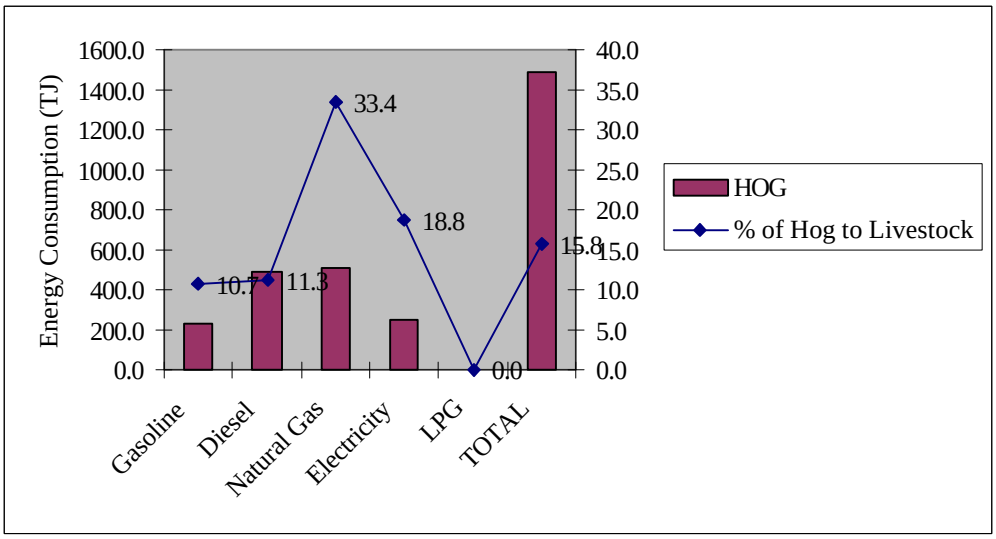


Figure 28. Energy Consumption in Hog Industry in Saskatchewan in 1997 (TJ and %).

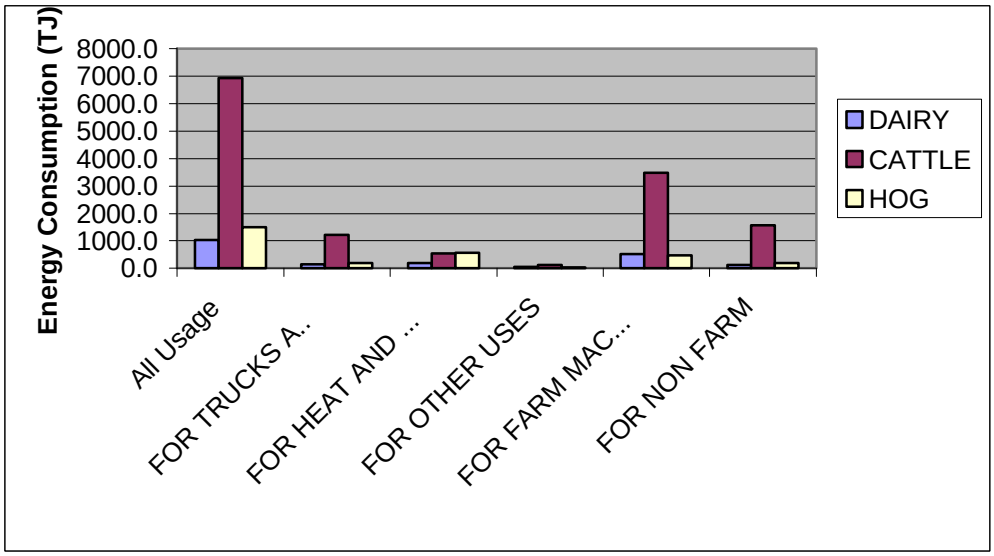


Figure 29. Energy Consumption by Usage Type in Livestock Activities in Saskatchewan in 1997 (TJ).