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STATISTICAL REPORT ON THE OCCURRENCE OF NON-FATAL ACCIDENTS AND FIRES ON CANADIAN FARMS, JUNE 1, 1946 - JUNE 1, 1947

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I. INTRODUCTION

In response to a request from the Deputy Minister of Agriculture, the Sampling Unit of the Central Research and Development Division of the Dominion Bureau of Statistics conducted a sample survey, beginning in June 1947, to determine the frequency of non-fatal accidents and fires on farms. This special investigation was carried out in conjunction with the seventh labour force survey of the Dominion Bureau of Statistics, the enumeration of which was carried out during most of the month of June. The survey was designed to cover about two percent of the households in Canada and therefore should have included approximately two percent of the farm households. In fact, only 11,051 farms were interviewed, which appears to be something less than two percent. A more detailed description of the sampling method used in conducting the survey is given in Appendix 1.

The questions relating to farm accidents referred to all persons who either lived or worked on the sample farms in the year between June 1, 1946 and June 1, 1947. A farm, according to the definition used in the labour force surveys of the Dominion Bureau of Statistics, must contain one or more acres and must have raised agricultural produce valued at $50 or more in the preceding calendar year. The questionnaire relating to both accidents and fires is shown in Appendix 2.

In interpreting the statistics in this report, it should be kept in mind that the estimates are subject to sampling error. In general, the smaller the estimate, the larger is the relative sampling error. It should be borne in mind, therefore, that the estimates, particularly for small categories, are subject to this reservation. In the tables, null or very small estimates are replaced by a dash in parentheses (-). In addition, it is to be expected that information of this sort is very liable to errors of reporting. People find it difficult to remember the events of a past year and may tend to give approximate or unreliable answers in some cases.

This report consists of three parts. The first is brief and consists principally of a table of estimates of the farm and non-farm population of Canada classified into two broad age groups. The second part deals with farm accidents and the third part with farm fires.

II. THE FARM POPULATION OF CANADA

Since the first labour force survey of the Dominion Bureau of Statistics, current estimates of the farm and non-farm population of Canada have been available. The breakdown by region and age is shown in Table 1 for the beginning of the year covered by the survey of farm accidents and fires. It is believed that this information is useful in judging the relative frequency with which farm accidents occur.

Table 1. - Estimates of the regional distribution of the farm and non-farm population under 14 and 14 and over, June 1, 1946

	farm		non-farm	
	under 14	14 and over	under 14	14 and over
Maritime Provinces	126,000	281,000	206,000	518,000
Quebec	406,000	573,000	790,000	1,926,000
Ontario	233,000	589,000	754,000	2,400,000
Prairie Provinces	347,000	773,000	320,000	998,000
British Columbia	21,000	62,000	190,000	674,000
Canada	1,133,000	2,278,000	2,260,000	6,516,000

III. FARM ACCIDENTS

In view of certain practical difficulties of enumeration, the survey of farm accidents was confined to non-fatal accidents. It must be remembered that the omission of accidental deaths on farms somewhat understates the evidently hazardous character of farm life.

Although the original intention was to obtain information about all farm accidents which caused individuals to lose time from their regular activities, there appeared to be some under-reporting of trivial accidents, such as cut fingers and minor sprains and bruises. In view of this, accidents involving the loss of less than one day from the regular activity of the injured person have been omitted.

Table 2 shows the regional distribution of farm accidents in the period June 1, 1946 - June 1, 1947, as well as the percentage of accidents occurring in each region and the percentage of the total farm population of Canada living in each region on June 1, 1946:

Table 2. - Estimates of the regional distribution of farm accidents

	number	percentage of farm accidents	percentage of total farm population
Maritime Provinces	3,300	8.9	11.9
Quebec	3,300	8.9	28.7
Ontario	8,900	23.9	24.1
Prairie Provinces	20,800	55.9	32.9
British Columbia	900	2.4	2.4
Canada	37,200	100.0	100.0

A comparison of the percentage distribution of accidents and farm population shows that not only do the greatest number of accidents occur in the Prairie Provinces, but the relative frequency of accidents is also greatest there. Quebec on the other hand is relatively the safest.

It is of some interest also to note the ages of persons injured in farm accidents. From the point of view of agricultural production, the accidental injury of persons of working age is more serious than accidents which happen to either young people or old people. Estimates of the age distribution of injured persons are given in Table 3.

Table 3. - Estimated age distribution of persons injured in farm accidents

age	number	percentage
under 14 years	4,700	12.6
14-19	4,700	12.6
20-24	4,700	12.6
25-44	11,700	31.5
45-64	9,400	25.3
65 and over	2,000	5.4
Total	37,200	100.0

The classification of the causes of farm accidents shown below in Table 4 is taken from the Vital Statistics Handbook containing International List of Causes of Death (Dominion Bureau of Statistics). This classification does not provide for a very exhaustive list of causes, and, in consequence, it has been necessary to include in the "other" category such causes of accidents as: kicked by a horse, tractor backfired, poisonous gas, automobile accidents, etc.

Table 4. - Estimates of the causes of farm accidents

cause of accident	men	women	both
burns	300	400	700
cutting and piercing instruments	4,900	800	5,700
fall	10,900	4,500	15,400
crushing	5,000	400	5,400
other and unspecified	8,900	1,100	10,000
total	30,000	7,200	37,200

A more detailed analysis of the schedules showed that one of the common reasons for falls is the existence of open trapdoors and inadequately protected stairs. In addition, an examination of individual returns indicate that a great many injuries are caused by horses.

It is of some interest to examine the relation between the age of the injured person and the cause of the accident. This is shown below in Table 5 for certain broad age classes.

Table 5. - Estimates of the age of injured persons by cause of accident

	under 14	14-19	20-24	25-44	45-64	65+	total
burns	200	(-)	200	100	100	100	700
cutting and piercing instruments	500	600	1,300	2,100	1,200	(-)	5,700
fall	2,600	2,200	1,000	4,600	3,900	1,100	15,400
crushing	600	400	600	1,800	1,600	400	5,400
other and unspecified	800	1,500	1,600	3,100	2,600	400	10,000
total	4,700	4,700	4,700	11,700	9,400	2,000	37,200

It appears from Table 5 that "falls" are relatively more of a hazard for young people and old people than for persons in intermediate age groups. As might be expected, this table also shows that accidents resulting in injury by cutting or piercing or crushing which would often be associated with agricultural machinery are relatively high for the age group 20-44.

The causes of accidents on farms vary somewhat between regions, although the distribution of causes shows a rather remarkable stability. For example, in all regions the percentage of accidents caused by cutting or piercing instruments or crushing is close to 30 per cent. The regional distribution of accidents by cause is shown below in Table 6.

Table 6. - Estimates of the regional distribution of farm accidents by cause

	Maritime Provinces	Quebec	Ontario	Prairie Provinces	British Columbia	Canada
burns	(-)	(-)	300	400	(-)	700
cutting or piercing instruments	600	400	1,200	3,300	200	5,700
fall	1,300	1,100	4,300	8,100	600	15,400
crushing	300	800	1,200	3,000	100	5,400
other and unspecified	1,100	1,000	1,900	6,000	(-)	10,000
total	3,300	3,300	8,900	20,800	900	37,200

Some further light is thrown on the cause of farm accidents by the classification given in Table 7 showing the place where the accident occurred:

Table 7. - Estimates of farm accidents by place of occurrence and cause of accident

	type of accident					
place of occurrence	burns	cutting or piercing instruments	fall	crushing	other	total
in the house	400	300	2,700	300	200	3,900
in barn or outbuildings	(-)	1,000	2,000	1,400	1,900	6,300
in fields, woodlot, etc.	300	4,000	8,100	3,200	5,900	21,500
off the farm	(-)	400	2,600	500	2,000	5,500
total	700	5,700	15,400	5,400	10,000	37,200

In many cases, accidents which occur off the farm may not be farm accidents in a strict sense. However, such accidents are often closely associated with rural life and have been included for this reason. Common accidents in this class are automobile accidents, falls from horses and bicycles, runaway teams and falls while travelling to and from the farm.

A further indication of the causes of farm accidents can be obtained from a classification of the type of injuries which are most common. The classification of injuries shown below in Table 8 is taken from the International Statistical Classification of Diseases, Injuries and Causes of Death (World Health Organization), although in several cases, classes have been lumped together.

Table 8. - Estimates of the nature of injuries occurring on farms

	men	women	both
fractures	9,700	2,600	12,300
sprains and strains	5,800	1,500	7,300
open wounds of upper limbs	4,300	400	4,700
crushing with intact skin surface	3,000	400	3,400
head injury excluding skull fracture	2,200	300	2,500
open wounds of lower limbs	1,500	500	2,000
other	3,500	1,500	5,000
total	30,000	7,200	37,200

In this table, the category "fractures" includes fractures of the upper and lower limbs, skull, spine and trunk. In view of the small size of a number of individual categories, they have all been included in "other." This combined group includes: internal injuries of chest, abdomen or pelvis; burns; dislocations without fracture; open wounds of face, neck and trunk; open wounds of multiple location; superficial injuries; injuries to nerves and spinal cord; effects of weather and exposure.

As might be expected, the period of the year has a marked bearing on the occurrence of farm accidents. The estimated distribution of accidents by the month of occurrence is shown in Table 9 below:

Table 9. - Estimates of the distribution of farm accidents by months

	number	percentage
January	2,000	5.4
February	3,400	9.1
March	3,200	8.6
April	2,900	7.8
May	5,100	13.7
June	2,700	7.3
July	3,300	8.9
August	2,900	7.8
September	3,200	8.6
October	3,700	9.9
November	2,600	7.0
December	2,200	5.9
total	37,200	100.0

It is obvious that the importance of farm accidents depends on their seriousness measured by the physical incapacity resulting from them, rather than their mere number. The classification of accidents by degree of incapacitation is shown in Table 10.

Table 10. - Estimates of farm accidents by resulting degree of incapacitation

incapacitation	men	women	both
temporary partial	18,800	4,900	23,700
temporary total	9,100	1,900	11,000
permanent partial	1,700	400	2,100
permanent total	400	(-)	400
total	30,000	7,200	37,200

Another factor which must be considered in this connection is the extent to which heads of farm households are incapacitated. The breakdown of accidents by degree of incapacitation for heads of households and other persons is shown below in Table 11.

Table 11. - Estimates of degree of incapacitation resulting from farm accidents occurring to heads of households and others

degree of incapacitation	heads	others	both
temporary partial	10,600	13,100	23,700
temporary total	4,800	6,200	11,000
permanent partial	800	1,300	2,100
permanent total	400	(-)	400
total	16,600	20,600	37,200

Another measure of the seriousness of farm accidents is the loss of time from the regular activity of the injured persons. Such regular activity would include keeping house and going to school as well as actual farm work. Table 12 shows estimates of the amount of time lost by all persons, and Table 13 the amount of time lost by heads of households and others. A supplementary calculation based on Table 13 shows that about 600,000 man-days were lost by heads of households in the period June 1, 1946 to June 1, 1947. Since other injured persons in the household are, in many cases, engaged in farm work, it is clear that farm accidents caused a loss of time from productive agricultural work substantially in excess of 1,000,000 man-days.

Table 12. - Estimates of time lost as a result of farm accidents

number of days	number of persons	percentage
1-2	3,300	8.9
3-4	2,100	5.6
5-6	1,200	3.2
7-8	3,100	8.3
9-14	5,000	13.5
15-21	4,600	12.4
22-35	5,400	14.5
36-70	7,600	20.4
71-140	3,800	10.2
more than 140	1,100	3.0
total	37,200	100.0

Table 13. - Estimates of time lost by heads of households and others

number of days	heads	others	total
1-2	1,600	1,700	3,300
3-4	800	1,300	2,100
5-6	500	700	1,200
7-8	1,300	1,800	3,100
9-14	2,600	2,400	5,000
15-21	2,400	2,200	4,600
22-28	500	1,000	1,500
29-35	1,200	2,700	3,900
36-70	3,100	4,500	7,600
71-140	1,900	1,900	3,800
over 140	700	400	1,100
total	16,600	20,600	37,200

IV. FARM FIRES

It is difficult to obtain adequate representation of farm fires by the methods used in enumerative surveys. If a fire is sufficiently serious to destroy the farm residence and it is not rebuilt, there is no possibility of collecting data about the fire from a sample survey of households. Nevertheless, despite the possible bias of understatement, the results of the survey indicate that farm fires occur with great frequency and cause enormous property damage.

It is estimated on the basis of the survey that there were some 8,000 farm fires in Canada in the period June 1, 1946 to June 1, 1947. The regional distribution of these fires is shown below in Table 14.

Table 14. - Estimated regional distribution of farm fires

	number	percentage
Maritime Provinces	400	5
Quebec	1,600	20
Ontario	2,400	30
Prairie Provinces	3,200	40
British Columbia	400	5
Canada	8,000	100

The commonest types of fires can be seen from the estimates shown below in Table 15.

Table 15. - Estimates of farm fires by type

	number	percentage
house	3,000	37.5
barn or outbuildings	3,600	45.0
machinery and equipment	200	2.5
stubble, bush, grass	1,200	15.0
total	8,000	100.0

The causes of farm fires, shown below in Table 16, seem to indicate that in many cases, adequate preventive methods of greater care would eliminate the hazard.

Table 16. - Estimates of farm fires by cause

cause of fire	number	percentage
defective chimneys and flues	800	10.0
sparks on combustible roofs	600	7.5
lightning	700	8.8
inflammable liquids	900	11.3
heating or cooking equipment	1,900	23.8
electrical wiring	300	3.8
other and unknown	2,800	35.0
total	8,000	100.0

The rather large "other and unknown" category in this table results from the fact that many people tend to ascribe fires caused by spontaneous ignition to "unknown" factors.

Some light is thrown on the causes of different types of farm fires by the classification shown in Table 17 of types of fire by cause.

Table 17. - Estimates of farm fires by type and cause

	house	barn and outbuildings	other	total
defective chimneys and flues	800	(-)	(-)	800
sparks on combustible roofs	400	200	(-)	600
lightning	200	500	(-)	700
inflammable liquids	600	300	(-)	900
heating or cooking equipment	600	1,300	(-)	1,900
electrical wiring	100	(-)	200	300
other and unknown	300	1,300	1,200	2,800
total	3,000	3,600	1,400	8,000

A review of the individual returns indicates that overheated stoves or other heating devices in brooder houses and tobacco kilns are a very common cause of fires in outbuildings.

The frequency of fires on farms shows considerable seasonal variation, the late spring and summer being the season in which fires are most common. As shown below in Table 18, about 46 percent of farm fires occur in the four months from May to August inclusive.

Table 18. - Estimates of the distribution of farm fires by months

	number	percentage
January	400	5.0
February	500	6.2
March	500	6.2
April	700	8.8
May	1,100	13.8
June	600	7.5
July	1,100	13.8
August	900	11.2
September	600	7.5
October	700	8.8
November	500	6.2
December	400	5.0
total	8,000	100.0

The type of property destroyed or damaged in farm fires is shown below in Table 19. Of the total of 4,200 fires occurring in the farm house or outbuildings, about 60 percent were house fires.

Table 19. - Estimates of the type of property destroyed or damaged by farm fires

	number	percentage
house or outbuildings	4,200	52.5
outbuildings and equipment	1,300	16.25
outbuildings, equipment, and livestock	1,200	15.0
other	1,300	16.25
total	8,000	100.0

In the course of the survey, information was collected on the value of the property destroyed in farm fires and the amount and percentage of the losses covered by insurance. These results, which are summarized in Table 20, show not only that the property damage is enormous, but also that a relatively small proportion of the loss is insured.

Table 20. - Estimated value of property destroyed in farm fires and insurance coverage, by cause of fire

cause of fire	value of property destroyed (dollars)	amount of loss covered by insurance (dollars)	percentage of loss covered by insurance
defective chimneys and flues	310,000	91,000	29.4
sparks on combustible roofs	56,000	19,000	33.9
lightning	846,000	388,000	45.9
inflammable liquids	1,734,000	375,000	21.6
heating or cooking equipment	2,524,000	1,882,000	74.6
electrical wiring	640,000	264,000	41.3
other	1,302,000	15,000	1.2
unknown	2,842,000	744,000	26.2
total	10,254,000	3,778,000	36.8

APPENDIX 1 - THE SAMPLING METHOD USED IN THE SURVEY OF FARM FIRES AND ACCIDENTS

The quarterly survey of the labour force is based on personal interviews by field representatives with responsible members of a random sample of households in Canada. It is the aim of the Dominion Bureau of Statistics to utilize modern sampling methods to obtain statistical data on the characteristics of the Canadian population quickly and economically. While major interest lies in the labour force characteristics of the population, it is quite possible to collect other information at the same time. The survey of farm fires and accidents is an example of a supplementary survey carried out in conjunction with a standard labour force survey.

In the survey conducted in June 1947, more than 50,000 sample households were interviewed, including more than 11,000 farm households. The sampling system covers all but a small proportion of the Canadian civilian non-institutional population 14 years of age and over. Persons in the armed services or living in institutions are excluded by design. On grounds of inaccessibility and the high cost of enumeration, persons living on Indian reserves and in certain remote areas are also omitted.

The selection of the areas and households to be sampled was based on a complex and scientific sampling design. Several recent advances in the theory of sampling were incorporated in order to reduce the cost and improve the efficiency of the sample.

As a preliminary step in the designation of the sample, the whole country was divided into primary sampling units. These are sample areas which consist of from one to ten adjoining townships or municipalities selected in such a way that the area included in a primary sampling unit is as heterogeneous as possible. Next, the primary sampling units in each province were classed into groups or strata. The objective of this stratification was to include in one stratum sample areas whose industrial, agricultural or population characteristics were most similar. Then, one primary sampling unit was selected from each stratum in such a way that the probability of selection of any unit was proportionate to its 1941 population. A primary sampling unit thus represents all other areas in the stratum from which it is selected. For example, one primary sampling unit would be chosen to represent the dairy farming areas of Ontario, and another the wheat farming areas of Sask-

atchewan. In addition, each city whose population in 1941 was 30,000 or more, was automatically included in the sample. Counting the cities, there are approximately one hundred primary sampling units.

After a primary sampling unit had been selected from each stratum, the sample area was subdivided into a number of smaller units. In cities, these smaller areas are "blocks" which consist of one or more city blocks. In rural areas, the primary sampling units were divided into "segments". A certain proportion of the blocks and segments were selected by random methods for inclusion in the sample. For most cities, listings of all the households in the selected blocks were available. In rural areas, it was usually necessary to compile special lists of households for sampling purposes. From the lists of households or farms in blocks or segments, a specific proportion were selected for actual enumeration. The proportion of households to be sampled in different areas was adjusted to yield approximately two percent of the households in the area covered by the sample.

Outside of the cities, a refinement known as area substratification was used in the selection of the sample households. Each primary sampling unit was divided into the following three types of area: urban; rural farm;and rural non-farm. The proportion of households selected in each of these areas was adjusted to reflect the corresponding proportion lying in these types of areas in the stratum which the primary sampling unit represents.

The method of sampling used in the labour force survey is sometimes referred to as "area sampling." One essential feature of it is that a specified ratio of the households in a given area is enumerated. This is to be distinguished from sampling methods which establish quotas for areas or classes of persons, a method whose adequacy depends on the availability of accurate and up-to-date information on the number of persons in an area or in a class. Since the area sampling method specifies only some proportion of the households in an area, the sample will reflect any changes in the population of the area or its characteristics. It is to be noted, therefore, that the labour force survey provides an estimate of population characteristics at the time the survey is taken.

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