

**Descriptive Analysis of On-Farm Energy Use
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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Final Report

February 2000

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1. Introduction

The objective of this report is to provide a descriptive analysis of on-farm energy use: by farm type, by energy type, and by usage type in Canada in 1997. The analysis will discuss the relation of farm types to the energy type and to usage type in Canada in total and in each province. Comparisons will be made throughout the report which will describe energy use in the different sectors of agriculture and where and what energy is used.

Farm types for this report represent different sectors of the agricultural industry and include: grain and oilseed, dairy, cattle, hog, poultry and eggs, fruit and vegetables, greenhouse and nursery, and other. This report makes use of data obtained from Statistics Canada and it makes extensive use of percentages calculated from the 1997 Farm Energy Use Survey, a telephone survey conducted by Statistics Canada ?? The tables describing energy use by farm type include a category referred to as “other”. As this category represents a large portion of the total energy use, it can be inferred that it captures a considerable amount of energy use. It is important to specify that, depending on the province, the category other can incorporate energy used in the following:

- the cultivation of specialty crops such as pulses, forages, and spices
- the baling of hay and straw
- the personal use of trucks and vans
- the heating of farm houses and barns
- the drying of grain
- the irrigation of field crops

The report 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 A. 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. A descriptive analysis of energy use for farm and non-farm purposes from 1990 to 1998 in Canada and in the provinces studied is available in the attached CD. The data for the year 1998 includes only the first three Quarters of that year (January to September).

The first part of the report provides a descriptive analysis of energy use in the Canadian agricultural sector. 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 agricultural sectors of these seven provinces is provided in the second part of the study. 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 Canadian Agricultural Sector

Table 1 and Figure 1 provide energy use data for agricultural sectors of Canadian provinces in 1997. Energy used in the agricultural sector of each province is segregated by energy type. Saskatchewan and Alberta together consumed more than 50 percent of the total agricultural energy used in Canada. The Saskatchewan agricultural sector is the

main user of energy in Canada with 55287 TJ of energy or 27% of total consumption.

Alberta is a close second at 54241 TJ and Ontario's use is also high at 49543 TJ.

Since Saskatchewan and Alberta have the majority of agricultural land in Canada, this is not surprising. Their production is aimed at the export market and since they are a long distance from those markets, transportation costs add to the total energy use. As farm size increases and number of farms decreases, land owned is often broken into different quarters and section which means more travel with farm machinery between fields.

Ontario's total amount of energy use is high due to the fact that its agriculture production is more intensive. Cropping practices include use of more chemicals, fertilizer, and tillage practices and there are more intensive livestock operations (ILOs), such as dairies, and poultry and hog barns.

Overall, diesel is the main energy type used in the Canadian agricultural sector, followed by gasoline. Primary farm machinery, such as tractors and combines, is powered by diesel engines and increasingly farm trucks are diesel powered as well. Smaller farm equipment is gasoline powered, such as some tractors and trucks, and swathers.

Table 1. Energy Consumption by Energy Type in Canadian Provinces in 1997 (TJ).

Provinces	Total	Gasoline	Diesel	Natural Gas	Electricity	LPG
Alberta	54241	12711	27829	6898	6527	276
British Columbia	11525	2282	5353	2510	1306	74
Manitoba	22208	5422	10287	425	5124	950
Newfoundland	335	76	35	0	51	173
Ontario	49543	9507	17159	10061	9949	2867
Quebec	17779	2241	6178	300	6587	2473
Saskatchewan	55287	11787	31834	6111	5311	244

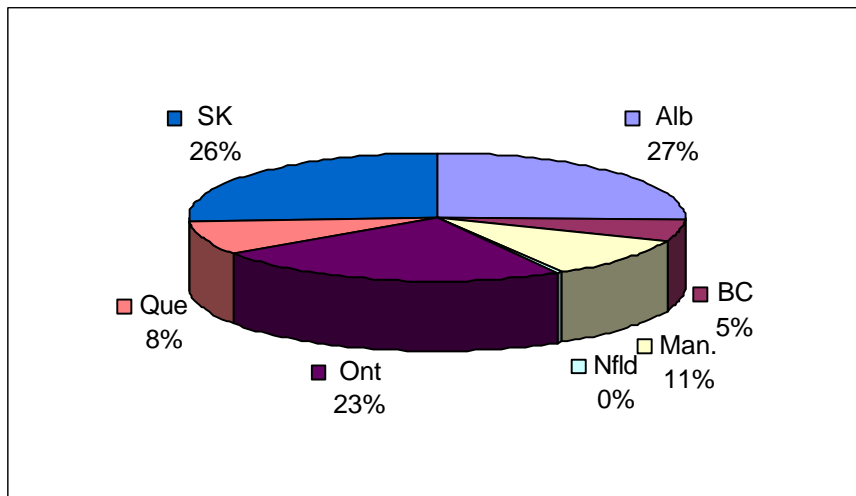


Figure 1. Energy Consumption in Agriculture by Province in 1997 (TJ).

Table 2 and Figure 2 illustrate energy use in agricultural sector of each province in Canada, by usage type. The agricultural uses are divided into five categories which include trucking and auto uses, heating and lighting uses, other uses, farm machinery uses, and non-farm uses. As Table 2 and Figure 2 indicate, farm machinery is the main energy usage type in all provinces in Canada. It is noteworthy to mention that energy used for non-farm purposes is a significant part of agricultural energy use in most provinces.

Energy consumed for trucking uses and for heating and lighting uses are other important usage types in Canada. However, one important result of Table 2 and Figure 2 is that in the Prairie Provinces (Alberta, Saskatchewan, and Manitoba), where farm

production can be a long distance from elevators and export destinations, energy used for trucking purposes plays an important role in the overall use of energy in agriculture. This usage type is less important in agricultural sectors of other provinces such as Ontario, Quebec, and British Columbia, where energy used for heating and lighting is the second highest usage type. These provinces have more intensive agricultural operation such as dairies, poultry and egg production, and hog barns.

Table 2. Energy Consumption by Usage Type in Canadian Provinces in 1997 (TJ).

Provinces	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm machine
Alberta	54241.0	9807.7	6020.8	982.3	27455.6	9323.7
British Columbia	11525.0	1436.3	1963.8	308.5	5147.6	1165.4
Manitoba	22208.0	3583.9	3066.3	1613.0	10536.9	3512.7
Newfoundland	335.0	41.4	119.6	76.3	37.2	49.3
Ontario	49543.0	4630.1	11120.6	3011.6	18211.9	10466.5
Quebec	17779.0	1504.2	4009.5	3220.0	5805.5	2626.0
Saskatchewan	55287.0	17239.6	4490.7	976.8	30599.4	9216.5

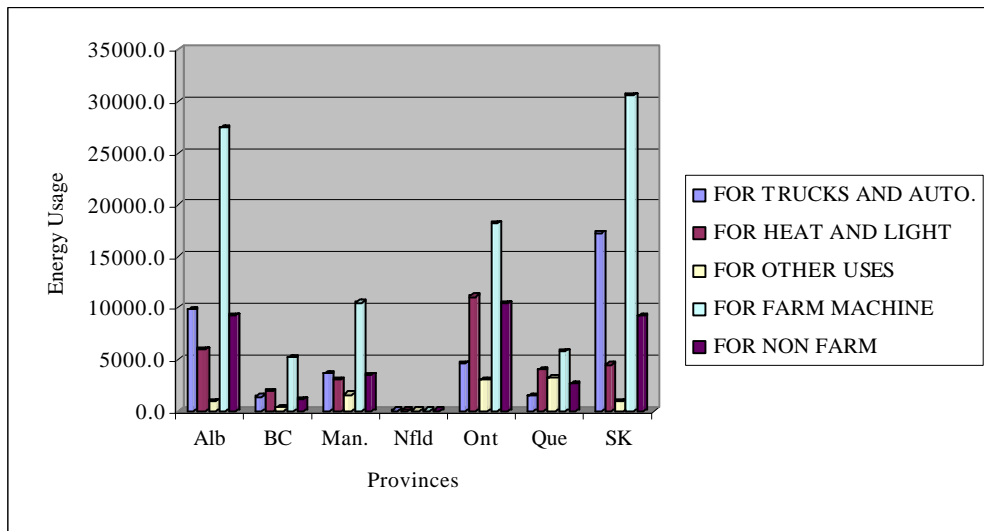


Figure 2. Energy Consumption in Agriculture by Usage Type in Canadian Provinces in 1997 (TJ).

Table 3 and Figures 3 and 4 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 users are the dairy (10%) and hog (6%) industries.

The grain and oilseed sector in Saskatchewan consumes more energy than in other provinces, followed by Alberta and Ontario. 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. Poultry and egg production is localized in Ontario with Alberta, British Columbia, and Quebec next. Fruit and vegetable production and greenhouse and nursery industries are centred in Ontario and Quebec. Other farm types show Saskatchewan leading in energy use at almost half of the total, followed by Ontario.

Table 3. 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

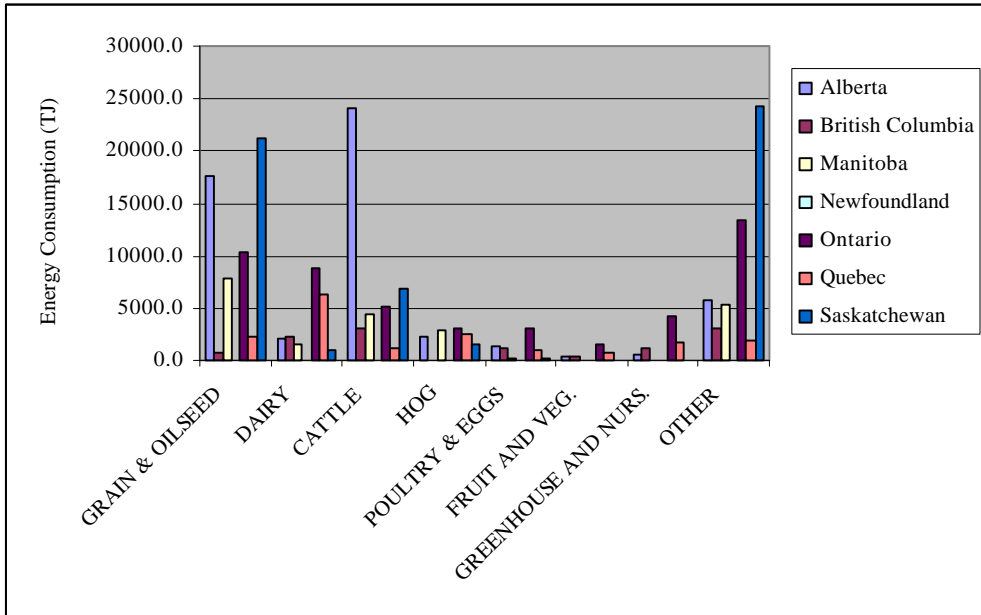


Figure 3. Energy Consumption by Farm Type by Province in 1997 (TJ).

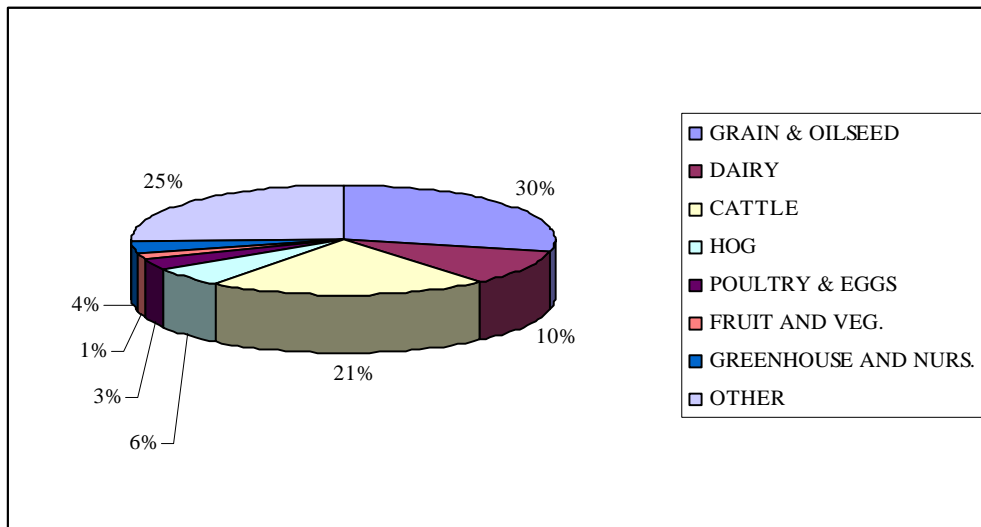


Figure 4. Energy Consumption by Farm Type in Canada (sum of seven provinces) in 1997.

3. Energy Used in Agricultural Sector of Canadian Provinces in 1997

Analysis of energy use in the agricultural sector of each Canadian province is provided in this section. A detailed analysis of energy use by farm type, usage type, and energy type for each province is discussed below.

3.1. Energy Use in Agricultural Sector of Alberta

Table 4 and Figures 5 and 6 provide detailed account of energy consumption in Alberta by farm type and energy type. The cattle industry is the main consumer of energy in the agricultural sector of Alberta, followed by the grain and oilseed sector, with other being third. In terms of energy type, the gasoline and diesel components make up 74% of the total energy use in this province. Use of diesel and gasoline account for 75% of energy type used. Farm machinery accounted for about half of the usage type (diesel and gasoline, respectively) with trucks and auto second (Table 5 and Figure 7). Energy (gasoline and diesel, respectively) used for trucking is ranked second among uses of energy in this provinces. Energy use for non-farm purposes ranked third among the usage type activities.

Table 4. Energy Consumption by Farm Type in Alberta in 1997 (TJ).

Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	Total
Grain & oilseed	3466.3	11310.2	1431.6	1355.1	75.4	17638.6
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
Poultry & eggs	119.3	327.1	627.6	263.4	3.4	1340.8
Fruit and veg.	74.9	194.9	49.7	85.7	0.0	405.1
Greenhouse and nursery	67.6	72.3	434.1	90.6	0.0	664.5
Other	2720.5	8.1	1439.0	1537.2	58.0	5762.7
Total	12711.0	27829.0	6898.0	6527.0	276.0	54241.0

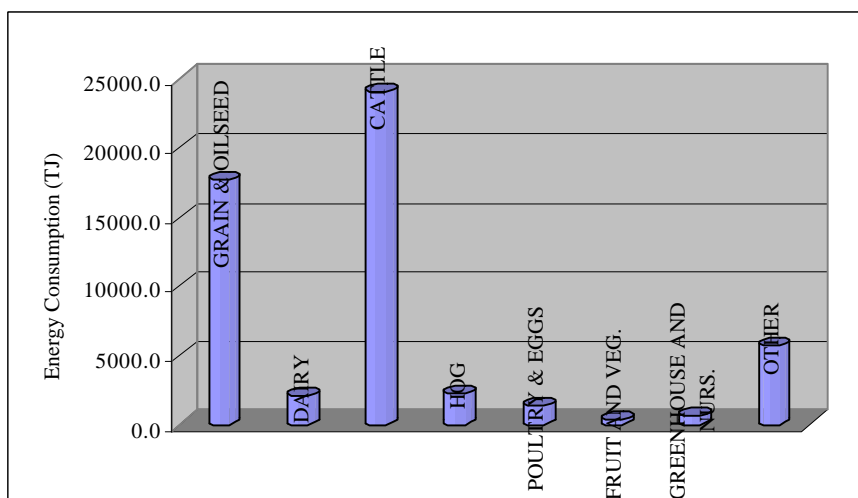


Figure 5. Energy Consumption by Farm Type in Alberta in 1997 (TJ).

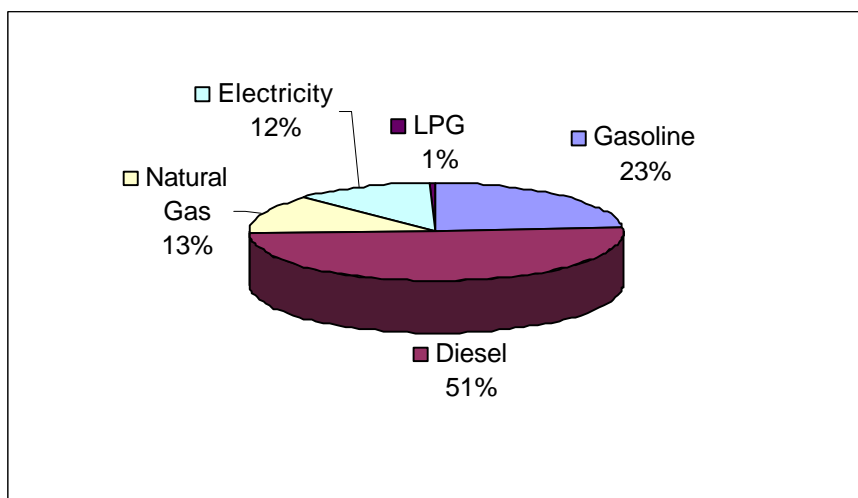


Figure 6. Energy Consumption by Energy Type in Alberta in 1997 (%).

Table 5. Energy Consumption by Energy Type and Usage Type in Alberta in 1997 (TJ).

Energy consumption	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Alberta (Gasoline)	12711	7357.6	0.0	0.0	2553.5	2523.3
Alberta (Diesel)	27829.0	2450.0	0.0	0.0	24902.1	504.9
Alberta (Natural Gas)	6898.0	0.0	2855.5	0.0	0.0	3664.8
Alberta (Electricity)	6527.0	0.0	3082.8	877.8	0.0	2565.5
Alberta (LPG)	276.0	0.0	82.5	104.5	0.0	65.2
Total Energy Consumption in Alberta	54241.0	9807.7	6020.8	982.3	27455.6	9323.7

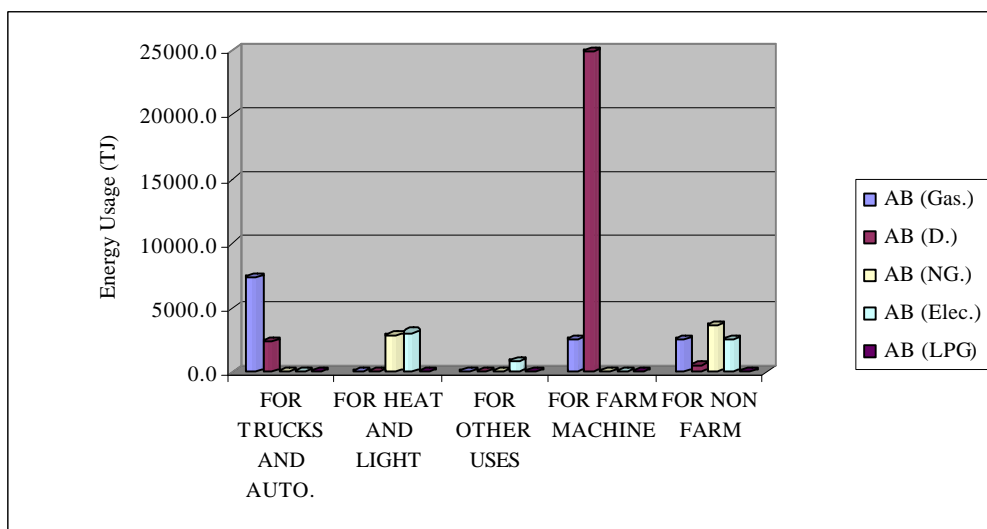


Figure 7. Energy Consumption by Energy Type and Usage in Alberta in 1997 (TJ).

Table 6 and Figure 8 illustrate energy consumption in Alberta agriculture by farm type and usage type in 1997. Farm machinery is the main use of energy in cattle, grain and oilseed, dairy, and hog activities. In other agricultural sub-sections, energy used for non-farm purposes (followed by energy used for trucking and auto) is a relatively important component of usage type.

Table 6. Energy Consumption by Farm Type and Usage Type in Alberta in 1997 (TJ).

Farm type	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Grain & oilseed	17638.6	2689.1	974.6	230.4	11211.7	2455.3
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
Poultry & eggs	1340.8	184.9	715.3	23.8	199.3	181.1
Fruit and veg.	405.1	34.4	42.2	19.7	185.8	90.2
Greenhouse and nurs.	664.5	61.1	234.1	14.5	48.9	302.2
Other	5762.7	1551.7	1292.9	231.4	578.2	1930.1
Total	54241.0	9807.7	6020.8	982.3	27455.6	9323.7

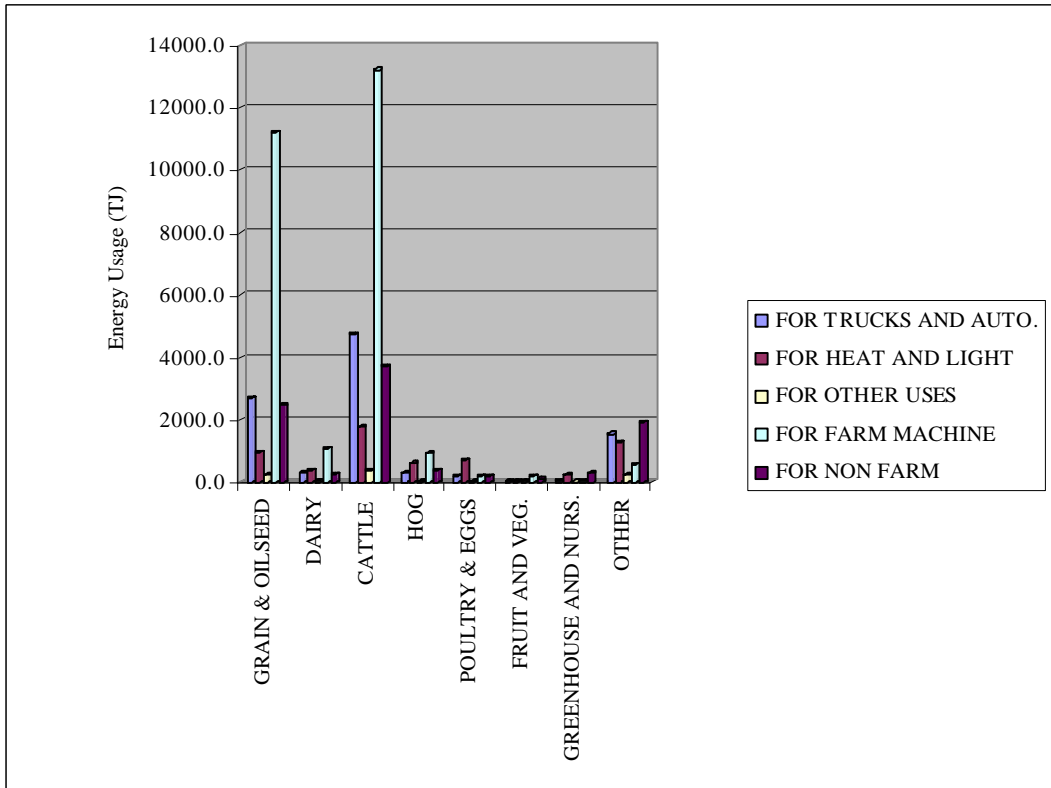


Figure 8. Energy Consumption by Farm Type and Usage Type in Alberta in 1997 (TJ).

3.2. Energy Use in Agricultural Sector of British Columbia

The cattle industry is also the main consumer of energy in British Columbia but much lower in terms of magnitude than energy used in the cattle industry of Alberta (Table 7 and Figure 9). Energy used for other agricultural activities is a significant part of the whole energy use in this province. Diesel and gasoline (respectively) make up 66% of total energy use in British Columbia agriculture, with natural gas (22%) a significant energy type used (Figure 10). Dairies are the second highest users of diesel and ranks third in overall energy use.

Table 7. Energy Consumption by Farm Type in BC in 1997 (TJ).

Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	Total
Grain & oilseed	161.6	497.5	0.0	55.2	0.0	714.3
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
Poultry & eggs	93.1	94.9	647.0	231.1	0.0	1066.1
Fruit and veg.	110.5	160.8	0.0	49.0	0.0	320.3
Greenhouse and nurs.	89.5	120.5	913.0	102.3	11.0	1236.3
Other	864.0	996.9	754.0	332.9	23.5	2971.3
Total	2282.0	5353.0	2510.0	1306.0	74.0	11525.0

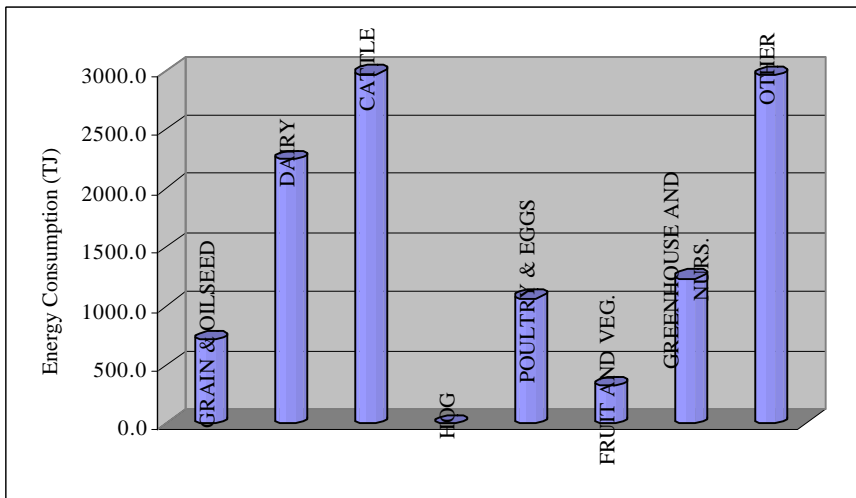


Figure 9. Energy Consumption by Farm Type in BC in 1997 (TJ).

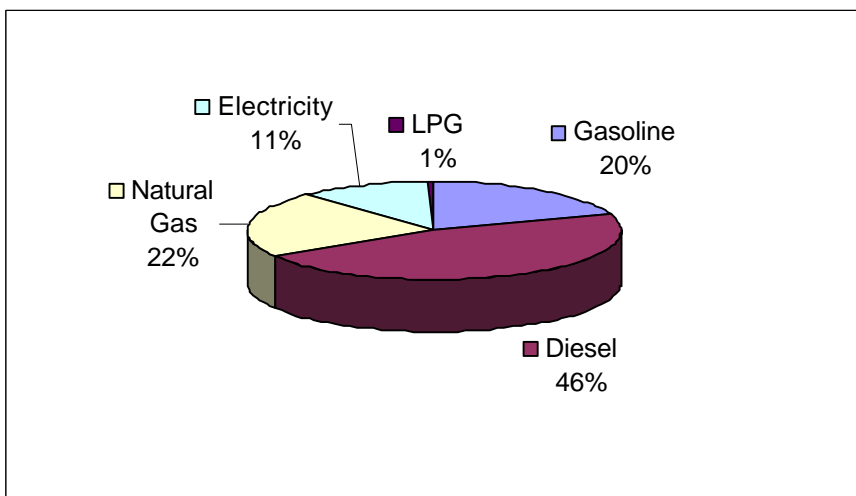


Figure 10. Energy Consumption by Energy Type in BC in 1997 (Percentage).

Similar to energy used in agricultural sector of Alberta, farm machinery is the main consumer of energy (mostly diesel) in British Columbia agriculture (Table 8 and Figure 11). Gasoline for trucks and autos and natural gas for heat and light are other high numbers.

Table 8. Energy Consumption by Energy Type and Usage Type in BC in 1997 (TJ).

Energy consumption	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
BC (Gasoline)	2282	1375.8	0.0	0.0	200.6	590.7
BC (Diesel)	5353.0	52.5	0.0	6.6	4945.4	5.0
BC (Natural Gas)	2510.0	0.0	1348.4	0.0	0.0	203.2
BC (Electricity)	1306.0	0.0	595.6	280.2	0.0	348.0
BC (LPG)	74.0	8.0	19.7	21.6	1.6	18.5
Total Energy Consumption in BC	11525.0	1436.3	1963.8	308.5	5147.6	1165.4

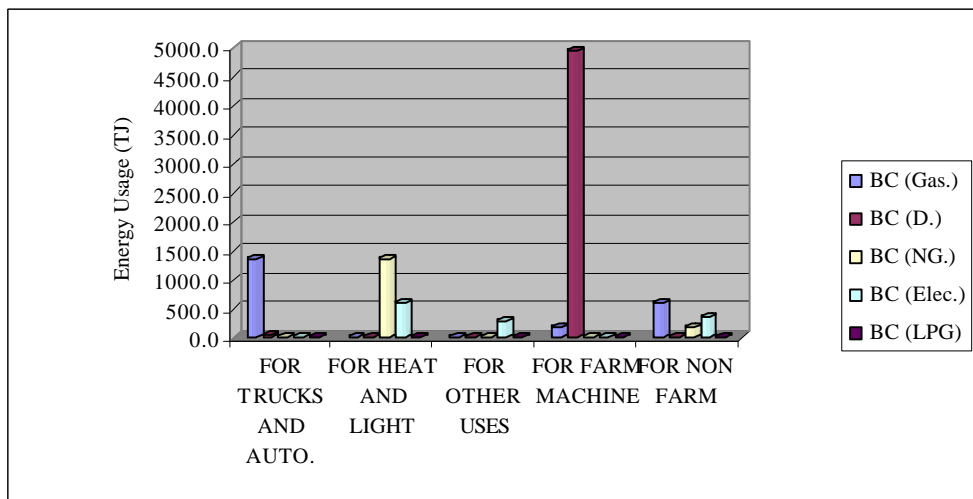


Figure 11. Energy Consumption by Energy Type and Usage Type in BC in 1997 (TJ).

Table 9 and Figure 12 show energy used in agricultural sector in BC by farm type and usage type in 1997. Farm machinery used the most energy in the cattle, dairy, and other categories (respectively) is again the main consumer of energy. Energy used for heat and light was highest in the poultry and eggs and the greenhouse and nursery sectors.

Table 9. Energy Consumption by Farm Type and Usage in BC in 1997 (TJ).

Farm type	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Grain & oilseed	714.3	118.6	22.1	7.7	491.7	67.6
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
Poultry & eggs	1066.1	67.1	620.7	103.7	89.1	129.5
Fruit and veg.	320.3	50.8	19.6	11.3	166.6	39.1
Greenhouse and nurs.	1236.3	96.3	592.8	26.6	97.1	57.5
Other	2971.3	527.0	341.3	24.4	957.0	393.1
Total	11525.0	1436.3	1963.8	308.5	5147.6	1165.4

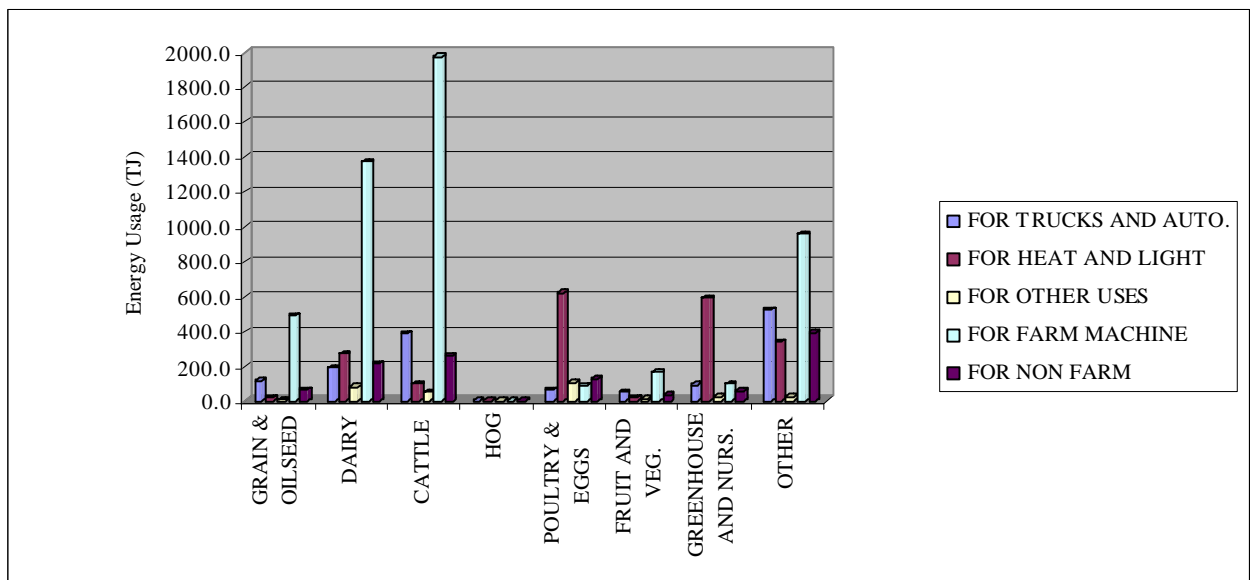


Figure 12. Energy Consumption by Farm Type and Usage in BC in 1997 (TJ).

3.3. Energy Use in Agricultural Sector of Manitoba

In Manitoba, 71% of the energy type used in agriculture is diesel and gasoline (47% and 24%, respectively). However, another important component of energy use in Manitoba agriculture is electricity (23%) (Table 10 and Figure 14). The grain and oilseed sector is the main consumer of energy (mainly diesel and gasoline) in Manitoba (Figure 13). The Manitoba hog industry is also an important part of agriculture in terms of energy use as this activity consumed 2841.1 TJ of energy or 13% of total energy consumption in 1997. Manitoba has a high concentration of intensive hog operations in its Interlake region and is a high consumer of electricity (Table 10) for heating purposes.

Table 10. Energy Consumption by Farm Type in Manitoba in 1997 (TJ).

Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	Total
Grain & oilseed	1949.3	4431.6	0.0	1150.2	386.9	7918.1
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
Poultry & eggs	33.9	32.3	0.0	89.5	0.0	155.6
Fruit and veg.	0.0	0.0	0.0	0.0	0.0	0.0
Greenhouse and nurs.	0.0	0.0	0.0	0.0	0.0	0.0
Other	1356.2	2605.3	0.0	1296.9	152.3	5410.7
Total	5422.0	10287.0	425.0	5124.0	950.0	22208.0

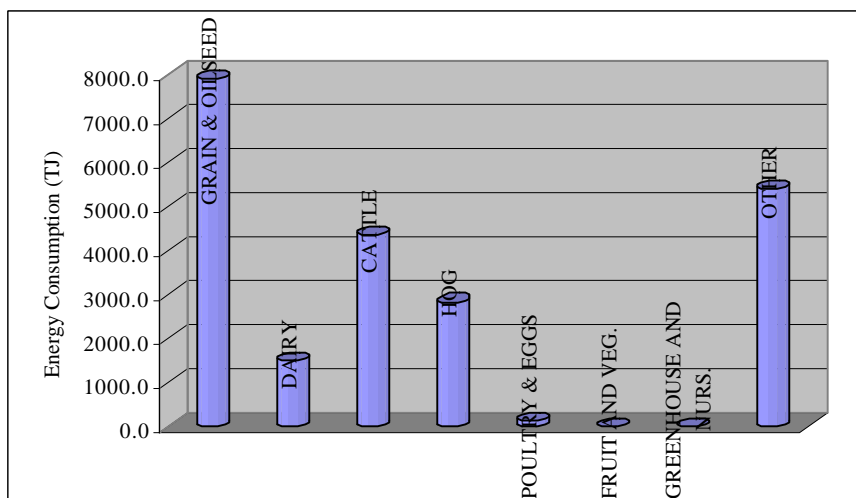


Figure 13. Energy Consumption by Farm Type in Manitoba in 1997 (TJ).

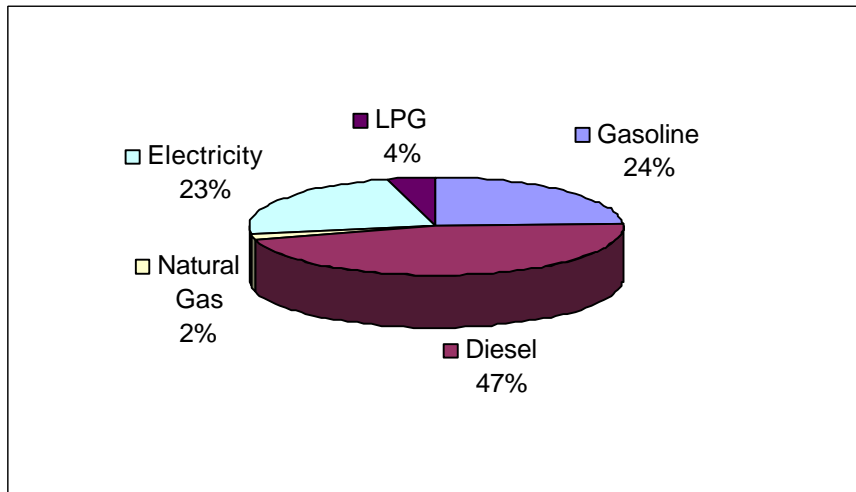


Figure 14. Energy Consumption by Energy Type in Manitoba in 1997 (%).

As Table 11 and Figure 15 indicate, similar to Alberta and British Columbia, farm machinery is the main user of energy in Manitoba. Farm machinery in the grain and oilseed sector is the main user of energy in Manitoba's agriculture followed by farm machinery in the cattle industry (Table 12 and figure 16). Farm type 'other' is the second highest consumer of energy in Manitoba (Table 12). However, for heating purposes, electricity (not natural gas) is the main component of energy use.

Table 11. Energy Consumption by Energy Type and Usage in Manitoba in 1997 (TJ).

Energy consumption	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Manitoba (Gasoline)	5422	2977.8	9.1	135.6	1091.0	1289.6
Manitoba (Diesel)	10287.0	606.1	0.0	0.0	9445.9	66.0
Manitoba (Natural Gas)	425.0	0.0	348.5	0.0	0.0	63.8
Manitoba (Electricity)	5124.0	0.0	2458.9	929.0	0.0	1953.7
Manitoba (LPG)	950.0	0.0	249.7	548.4	0.0	139.8
Total Energy Consumption in Manitoba	22208.0	3583.9	3066.3	1613.0	10536.9	3512.7

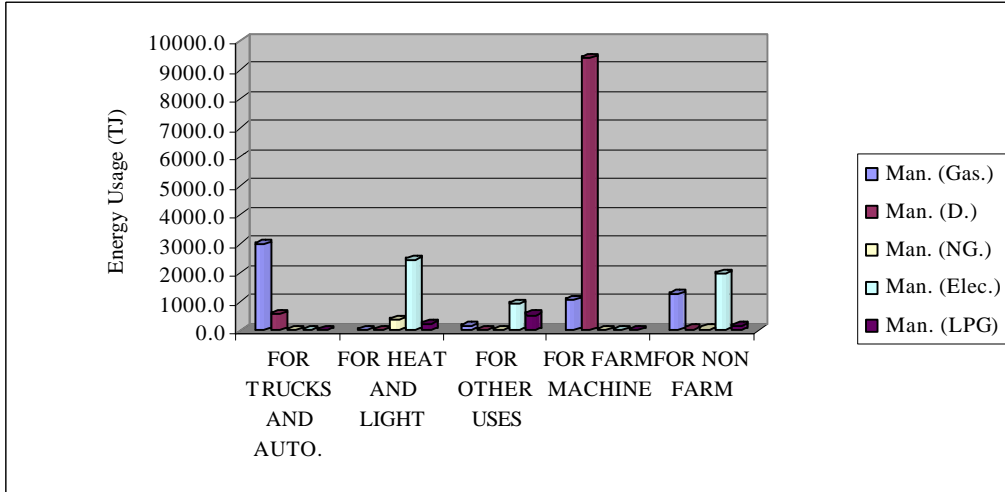


Figure 15. Energy Consumption by Energy Type and Usage in Manitoba in 1997 (TJ).

Table 12. Energy Consumption by Farm Type and Usage in Manitoba in 1997 (TJ).

Farm type	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Grain & oilseed	7918.1	1451.5	487.1	509.0	4397.8	1045.5
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
Poultry & eggs	155.6	0.0	76.3	8.1	50.0	17.0
Fruit and veg.	0.0	0.0	0.0	0.0	0.0	0.0
Greenhouse and nurs.	0.0	0.0	0.0	0.0	0.0	0.0
Other	5410.7	876.2	617.9	380.4	2654.6	913.4
Total	22208.0	3583.9	3066.3	1613.0	10536.9	3512.7

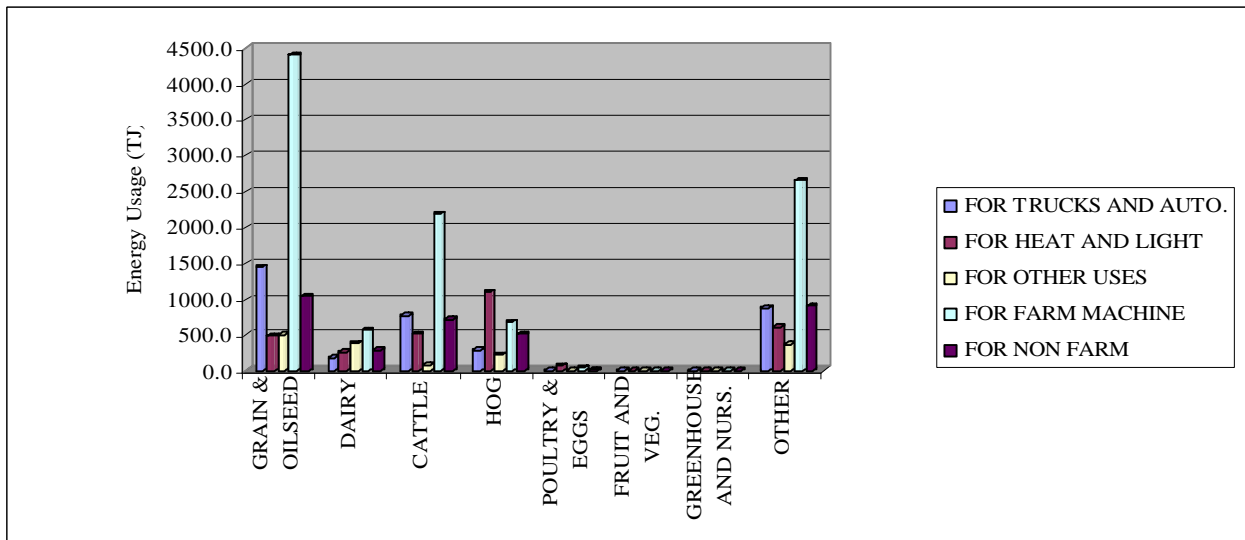


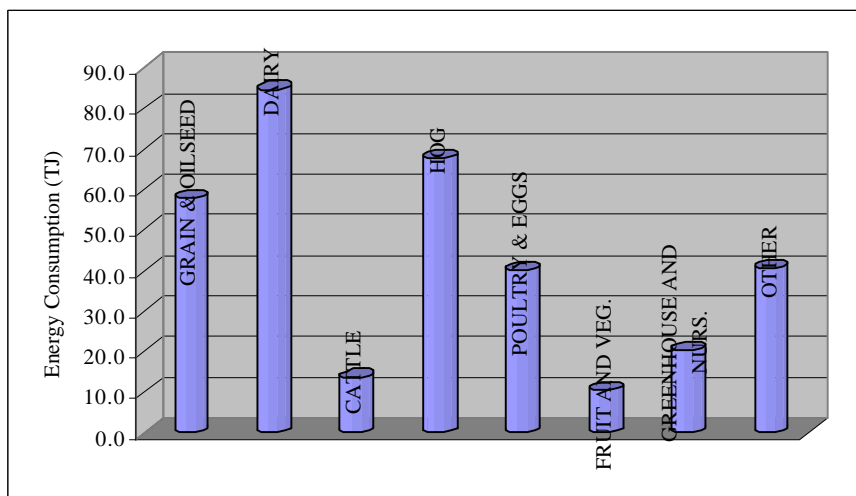
Figure 16. Energy Consumption by Farm Type and Usage in Manitoba in 1997 (TJ).

3.4. Energy Use in Agricultural Sector of Newfoundland

Energy used in the agricultural sector of Newfoundland is the lowest in terms of magnitude among the provinces. Total energy consumption in the agricultural sector in Newfoundland was only 335 TJ in 1997. Of this total, dairy sector ranked first followed by the hog industry and grain and oilseed sectors (Table 13 and Figure 17). In terms of energy components, LPG is the main component (52%) of energy type used followed by gasoline (23%) and electricity (15%) (Figure 18). Diesel use is very low.

Table 13. Energy Consumption by Farm Type in Newfoundland in 1997 (TJ).

Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	TOTAL
Grain & oilseed	9.2	6.9	0.0	2.6	39.0	57.7
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
Poultry & eggs	2.1	0.5	0.0	2.9	34.6	40.1
Fruit and veg.	4.0	2.2	0.0	1.9	2.3	10.4
Greenhouse and nurs.	5.7	2.5	0.0	6.2	6.0	20.4
Other	9.9	3.4	0.0	5.5	21.7	40.5
Total	76.0	35.0	0.0	51.0	173.0	335.0



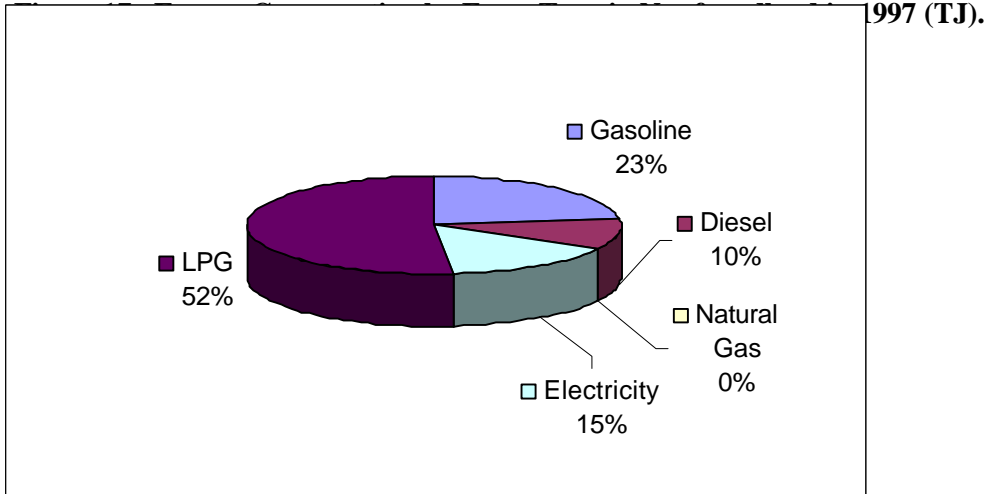


Figure 18. Energy Consumption by Energy Type in Newfoundland in 1997 (%).

Table 14 and Figure 19 illustrate energy consumption by energy type and usage type. LPG is the main contributor for heating purposes.

Table 14. Energy Consumption by Energy Type and Usage in Newfoundland in 1997 (TJ).

Energy consumption	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Newfoundland (Gasoline)	76	39.4	0.0	4.6	5.2	21.2
Newfoundland (Diesel)	35.0	1.9	0.0	0.1	32.0	0.0
Newfoundland (Natural Gas)	0.0	0.0	0.0	0.0	0.0	0.0
Newfoundland (Electricity)	51.0	0.0	20.0	17.8	0.0	13.9
Newfoundland (LPG)	173.0	0.0	99.6	53.8	0.0	14.1
Total Energy Consumption	335.0	41.4	119.6	76.3	37.2	49.3

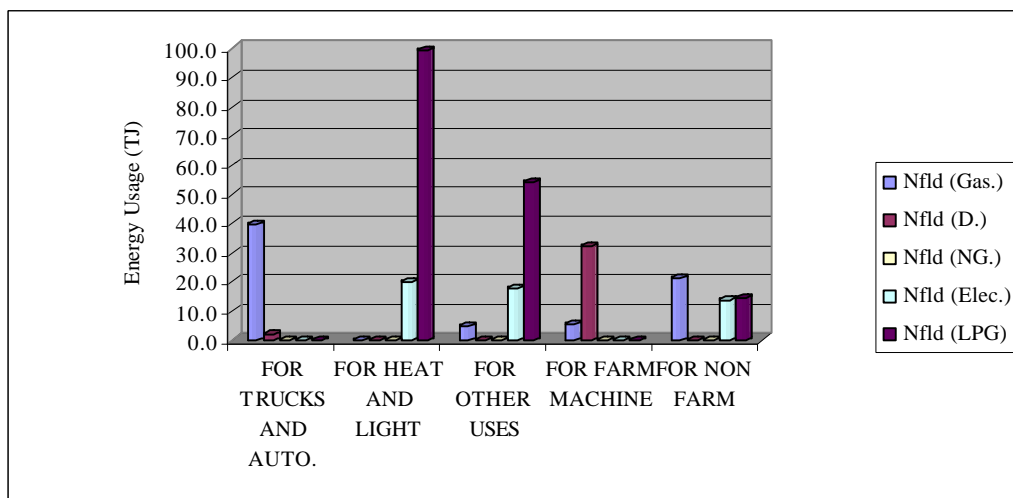


Figure 19. Energy Consumption by Energy Type and Usage in Newfoundland in 1997 (TJ).

Energy by farm type and usage type is shown in Table 15 and Figure 20. Energy used for heating is very important in hog, and poultry and egg industries (figure 20).

Table 15. Energy Consumption by Farm Type and Usage in Newfoundland in 1997 (TJ).

Farm type	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Grain & oilseed	57.7	4.9	10.0	28.4	8.2	3.8
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
Poultry & eggs	40.1	1.4	33.6	2.6	0.6	1.0
Fruit and veg.	10.4	2.6	1.5	1.3	2.1	2.5
Greenhouse and nurs.	20.4	3.9	6.4	1.5	2.3	5.0
Other	40.5	4.2	9.6	10.3	4.9	11.0
Total	335.0	41.4	119.6	76.3	37.2	49.3

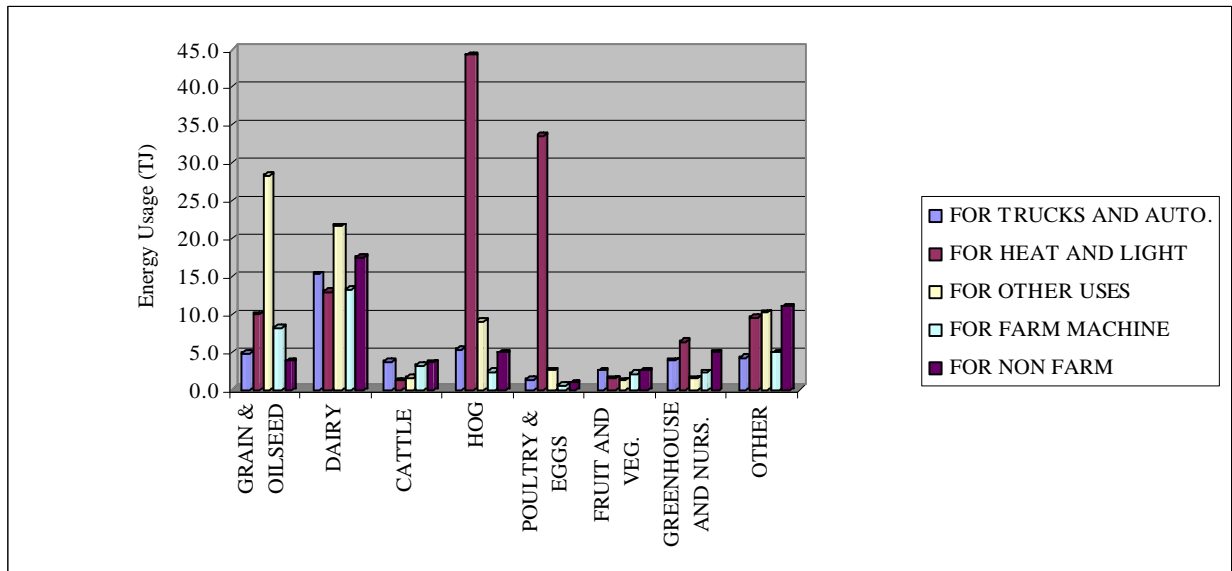


Figure 20. Energy Consumption by Farm Type and Usage in Newfoundland in 1997 (TJ).

3.5. Energy Use in Agricultural Sector of Ontario

Among energy types used in Ontario agriculture, diesel plays an important role (35%); however, energy components, such as gasoline, natural gas, and electricity, contribute equally to energy consumption in this province (Table 16 and Figure 22). The grain and oilseed and dairy sectors are two main agricultural energy users in the province (Table 16). Diesel use is the highest in the grain and oilseed and ‘other’ sectors. In fact, ‘other’ is the highest user of energy, overall.

Table 16. Energy Consumption by Farm Type in Ontario in 1997 (TJ).

Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	Total
Grain & oilseed	2412.7	4568.5	1078.6	1524.0	798.9	10382.7
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
Poultry & eggs	327.7	455.0	824.2	817.3	605.6	3029.9
Fruit and veg.	453.2	510.7	155.8	347.8	54.9	1522.4
Greenhouse and nurs.	166.1	181.4	3497.2	363.8	54.2	4262.8
Other	2352.0	4284.0	3929.0	2123.7	636.9	13325.5
Total	9507.0	17159.0	10061.0	9949.0	2867.0	49543.0

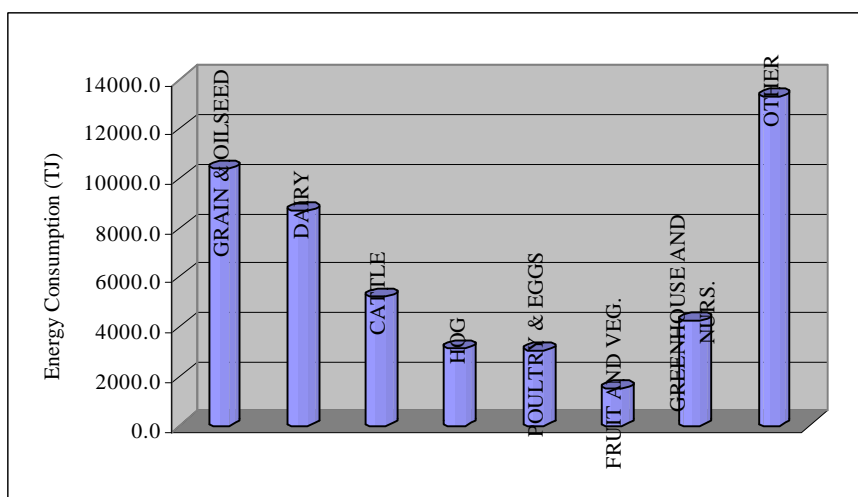


Figure 21. Energy Consumption by Farm Type in Ontario in 1997 (TJ).

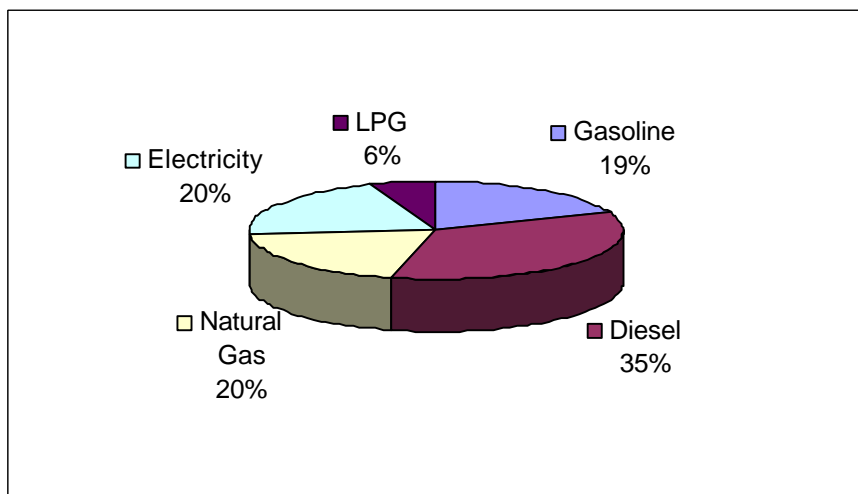


Figure 22. Energy Consumption by Energy Type in Ontario in 1997 (%).

Farm machinery and truck and autos are the main users of diesel and gasoline, and heating and lighting and non-farm are the main users of natural gas, electricity and LPG in Ontario (Table 17 and Figure 23).

Table 17. Energy Consumption by Energy Type and Usage in Ontario in 1997 (TJ).

Energy consumption	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Ontario (Gasoline)	9507	3743.6	0.0	27.2	2557.2	2820.9
Ontario (Diesel)	17159.0	886.5	0.0	0.0	15654.7	45.7
Ontario (Natural Gas)	10061.0	0.0	5683.0	0.0	0.0	3327.4
Ontario (Electricity)	9949.0	0.0	4248.8	2164.1	0.0	3518.5
Ontario (LPG)	2867.0	0.0	1188.8	820.3	0.0	754.1
Total Energy Consumption in Ontario	49543.0	4630.1	11120.6	3011.6	18211.9	10466.5

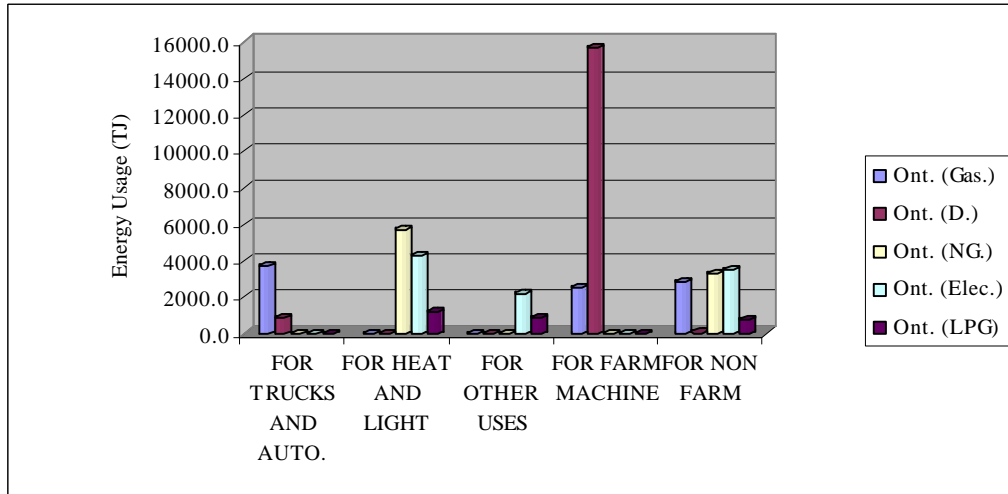


Figure 23. Energy Consumption by Energy Type and Usage in Ontario in 1997 (TJ).

Farm machinery in the grain and oilseed, dairy, and cattle sectors (respectively) is ranked first in terms of energy usage in Ontario (Table 18 and Figure 24). The greenhouse and nursery sector is a high user of heat and light and ranks third in all usage. Again ‘other’ is a high user, first in total usage.

Table 18. Energy Consumption by Farm Type and Usage in Ontario in 1997 (TJ).

Farm type	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Grain & oilseed	10382.7	984.1	975.3	532.2	5063.9	2569.7
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
Poultry & eggs	3029.9	183.3	1474.7	199.5	464.7	589.4
Fruit and veg.	1522.4	213.1	194.8	122.0	598.4	356.7
Greenhouse and nurs.	4262.8	131.6	2904.4	65.8	157.1	944.1
Other	13325.5	1318.0	3027.3	592.4	4261.3	2913.0
Total	49543.0	4630.1	11120.6	3011.6	18211.9	10466.5

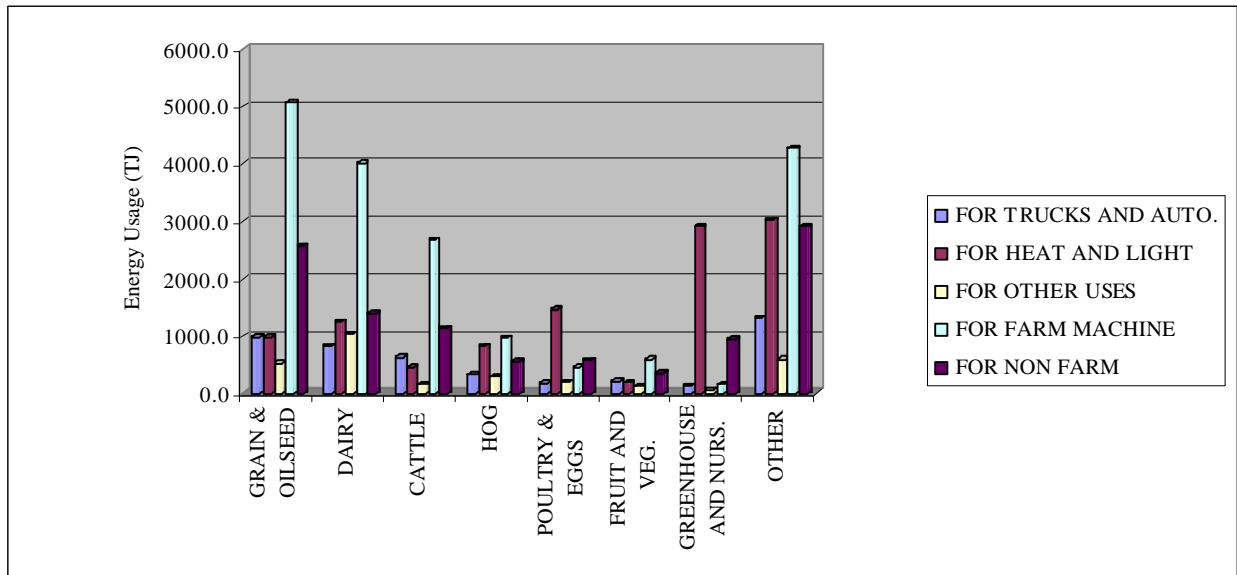


Figure 24. Energy Consumption by Farm Type and Usage Type in Ontario in 1997 (TJ).

3.6. Energy Use in Agricultural Sector of Quebec

In Quebec agriculture, the dairy industry is the main consumer of agricultural energy, using the highest amount of gasoline, diesel, and electricity. The grain and oilseed and hog sectors share equal consumption of agricultural energy in this province (Table 19 and Figure 25). Together, diesel and electricity make up 71% of total energy consumption (Figure 26). Electricity at 36% is the main energy type used in this province, followed by diesel at 35%. It is interesting to note that natural gas is not a highly used energy type in Quebec agriculture.

Table 19. Energy Consumption by Farm Type in Quebec in 1997 (TJ).

Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	Total
Grain & oilseed	272.2	1214.6	0.0	333.9	558.0	2378.7
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
Poultry & eggs	61.1	94.6	0.0	369.1	494.4	1019.3
Fruit and veg.	117.5	388.5	0.0	244.8	33.3	784.1
Greenhouse and nurs.	169.4	432.6	287.067	799.3	85.4	1773.8
Other	292.5	604.2	12.9332	710.5	310.3	1930.4
Total	2241.0	6178.0	300.0	6587.0	2473.0	17779.0

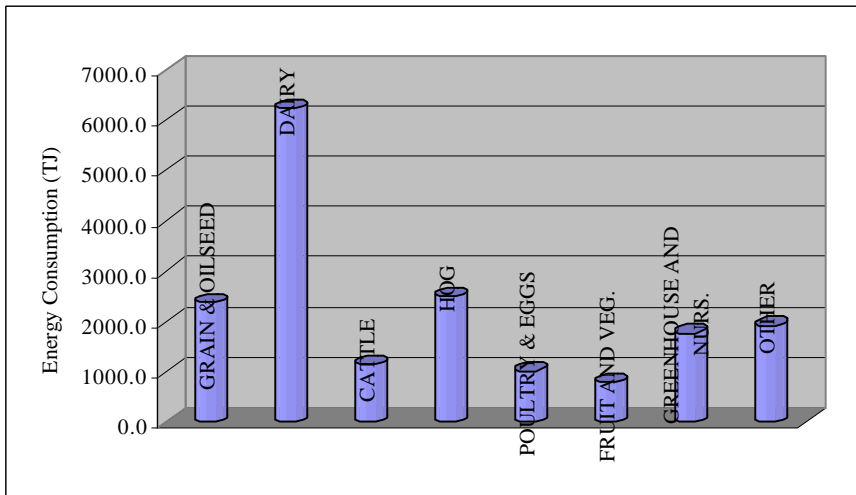


Figure 25. Energy Consumption by Farm Type in Quebec in 1997 (TJ).

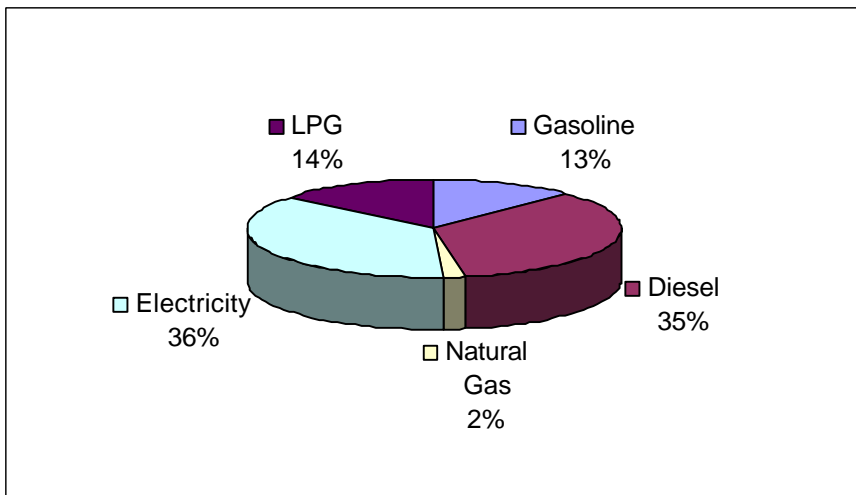


Figure 26. Energy Consumption by Energy Type in Quebec in 1997 (%).

As Table 20 and Figure 27 indicate, farm machinery is the main user of diesel. For truck and auto, gasoline is the main energy type used, revealing that trucking is not as important a usage type as it is in the Prairie Provinces. In Quebec, electricity and LPG are used mainly for heating and lighting purposes and electricity is the energy type used most for non-farm uses. Farm machinery and heat and light are the highest usage types.

Table 20. Energy Consumption by Energy Type and Usage in Quebec in 1997 (TJ).

Energy consumption	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Quebec (Gasoline)	2241	1162.3	0.0	135.6	154.1	625.2
Quebec (Diesel)	6178.0	341.8	0.0	21.8	5651.4	0.0
Quebec (Natural Gas)	300.0	0.0	4.4	0.0	0.0	0.0
Quebec (Electricity)	6587.0	0.0	2581.1	2292.8	0.0	1798.6
Quebec (LPG)	2473.0	0.0	1424.1	769.7	0.0	202.2
Total Energy Consumption in Quebec	17779.0	1504.2	4009.5	3220.0	5805.5	2626.0

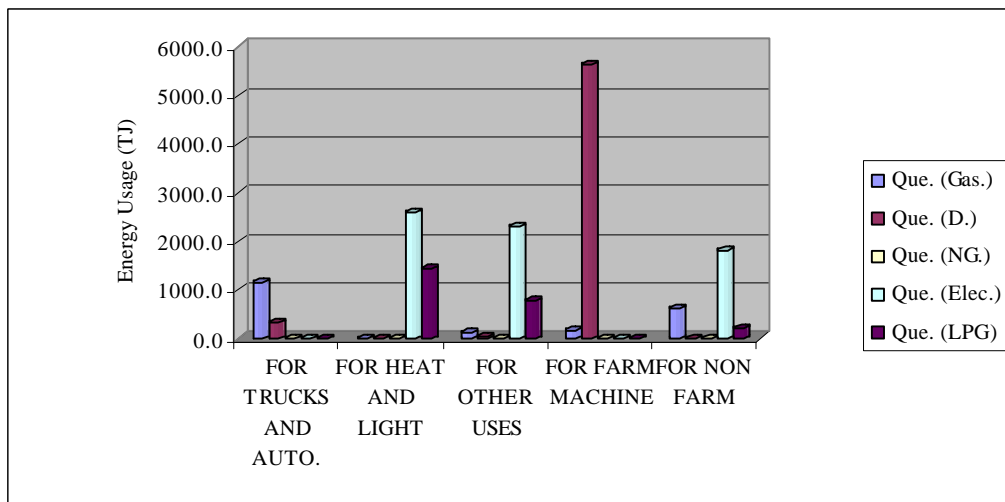


Figure 27. Energy Consumption by Energy Type and Usage in Quebec in 1997 (TJ).

Farm machinery is the main user of energy in the dairy and grain and oilseed sectors; however ‘other’ agricultural uses play a relatively important role in other farming activities (Table 21 and Figure 28). The dairy sector has the highest overall usage and the hog sector has the highest usage in the heat and light category.

Table 21. Energy Consumption by Farm Type and Usage in Quebec in 1997 (TJ).

Farm type	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Grain & oilseed	2378.7	194.1	210.7	506.2	1193.5	225.9
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
Poultry & eggs	1019.3	45.7	608.7	181.4	86.9	83.0
Fruit and veg.	784.1	130.7	76.5	93.8	302.7	149.4
Greenhouse and nurs.	1773.8	188.1	525.2	99.9	328.4	285.9
Other	1930.4	150.1	343.5	380.8	593.3	475.3
Total	17779.0	1504.2	4009.5	3220.0	5805.5	2626.0

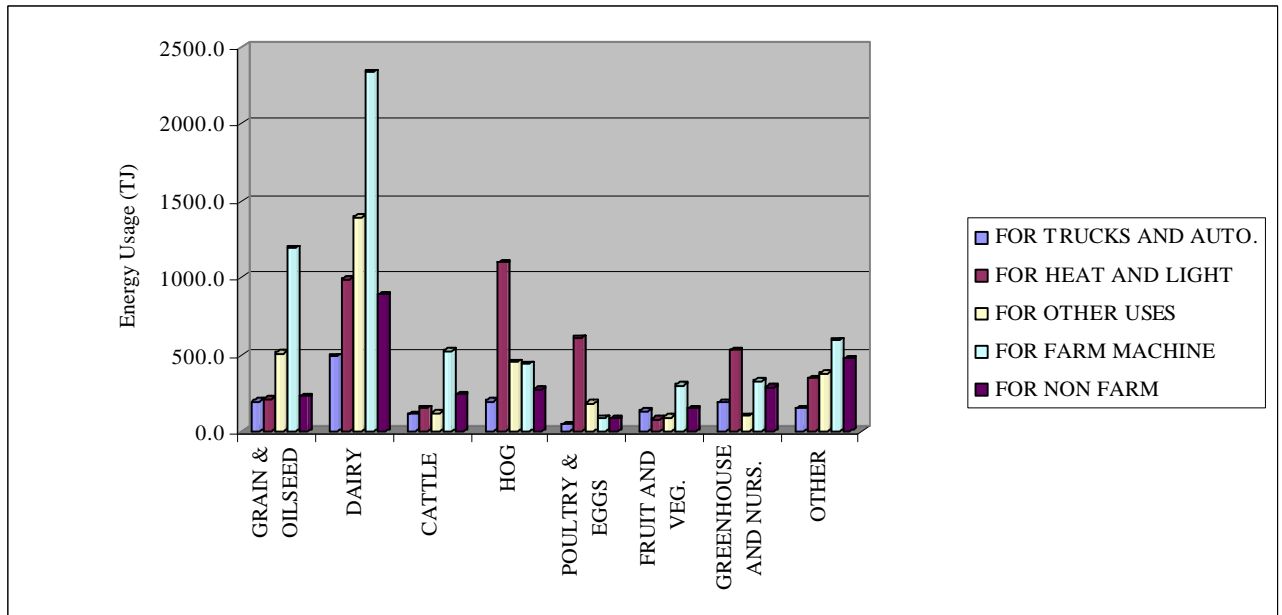


Figure 28. Energy Consumption by Farm Type and Usage Type in Quebec in 1997 (TJ).

3.7. Energy Use in Agricultural Sector of Saskatchewan

Agriculture in Saskatchewan is the highest user of energy (27%) among the provincial agricultural sectors studied. Diesel (58%) and gasoline (21%) together contribute about 80% of the total energy consumption (Table 22 and Figures 29 and 30). This large consumption of diesel and gasoline is due to the fact that the main agricultural activity in this province is in the grain and oilseed sector. The farm type ‘other’ is the highest consumer of energy in Saskatchewan. Saskatchewan’s grains and oilseeds are destined for export markets, which means high transportation costs. Relatively, there are few hog, dairy, and poultry, and greenhouse and nurseries in this province, which are high users of electricity and natural gas and this is reflected in their low numbers.

Table 22. Energy Consumption by Farm Type in Saskatchewan in 1997 (TJ).

Farm type	Gasoline	Diesel	Natural Gas	Electricity	LPG	Total
Grain & oilseed	4545.6	12812.0	2186.4	1599.3	105.0	21248.2
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
Poultry & eggs	18.0	55.8	139.6	40.0	0.0	253.4
Fruit and veg.	0.0	0.0	0.0	0.0	0.0	0.0
Greenhouse and nurs.	0.0	0.0	0.0	0.0	0.0	0.0
Other	5048.0	14601.7	2245.7	2336.7	98.0	24330.0
Total	11787.0	31834.0	6111.0	5311.0	244.0	55287.0

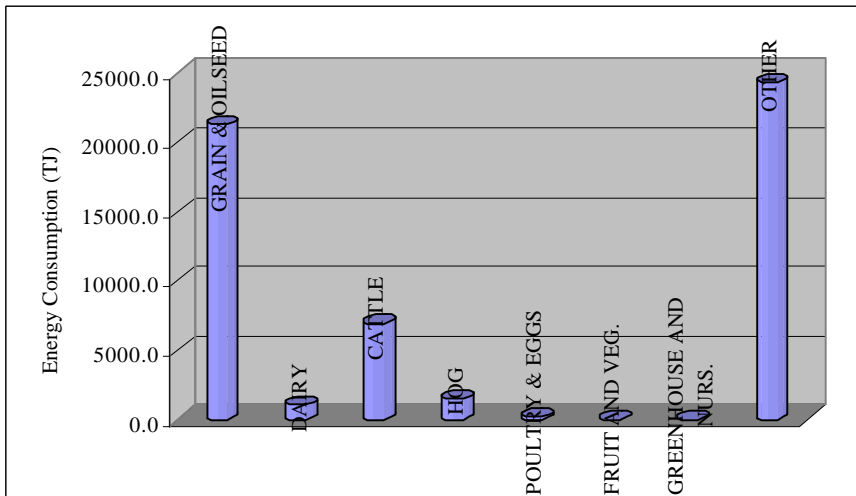


Figure 29. Energy Consumption by Farm Type in Saskatchewan in 1997 (TJ).

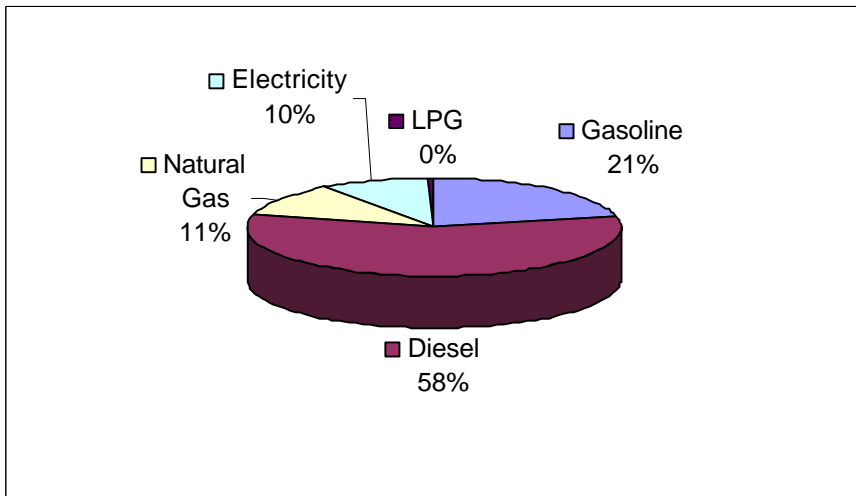


Figure 30. Energy Consumption by Energy Type in Saskatchewan in 1997 (%).

Table 23. Energy Consumption by Energy Type and Usage in Saskatchewan in 1997 (TJ).

Energy consumption	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Saskatchewan (Gasoline)	11787	7052.7	0.0	0.0	1960.1	2626.7
Saskatchewan (Diesel)	31834.0	10186.9	0.0	128.1	28639.2	453.3
Saskatchewan (Natural Gas)	6111.0	0.0	2057.8	0.0	0.0	3904.6
Saskatchewan (Electricity)	5311.0	0.0	2393.3	736.4	0.0	2152.3
Saskatchewan (LPG)	244.0	0.0	39.5	112.3	0.0	79.7
Total Energy Consumption	55287.0	17239.6	4490.7	976.8	30599.4	9216.5

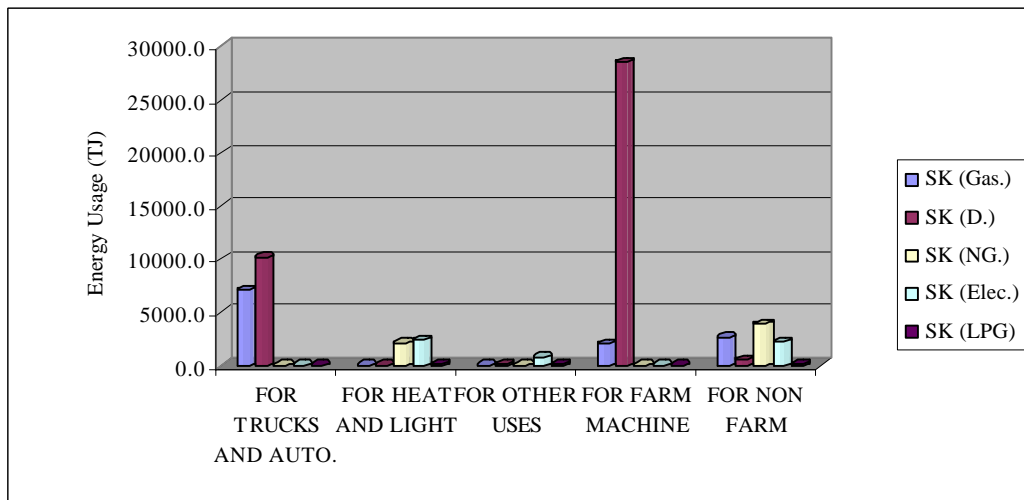


Figure 31. Energy Consumption by Energy Type and Usage in Saskatchewan in 1997 (TJ).

Table 24. Energy Consumption by Farm Type and Usage in Saskatchewan in 1997 (TJ).

Farm type	All usage	For trucks and auto.	For heat and light	For other uses	For farm machine	For non-farm
Grain & oilseed	21248.2	3277.1	1181.2	414.0	12733.3	3483.7
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
Poultry & eggs	253.4	24.4	144.5	3.6	43.0	31.6
Fruit and veg.	0.0	0.0	0.0	0.0	0.0	0.0
Greenhouse and nurs.	0.0	0.0	0.0	0.0	0.0	0.0
Other	24330.0	12379.3	1852.1	336.1	13359.7	3841.0
Total	55287.0	17239.6	4490.7	976.8	30599.4	9216.5

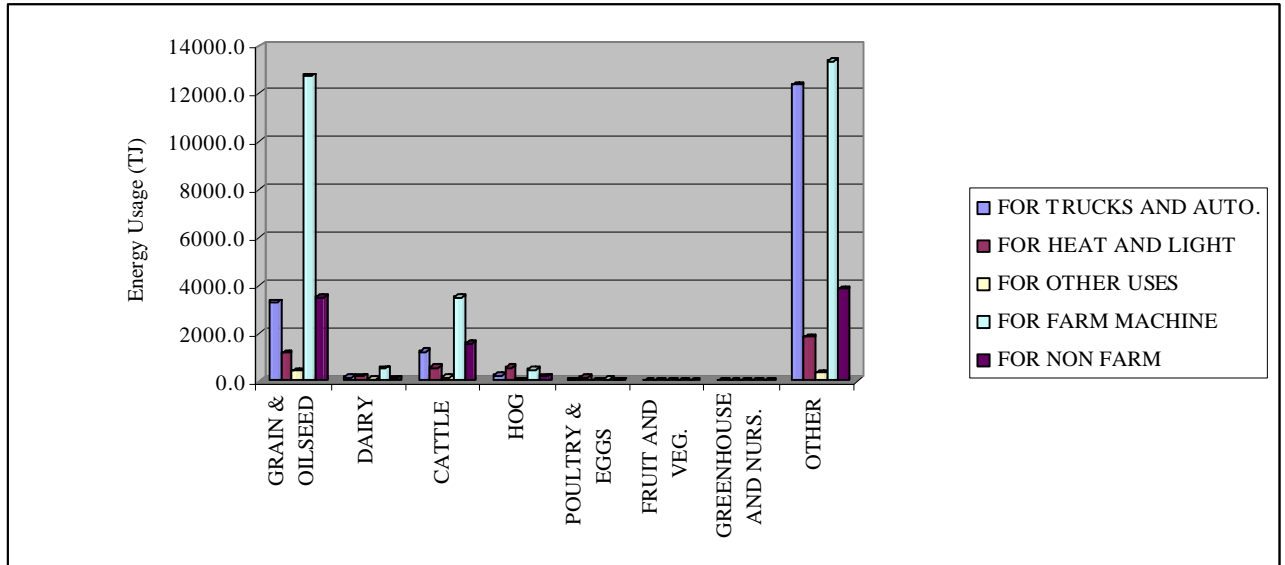


Figure 32. Energy Consumption by Farm Type and Usage in Saskatchewan in 1997 (TJ).