## 1HFOOSE <br> no. 18 <br> Analytical Studies Branch

Research Paper Series

## A PROFILE OF FARMERS WITH COMPUTERS



This is a condensed version of a paper entitled "Planning for the Agriculture Computer Products Marketplace" presented to the "Agricultural Management Systems: Directions and Visions" Conference May 9-11, 1988, Edmonton.

The helpful contribution of Monica Tomiak is gratefully acknowledged.

The analysis presented in this paper is the responsibility of the author and does not necessarily represent the views or policies of Statistics Canada.

## ABSTRACT

According to the 1986 Census of Agriculture, only a small proportion of all census-farms have a computer that is used "principally in managing your farm business". This paper shows some of the variables that are associated with the use of computers on farms and has suggested the size of the remaining potential market for computers and computer products.

Keywords: farmers, computers

## A Profile of Farmers with Computers

## 1. Introduction

Computers are entering all aspects of business and personal life in our soclety. Farms (and agribusiness firms) are adopting computers for a variety of functions. The purpose of this paper is to profile selected aspects of the potential market for agriculture computer products, both microcomputers and supporting software, at the farm level. Specifically, I will discuss:

1. the number of "farms" and "farmers";
2. who had a computer in 1986?; and
3. the potential market for computer products.

## 2. The Number of "Farms" and "Farmers"

The first question in planning for the agriculture computer products marketplace is the number of "farms" and "farmers" in Canada. In this section, we update a previous analysis of the number of "farms" and "farmers" in Canada (see Bollman, 1983). The number of "farms" and "farmers" appropriate for planning in the agriculture computer products marketplace depends upon the target group for the particular computer product or service being marketed. For example, over 450,000 individuals reported some unincorporated selfemployment income from farming on their income tax forms whereas as few as 125,000 individuals are "viable" in the sense that the net farm income alone is over the low-income cut-off (Table 1). It is interesting to note that the number of census-farms with gross sales over $\$ 15,000$ (constant $\$ 1975$ ) has been increasing over time. The provincial distribution of "farmers" under alternative definitions is presented in Table 2.

The number of unincorporated taxfilers whose major source of gross income is from farming has declined only gradually from 290,000 in the late - 1960's to 275,000 today. (Table 1 and Figure 1). Data tabulated from Statistics Canada's Survey of Consumer Finances show that the number of families with one individual with some farm income or with farming as the principal occupation has been level at about 330,000 over the past 10 years (Pigure 2). The number of families with one individual with net farm income as the major source has been level at about 220,000 over the past 10 years.
"Farms" and "farmers" can be profiled in numerous ways. Ehrensaft and Bollman (1985) profiled "farms" and suggested that "classic family farms" represented about 50 percent of all census-farms in 1981 and had maintained their share of aggregate production between 1971 and 1981 (Table 3). Clemenson and Bollman (1985) profiled "farmers" to show that census-farm operators with a "strict" full-time occupational committment to farming represented 130,000 operators in 1981 ( 41 percent of all operators) and the 1981 number had declined 10 percent from the 1971 number (Table 4).

Table 1. Number of "Farmers" under alternative definitions, Canada, 1901-198:

$1901 \quad 511073$
1911682766
1921711090
1931728623
$1941 \begin{array}{llllll} & 75283: & 472443 & 237077 & 23312 & 260389\end{array}$
$1951363091 \quad 450999 \quad 135558 \quad 36534 \quad 172092$
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
196 19
197
1971 37
1972360
1973355
1974349
1975344
1976338
197733457
$1978 \quad 330578$
1979326578
1980322578
$19813318361 \quad 195225 \quad 78933 \quad 44203123136$

Table 1. (cont') Number of "Farmers" under alternative definitions, Canada, 1901-1981

as percent of number of census-farm operators


Sources: Canada. Statistics Canada. Censuses of Agriculture, 1901-1981.
The Labour Force (Cataloque No. 71-001)
Unpublished taxation statistics
(1) A census-fare operator is the person responsible for the day-to-day operation of a census-farm. The definition of a a census-fare has changed somentat over the years. Since 1961, it represents a holding of one acre or more with gross sales of $\$ 50$ or more in the previous year $(\$ 250$ in 1981). Data are anterpolated betueen census years.
(2) A full-time farmer is a census-farm operator tho reports no days of off-farm work.
(3) A part-time farmer is a census-fam operator tho reports some days of off-farm work.
(4) Part-tiee off-farm work is 1-128 days of work of! the census-farm holding.
(5) Full-time off-farm work is over 228 days of work off the census-farm holding.
(6) Operators of holdings with gross sales over $\$ 15,000(\$ 1975)$ were estieated alter correcting for the change in the prices of far outputs.
(7) The labour force survey estimates the nusber of people tho vere self-2mployed in agriculture during the reference week.
(8) A farm taxiller is an individual tho reports positive gross or non-zero net (unincorporated) self-employment income from farming. The subsequent coluans present subsets of the far taxfiler group.
(9) A "full-time farmer" 15 a farm taxfiler with net farm income being the major source of income.
(10) A "viable farmer" is a fare taxfiler with net far income greater than the Statistics Canada low-income cutoff (ad justed for fanily size).
(11) Fare taxfilers vith "lou income" are taxfilers with total net income (excluding capital gain) being less than the Statistics Canada lor-income cutof! (adjusted for fanily size).

Table 2. Munber of "Farmers" in 1981 under alternative delinations, Camod and Provances, 1981

| Prov | Censusfare operator (1) | Part-tine Tarmer (3) |  |  |  | Operator holdinas vith gross sales over <br> $\$ 15,000$. $11975(0)$ |  |  |  | "Fiable farmer" (9) | $\begin{gathered} \text { Farw } \\ \text { taxfiler } \\ \text { vith } \\ \text { low } \\ \text { income } \\ \text { i10) } \end{gathered}$ | $\begin{array}{r} \text { FulI } \\ \text { tiee } \\ 181 \\ \text { AND } \\ \text { viable } \\ 19)^{\prime} \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Fulltde censusfarm operator 12) | Partble of1larm woris(4) | Fulltame of $4-$ Iarm work(5) | Total |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| NLO | $\begin{array}{r} 651 \\ 3145 \\ 5029 \\ 6054 \end{array}$ | 373 | $\begin{aligned} & 182 \\ & 842 \end{aligned}$ | 96 | 278 | 149 | 638 | 236 | 240 |  | 2501495 | -55 |
|  |  | 2is |  | 5300 | 114 | 1575 |  | -546 |  |  |  |  |
| ME! |  | 262 | 1427 | 980 | 2407 | 1319 | 5849 | 2594 | 1035 | 790 | 1945 | 630 |
| N8 |  | . 234 | 1108 | 592 | 1800 | 1300 | 5035 | 2146 | $!775$ | 550 | 1760 | 590 |
| OLE | -8100 | 3.658 | 10986 | -450 | 15442 | 23059 | 47388 | 3.646 | 35545 | 10895 | !6955 | 13300 |
| Ont | 82389 | 45902 | 19955 | 16442 | 36397 | 38443 | 118985 | 70800 | - 9905 | - 4575 | 34905 | 21845 |
| MAN | $\bigcirc .9405$ | 19014 | 7324 | \$070 | 10391 | : 7024 | 45929 | 320\% | - 4.70 | :179 | 154, 5 | $1: 50$ |
| SASK | 07784 | 40188 | 15178 | 5718 | 20890 | . 5005 | 95119 | 59392 | 57275 | 450 | 10 nus | 20610 |
| ALTA | $57935$ | 33858 | 16059 | 8016 | - 2775 | 37605 | 94708 | 53177 | 41165 | 57670 | -39:9 | -3540 |
| RC |  | 979 | 5870 | 4515 | 10245 | :466 | -999:4 | 110) 40 | ? 0 | 35 | 755 | $\therefore 360$ |
| $\because \mathrm{N}$ | 317758 | 194687 | 78886 | - 48.18 | 1:371 | 16.085 | $4 \rightarrow 1150$ | 27652 | 21130 | :20155 | $\because 2$ | 10: 0 |

as percent of number of census-farn oderators in each province

| Afld | 100 | 57 | 8 | 15 | 43 | 23 | 98 | 36 | 31 | 8 | 36 | 8 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PI | 100 | 04 | 6 | 11 | 36 | 44 | 112 | 31 | 58 | 5 | 48 | 3 |
| NS | 100 | 52 | 28 | 19 | 48 | 25 | 116 | 52 | $\overline{3}$ | 14 | 39 | 43 |
| N8 | 100 | 56 | 27 | 17 | 4 | 3? | 124 | 59 | 4 | 14 | 4 | $!3$ |
| QE | 100 | 68 | 23 | 9 | 32 | 48 | 99 | 88 | 53 | 3 | 35 | - |
| ONT | 100 | 56 | 24 | 20 | 44 | 47 | 144 | 86 | 01 | 30 | \% | ¢ |
| Man | 100 | 65 | \% | 10 | 35 | 58 | 156 | 110 | 83 | 43 | 52 | 38 |
| SASK | 100 | 89 | 23 | 7 | 31 | 67 | 162 | 103 | 35 | 60 | ? | 50 |
| nta | 100 | 58 | 28 | 14 | 42 | 53 | 164 | 92 | 71 | 48 | $\cdots$ | 40 |
| BC | 100 | 69 | 29 | 2 | 51 | $\hat{2}$ | 150 | 5 | 38 | 18 | 36 | 16 |
| CAN | 100 | 01 | 3 | 14 | 39 | 52 | 141 | 87 | 07 | +0 | 39 | 35 |

as percent of nueber of individuals in each group

| N1d | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PEI | 1 | 1 | 1 | 1 | 1 | 1 | , | 1 | 1 | 1 | 1 | 1 |
| 16 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| N8 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| QE | 15 | 17 | 14 | 10 | 13 | 14 | 11 | 12 | 12 | 9 | 16 | 9 |
| Ont | 26 | 24 | 25 | 37 | 30 | 23 | 27 | 26 | 24 | 19 | 28 | 20 |
| NW | 9 | 10 | 9 | 7 | 8 | 10 | 10 | 12 | 11 | 10 | 13 | 10 |
| SASK | 21 | 24 | 19 | 13 | 17 | 27 | 21 | $\chi$ | 27 | 35 | 16 | 35 |
| MTA | 18 | 17 | 20 | 18 | 20 | 19 | 21 | 19 | 19 | 22 | 19 | 21 |
| BC | 6 | 5 | 7 | 10 | 8 | 3 | 7 | 4 | 4 | 3 | $\bigcirc$ | 3 |
| CAN | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Sources: Canada. Statistics Canada. Census of Agriculture, 1981.
Unpuolished taxation statistics
(1) Operators of institutional farms, commity pastures, and larms an the Yukon and Northuest Territories are excluded.
(2) A full-time farmer is a census-fatm operator who reports no days of of 1 -farm work.
(3) A part-time farmer 15 a census-fari operator wo reports some ajys of off-1ara work.
(4) Part-time off-far work 15 1-1/8 aays of work of f the census-fare holoing.
(5) Full-time off-fart work is over ias mays of work off the census-fam holding.
(6) Operators of holdings with gross sales over $\$ 15.000(\$ 1975$ ) were estinated aiter corecting for the change in the prices of tar ourpurs.
(7) A farm taxisier 15 an individual tho redorts positive gross or nun-zero net funincorparated) self-employment income from farming. The subsequent colunns present subsets of the fare taxfsler groud.
(8) A "full-time iarmer" is a farm taxiller with net farm income being the major source of ancome.
(9) A "vaable farmer" is a fare taxibier with net fam income greater than the Statistics canada

Form tancom cutoff (ad gusted for fanily slitel. the Statistics Canada dovincoee mutaf! ac nisted for family s!ee).

Number of "Farmers", Canada, 1946-1985 "farmers": taxfilers with gross farm income as major source
300000
200000


Table 3

MARKET SHARES, CLASSIC AND NON-CLASSIC FARM ENTERPRISES

| Typology | 1971 |  | 1981 |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Number of farms | of wetal | Number of farms | \$ of cotal |
| Clessic |  |  |  |  |
| Full-time family farms | 43.1 | 67.7 | 44.3 | 66.2 |
| Part-time family farms | 5.2 | 6.4 | 6.7 | 7.7 |
| Totalstare |  | 74.1 |  | 73.9 |
| Non-classic |  |  |  |  |
| Semi-manegerial | 1.2 | 7.2 | 2.0 | 8.5 |
| Independent managerial | 0.3 | 5.8 | 0.6 | 6.9 |
| Integrated managerial | 0.1 | 2.3 | 0.3 | 3.4 |
| Tolal share |  | 15.3 |  | 18.8 |

Typology of Census-farm Operators(1), Canada, 1971 and 1981

| TYPOLOGY | 1971 |  | 1981 |  | Percent Change$1971 \text { - }$$1981$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Number of Operators | Percent of Total | Number of Operators | Percent of Total |  |
| 1. Retired(2) | 43,040 | 11.8 | 32,215 | 10.1 | -25.1 |
| 2. Farming occupation(3) | 234,455 | 64.0 | 194,715 | 61.3 | $-16.9$ |
| 2.1 "Strict" full-time farmers(4) <br> 2.2 "Less strict" fulltime farmers(5) <br> 2.3 All other | $\begin{aligned} & 145,145 \\ & 24,320 \\ & 64,995 \end{aligned}$ | $\begin{array}{r} 39.6 \\ 6.6 \\ 17.7 \end{array}$ | $\begin{array}{r} 130,300 \\ 20,140 \\ 44,275 \end{array}$ | $\begin{array}{r} 41.0 \\ 6.3 \\ 13.9 \end{array}$ | $\begin{aligned} & -10.2 \\ & -17.2 \\ & -31.9 \end{aligned}$ |
| 3. Non-farming occupation | 38,915 | 24.3 | 90,995 | 28.6 | +2.2 |
| 3.1 "Strict" non-farm(6) <br> 3.2 "Less strict" non farm(7) <br> 3.3 All other | $\begin{aligned} & 54,930 \\ & 21,660 \\ & 12,300 \end{aligned}$ | $\begin{array}{r} 15.0 \\ 5.9 \\ 3.4 \end{array}$ | $\begin{aligned} & 61,195 \\ & 18,895 \\ & 10,825 \end{aligned}$ | $\begin{array}{r} 19.3 \\ 5.9 \\ 3.4 \end{array}$ | $+11.4$ $\begin{aligned} & -12.8 \\ & -12.0 \end{aligned}$ |
| 4. Total | 366,410 | 100.0 | 317,850 | 100.0 | -13.2 |

Source: Canada. Statistics Canada. Agriculture-Populatıon Linkage, 1971 and 1981.
(1) Operators of institutions and community pastures are excluded.
(2) "Retired" refers to all operators 65 years of age or more. (They generally have an agricultural occupation or no occupation and sales less than the median level of sales).
(3) "Farming occupation" includes all operators under 65 years of age who reported their major occupation to be farmer, farm manager, farm foreman, farm worker, nursery worker, farm machinery or custom operator, other farming occupation or who did not report an occupation.
(4) "Strict full-tıme farmers" are operators reporting 0-96 days of work off-farm, net farm income is the major source of employment income and net farm income is positive.
(5) "Less strict full-time farmers" are operators reporting $0-96$ days of work offfarin, net farm income is the major source of employment income, but net farm income 15 zero or neyative.
(6) "Strict non-farm occupation" includes all operators under 65 years of age who reported a non-farming occupation, who reported 97 or more days work off-farm and net farm incone is not the major source of income.
(7) "Less strict non-farm occupation" is as "strict" (footnote \#6) except the operator reported $0-96$ days of work off-farm.

## 3. The Tends to Use Computers on Farms?

This short review of a few articles is obviously not an exhaustive review of the literature but the observations of the authors are helpful for the subsequent discussion of the potential market for computer products.

Lasley and Bultena (1986) surveyed Iowa farmers in 1984 to ascertain farmer's opinions about innovative technologies. Regarding personal computers, they found,

> About one-half of the respondents (53\%) supported personal computers for farm families but, surprisingly, 26 percent were undecided about their merits and 21 percent indicated they were opposed.
> These findings take on added significance in light of the often assumed widespread acceptability of ... farm computers among farmers. It appears that a significant proportion of farmers hold some reservations about even these "accepted" farm practices (Lasley and Bultena, $1986, ~ p .124)$.

They found younger farmers, higher educated farms, farmers with more acres operated, and farmers with higher gross sales to have a high acceptance of personal computers. The level of net income and amount of acres owned were not correlated with the acceptance of personal computers. However, the differences were not large.

Farmers on large operations were just as likely to oppose these technologies as small farmers (Lasley and Bultena, 1986, p. 124)

Funk and Hudon (1988) surveyed 430 Ontario farmers in 1985 and used psychographic clustering techniques to segment farmers according to characteristics important for firms selling farm inputs. They aggregated farmers into four groups or clusters:

1. leading edge entrepreneurs (10 percent);
2. progressive ( 36 percent);
3. traditionalists (14 percent);
4. marginal majority (40 percent).

The top group were, or soon would be, using computers (Table 5). There was some agreement among the "progressive" group that they would be soon using

TABLE 5: Selected Characteristics of Ontario Farmers by Market Segmentation Cluster Profile

|  | Name of Cluster |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Leading Bdge Entrepreneurs | Progressive | Traditionalists | Marginal <br> Majorlty |
| Percentage of farmers in cluster | 104 | 368 | 148 | 401 |
| 1PE4 |  |  | rics |  |


| fine of aduption | gute early | relatively edily | 1ober | later |
| :---: | :---: | :---: | :---: | :---: |
| Attitude toward short courses | really enjoy taking short | basically enjoy taking short cources | basically enjoy <br> taking short courses | short courses not that important |
| Aarming records | very good | goed | average | poor |
| Cash flow statements | very good | good | average | poor |
| Enjoy keeping records | basically yes | basically yes | basically no | basically no |
| Do detailed cost analysis before making change | almost always | frequently | occasionally | occasionally |
| vow using, or will be using computer soon | agreement | some agreement | disagreement | disagreement |
| Involvement of wife | involved | not very involved | some Involvement | not very involved |
| Age | fairly even distribution | fairly even distribution | fairly even distribution | fairly even distribution |
| Bducation | generally higher education | medium amounts of education | generally lower education | medium anounts of education |
| Gross income | high levels | medium to high | lower | lower |
| Parm type | higher percentage of tixed farss | higher percentage of cash crop farms | higher percentage of livestock fares | higher percentage of livestock farms |

Source: Funk and Hudon (1988), Table 1. (This represents only a few of the 115 itews reported by the author.
computers. The remaining one-half of the sample did not expect to be using computers. This tendency to adopt computers was directly associated with:

1. the quality of farm records;
2. the use of cash flow statements;
3. the frequency of doing a detailed cost analysis before making changes;
4. the educational level of the farmer;
5. the size of the farm's gross farm sales; and
6. whether or not the farmer erjoys keeping recoris.

Buggie (1977) suggested


#### Abstract

That a farmer's intelligence sets a broady defined constraint to the complexity of decision-making that he is able to undertake. ... The level of intelligence... is not significantly changed by education or experience during adult life. ... significance ... is an apparent conflict... that education can enhance allocative ability.


Thus, Buggie is skeptical of the extent to which farm management education and extension can influence "allocative" ability. He suggests that the following two common assumptions are false:

That knowledge of a procedure (such as a farm business management: technique) is the only necessary human input to perlormance in conducting the process (i.e., managing the farm)...

That there is no necessary limit to what can be achieved by education of the individual, provided, of course, that adequate educational. resources are available (Buggie, 1977, p. 54).

Buggie's conclusion is,

As farmers have different levels of intellectual capacity, there is need for a range of models. Indeed, I suggest that there are many farmers whose intellectual capacity and other attributes are such that they are not going to significantly benefit from attempts to teach them decision-making/record-keeping procedures that are different to those they now use (Buggie, 1977, p. 55).

One issue regarding the use of computers on farms is the question whether the computer services will be provided within the farm firm or provided by nonfarm firms. It was coase (1937) who first articulated that activities remain within the firm for which the cost of supervision is less than the transaction cost of negotiating (and sometimes enforcing) a price in the market. There
would seem to be a market for the provision of computerized farm accounting services by non-farm firms. A non-computing example of this phenomenon is the present role of off-farm feed mills in the grinding of feed grain that used to be performed solely on farms.

Della Radcliffe, in a recent GRAINEWS article, described the interpersonal dynamics of a group that met daily for two weeks for the ostensible purpose of learning about micro computers. In fact, the major part of the group's discussion appeared to be how to analyse the farm business. The computer was not the end, it was the means to an end. This reminds me of one way that fostered the adoption of farm accounting books. Farm accounting "clubs" ${ }^{(1)}$ were formed which used farm accounting books as the means to achieve the end of how to analyse the farm business. If Ms. Radcliffe's observations can be generalized, one way to promote on-farm computerized record-keeping is to promote farm business associations that are centered on a computerized analysis of farm business records.
(1)

Examples in Manitoba were the Carman Farm Business Association and the Western Manitoba Farm Business Association.

## 4. The Potential Market for Computer Products

### 4.1 Introduction

In this section, I plan to use the 1986 Census of Agriculture:
(1) to indicate the variables associated with the presence on farms of computers "used principally in managing your farm business"; and at the same time,
(2) to show the number and characteristics of farms that might be expected to adopt computer technology.

The 1986 Census of Agriculture requested the operator to indicate whether she/he had a computer "used principally in managing our farm business". At the Canada level, 7,500 operators, representing 2.6 percent of all census-farm operators reported a computer. The proportion varied somewhat across all provinces, ranging from a low of 1.6 percent in Prince Edward Island to 3.4 percent in British Columbia (Figure 3 ).

### 4.2 Size of Gross Farm Sales

As suggested above, one variable determining the use of computers is the size of farm in terms of size of gross farm sales. The larger the farm, the higher the proportion reporting a computer. At the Canada level in 1986, one percent of census-farms reported gross sales of $\$ 562,550$ or over and 20 percent reported a computer (Table 6 and Figure 4). Alternatively, there are 2,000 farms in Canada with gross sales of $\$ 562,550$ or over which do not yet own computers. The use of computers drops quickly as gross farm sales decline. For farms in the $95^{\text {th }}$ to $98^{\text {th }}$ percentile (gross sales of $\$ 235,384$ to 562,549 ), only 108 reported a computer; 10,000 farms did not report computers at the time of the 1986 Census of Agriculture.


NUMBER AND PERCENT OF CENSUS-FARMS WITH COMPUTERS "USED PRINCIPALLY IN MANAGING YOUR FARM BUSINESS"

BY SIZE CLASS OF GROSS FARM SALES, CANADA ( PROPRIETORSHIP, PARTNERSHIP, \& FAMILY CORPORATIONS ONLY) SOURCE: 1986 CENSUS OF AGRICULTURE 12 APRIL 1988 PAGE 11

AREA: T1000001
SALES LT $\$ 2167$ : PERCENTILES $1-9$ NUMBER OF CENSUS-FARMS. ROW PERCENT
SALES \$2167 TO 5387: PERC 10-19 NUMBER OF CENSUS-FARMS................................................ ROW PERCENT $\qquad$
SALES $\$ 5388$ TO 10560: PERC 20-29 NUMBER OF CENSUS-FARMS. ROW PERCENT
SALES \$10561 TO 18999: PERC 30-39 NUMBER OF CENSUS-FARMS ROW PERCENT. ........................
SALES \$19000 TO 30276: PERC 40-49 NUMBER OF CENSUS-FARMS ROW PERCENT
SALES $\$ 30277$ TO 46999: PERC 50-59 NUMBER OF CENSUS-FARMS. RON PERCENT. $\operatorname{\text {RALES}\$ 47000\text {TO}68640:\text {PERC}60-69}$ SALES \$47000 68640: PERC 60-69 NUMBER OF CENSUS-FARMS ROW PERCENT. $\qquad$
SALES \$68641 TO 99799: PERC 70-79
NUMBER OF CENSUS-FARMS
ROW PERCENT.
SALES \$99800 TO 157081: PERC 80-89
NUMBER OF CENSUS-FARMS

SALES \$157082 TO 235380: PERC 90-94
NUMBER OF CENSUS-FARMS

SALES \$235381 TO 562549: PERC 95-98
NUMBER OF CENSUS-FARMS
ROW PERCENT.
SALES $\$ 562550$ * : PERCENTILE 99 +
NUMBER OF CENSUS-FARMS.............. 490
ROW PERCENT.................................................. 20.1

* all sales classes
NUMBER OF CENSUS-FARMS............................. 7,525
ROW PERCENT


Census-farms with Computers CANADA, 1986


### 4.3 Major Type of Farm Enterprise

To determine if the proportion of operators using computers differs among farms according to the major type of farm enterprise, we have selected farms above the median gross sales ( $\$ 30,277$ or over) and classified them according to the product (or product group) providing 51 percent or more of gross sales. Specialty farms (eg. goats, mushrooms, nursery products, greenhouse, other livestock specialties, poultry) had over twice the average proportion with computers whereas farms specializing in dairy, grain, or cattle had a proportion with computers below the overall average (Table 7 and Figure 5).

### 4.4 Size of Milk Cow Herd

According to newspaper reports, computerized feeding systems for dairy herds is becoming popular. The Census of Agriculture did not request information on whether the feeding system is computerized. However, we can show the potential. At the Canada level, there are 1,000 dairy herds with over 100 milkcows (Table 8); 16 percent reported a computer "used principally in managing your farm business" (Figure 6). An additional 7,000 operators reported milkcow herds of 50 to 99 milkcows; 6 percent reported personal computers. The potential market here appears to about 7,000 operators with herds over 50 milkcows and no personal computer.

### 4.5 Type of Pig_Herd

Computerized feeding systems for pig herds is not as popular, but some companies are apparently trying to design necklaces for pigs that will automatically trigger the feeder. Certainly, there is a market for analyzing business records and production records using personal computers.

To show the potential market, we have adopted the typology reported by Shomsky (1985) and updated the figures to 1986.

| atar fietitil | camada |  |  |
| :---: | :---: | :---: | :---: |
| Dasir |  |  |  |
| Munben or CEMSUS－FARM Optratoms． | 1.030 | 27，760 | 28，745 |
|  | 3.4 | 16．6 | 160.0 |
| catile |  |  |  |
| numbem or census－Fanm operators． | 635 | 21，725 | 22，545 |
| ROM PERCENT． | 2.8 | 97.1 | 100.0 |
| P16 |  |  |  |
| numeen or census－Famm oneparons． | 405 | 5．065 | －1265 |
|  | ＊． | 45.7 | 100 |
| poulity |  |  |  |
| NUMEE OF CEMSUS－FARM ORERATORS． | 225 | t．700 | 3.010 |
| ROM PEMCENT． | 7.5 | 12.7 | 100. |
| SMEE LAME |  |  |  |
| mumber of census－famm operators． | 10 | 18 | 200 |
| now Pincemt． | 5.0 | 10.0 | 100．0 |
| COAT |  |  |  |
| number of cemsus－bamm operbtors． | ， | 55 | 4 |
|  | 12.5 | 17．5 | 100. |
| morse mumbe of cemsus－famm operatons． | \＄0 | 745 | 75 |
| Mumber of cemsus－ramm operators． | ． 6 | 45.7 | 100.0 |
| FUR |  |  |  |
| NUMEER OF CENSUS－FAPM OPERATORS． | 15 | 275 | 250 |
| 品mentint．．．．．．．．．．．．．．．．． | 5.2 | 44.6 | 180.0 |
| Dim LYSk SPEC |  |  |  |
| mumber or Cemsus－fatm oremators． | 55 | 355 | 305 |
| mom peremt．．．．．．．．．．．．．．．．． | －1 1 | 12.2 | 100.0 |
| MMEAT |  |  |  |
| mumser or census－Farm opelarons． | 185 | 27，880 | 28.570 |
| nom Pencent． | 1． | 66． 5 | 100. |
| OILSEEO |  |  |  |
| number or census－farm openatoms． | 270 | 6．630 | 6.76 |
| OOM PERCEMT | －． 0 | \＄5． | 190. |
| CORN FOR GRAIM |  |  |  |
| mumer of cemsus－fatm operatous． | 210 | 3．450 | 4.163 |
| COM PEEENT． | 5． | ＋4． | 104. |
| pea elam |  |  |  |
| Mumet of CEMSUS－FARS OPEATOAS． | 10 | 178 | $1{ }^{1} 5$ |
| nom Percemt． | 5.4 | \＄4．6 | 104. |
| SMALL Emaj |  |  |  |
| moner of cemsus－famm opematoms． | 6st | 83．500 | 84．255 |
| Lom Pencemt ．．． | 5． | 46．${ }^{\text {b }}$ | 166.0 |
| way fooore |  |  |  |
| munet of CEmSUS－fam opthitoes． | 15 | 875 | 85 |
| nom rememt．．．．．．．．．．．．．．．．．． | 1.3 | \％6． 6 | 108.0 |
| Pomage seto |  |  |  |
| mumen or census－lamm opteatons． | 15 | 55. |  |
| ROM PETCEMT． | 4.1 | \％8．${ }^{\text {a }}$ | 164. |
| josacco |  |  |  |
| MUMEER OF CEmSUS－FARM OPEATOMS． | 50 | 1．540 | 1，688 |
| TOM PEEEEMT． | 3.1 | 17.1 | 168. |
| potaro |  |  |  |
| muner of census－Famm openatows． | 65 | 1.265 | 1．310 |
| NOM PECEMT．． | E． | \＄8．0 |  |
| OTM PIELD CROP |  |  |  |
|  | 5 | 0 | $1{ }^{10}$ |
| COM DECEMT． | 5.6 | 180．＊ | 108.0 |
| Fouti |  |  |  |
| muxer of cemsus－fatm optratots． | 118 | 2，0\％ | 2.265 |
| ，DOM Pertemp．．．．．．．．．．．．．．．．．． | 5.6 | ＋4． | 168. |
| vecetable |  |  |  |
| numer or CEMSUS－FAMm OpErators． | 4 | 1，765 | 1，000， |
|  | E． 1 | 0．${ }^{\text {P }}$ |  |
| P晈t E VEETABLE |  |  |  |
| muret of census－iater opleatoms． | E | 145 |  |
| now pement ．．．．．．．．．．．．．．．．．．． | 1.6 | 54.2 | 108. |
| mushmoom |  |  |  |
| muete of CEMSUS－Fitm opleatoms． |  |  | 110 |
| ROM PETCEM1．．．．．．．．．．．．．．．．．．．．．．． | 18.8 | 17．6 | 160．0 |
| CREENHOUSES |  |  |  |
| muen of census－famm oplratons． | 180 | 1，675 | 1.65 |
|  | 10.1 | 59.1 | 100. |
| munseay paopucts |  |  |  |
| mener of cemsus－fanm oplratoms． | ${ }_{18}$－ | 4t． | $\begin{aligned} & 585 \\ & 106 . \end{aligned}$ |
| TOM PEREEMY．．．．．．．．．．．．．．．．．． | 18.4 | 64. |  |
| MAPLE TREE CEMSUS－FAMM DPERATORS． |  |  | 110 |
| MUnEE OF CEMSUS－Then DPENATOES． <br>  | ： | 95．8 | 166. |
| CATTLE＋MOS COH |  |  |  |
| MUEER OF CEMSUS－FARM OPEmATOES． | 38 | 1，670 | 1，785 |
| NOM PEEEMT．．．．．．．．．．．．．．．．．． | t． 1 | 17． | 186. |
| CATTLE MOS SMEEP COHA |  |  |  |
| Munet of CENSUS－FAMM OPERETOSS． | 5 | 78. | 11. |
| nom Percent．．．．．．．．．．．．．．．．． | ． 7 | 180. |  |
| IIVESTOCR COE |  |  | 1．168 |
| MUWED of CEMSUS－Fimm oricios ROW PERCENT | 3．6 | 10．6 | 14．0． |
| Prete chop cow |  |  |  |
| muster of census－fanm optuatome | \％ | 405 | 180 |
| now Peremt．．．．．．．．．．．．．．．．．．．．．．．．． | 3． | 47.1 | 106．＊ |
| all otwen types |  |  |  |
| mueet or cencus－Fanm optmatoss． |  | 1．938．3 | $106.0$ |
| MOW PE颠EMT ．．．．．．．．．．．．．．．．．． | 1.8 |  |  |
| ALL FAmm irfis | 5，520 | 139，848 | 164．768 |
| ROW PERCEMT．．．．．．．．．．．．． | 3. | 96.8 | 106.0 |



Major type of farm enterprise

# NUMBER AND PERCENT OF CENSUS-FARM OPERATORS WITH COMPUTERS "USED PRINCIPALLY IN MANAGING YOUR FARM BUSINESS" BY SIZE OF MILK COW HERD, CANADA, 1986 <br> (PROPRIETORSHIP, PARTNERSHIP, \& FAMILY CORPORATIONS ONLY) SOURCE: 1986 CENSUS OF AGRICULTURE <br> 22 APRIL 1988 PAGE 11 

YES COMPUTER NO COMPUTER
ALL (FAMILY) CENSUS-FARMS

AREA: T1000001
CANADA

| 1 TO 24 MILKCOWS |
| :---: |
| NUMBER OF CENSUS-FARM OPERATORS |
| W PER |
| AGGREGATE |
| OF ALL MI |
| 25 TO 49 MILKCOWS |
| NUPPBER OF CENSUS-FARM OP |
| ROW PERCENT..................... |
| AGGREGATE MILKCOWS.............. |
| PERCENT OF ALL MILKCOWS......... |
| 50 TO 99 MILKCOHS |
| NUM8ER OF CENSUS-FARM OP |
| ROW PERCENT..................... |
| AGGREGATE MILKCOWS.............. |
| PERCENT OF ALL MILKCOWS........ |
| 100 OR MORE MILKCOWS |
| NUMBER OF CENSUS-FARM OPERATORS. ROW PERCENT |
|  |  |
|  |
| PERCENT OF ALL MILKCOWS......... |
| ALL MILKCOW SIZE CLASSES |
| NUMBER OF CENSUS-FARM OPERATORS. |
| ROW PERCENT...................... |
| AGGREGATE MILKCOWS. PERCENT OF ALL MILKCOWS. |
|  |  |



At the Canada level in 1986, there were 23,000 pig heads with over 20 pigs (Table 9). One-half were farrow to finish operations, one-quarter were farrowing enterprises, and one-quarter were finishing enterprises. Only about 3 percent of the operators with pig herds reported personnel computers (Figure 7).

### 1.6 Age of Operator

The study by Lasley and Bultena (1986) suggested younger operators were more inclined to adopt new technologies. However, the analysis by Funk and Hudon (1988) found a similar age distribution among the farmers in each of the four groups.

In 1986, younger operators had a greater tendency to report computers (Table 10 and Figure 8). The age group most likely to have a computer was the group of operators 35 to 39 years of age (4.2 percent).

### 4.7 Other Variables

One question is whether farms with a more complex type of legal organization might own a computer. Considering only farms with gross sales of $\$ 82,000$ or over (the top 25 percent of census-farms), we find family corporations to be twice as likely to own computers (Table 11). However, this result may be due to the fact that family corporations also tend to have the larger gross sales within this category.

Male and female operators with gross sales of $\$ 82,000$ or over are equally likely to own computers (Table 12).

New farmers (i.e. operators who started farming between June 3, 1985 and June 3,19861 were equally likely as continuing farmers to own a computer (Table 13).



# NUMBER AND PERCENT OF CENSUS-FARM OPERATORS HITH COMPUTERS "USED PRINCIPALLY IN MANAGING YOUR FARM BUSINESS" BY AGE OF OPERATOR; CANADA <br> (PROPRIETORSHIP, PARTNERSHIP, FAMILY CORPORATIONS ONLY) SOURCE: 1986 CENSUS OF AGRICULTURE <br> 18 APRIL 1988 PAGE 11 

YES COMPUTER NO COMPUTER ALL (FAMILY) CENSUS-FARMS

AREA: T1000001
CANADA

OPERATOR AGE UNDER 25
NUMBER OF CENSUS-FARM OPERATORS .
ROW PERCENT......................................... 2
OPERATOR AGE $25-29$
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT.......................
OPERATOR AGE $30-34$
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT........................
OPERATOR AGE $35-39$
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT.......................
OPERATOR AGE $40-44$
NUMBER OF CENSUS-FARM OPERATORS. ROW PERCENT
2.1

565
2.9

1,060
3
1,385
4.2

1,315
OPERATOR AGE $45=49$
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT
OPERATOR AGE 50 - 54
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT
2.1

OPERATOR AGE $55-59$
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT
625
OPERATOR AGE $60-64$
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT.........................
OPERATOR AGE 65-69
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT.
OPERATOR AGE 70 AND OVER
NUMBER OF CENSUS=FARM OPERATORS
ROW PERCENT.......................
ALL OPERATOR AGE CLASSES
NUMBER OF CENSUS-FARM OPERATORS.
ROW PERCENT $\qquad$

Census-farms with Computers
CANADA, 1986


## Table 11



## Table 12

> NUMBER AND PERCENT OF CENSUS-FARMS WITH COMPUTERS "USED PRINCIPALLY IN MANAGING YOUR FARM BUSINESS" BY GENDER OF OPERATOR,
> FOR FARMS WITH GROSS SALES OF $\$ 82,000$ OR OYER, CANADA (PROPRIETORSHIP, PARTNERSHIP, FAMILY CORPORATIONS ONLY, SOURCE: 1986 CENSUS OF AGRICULTURE 28 APRIL 1988 PAGE 11

YES COMPUTER NO COMPUTER
ALL (family) CENSUS-FARMS

AREA: T1000001
CANADA

```
FEMALE OPERATOR
    NUMBER OF CENSUS-FARMS.
    RON PERCENT.
    100
    6.5
MALE OPERATOR
    NUMBER OF CENSUS-FARMS.
    ROW PERCENT.............
ALL OPERATORS
    NUMBER OF CENSUS-FARMS. 3,955
    ROW PERCENT............ 5.5
```

| 1,440 | 1,540 |
| :---: | :---: |
| 93.5 | 100.0 |
| 65,925 | 69,780 |
| 94.5 | 100.0 |
| 67,365 | 71,320 |
| 94.5 | 100.0 |

# NUMBER AND PERCENT OF CENSUS-FARMS WITH COMPUTERS "USED PRINCIPALLY IN MANAGING YOUR FARM BUSINESS" By YEAR STARTED FARMING, <br> FOR FARMS HITH GROSS SALES OF $\$ 30,277$ OR OVER, CANADA IPROPRIETORSHIP, PARTNERSHIP, FAMILY CORPORATIONS ONLY, SOURCE: 1986 CENSUS OF AGRICULTURE 4 MAY 1988 PAGE 11 

|  | YES COMPUTER | No COMPUTER | ALL (FAMILY) CENSUS-FARMS |
| :---: | :---: | :---: | :---: |
| AREA: T1000001 | CANADA |  |  |
| STARTED FARMING JUNE 3/85 TO JUNE 3/86 |  |  |  |
| NUMBER OF CENSUS-FARMS............... | 95 | 2,695 | 2,790 |
| ROW PERCENT. | 3.4 | 96.6 | 2, 100.0 |
| STARTED FARMING BEFORE JUNE $3 / 85$ |  |  |  |
| NUMBER OF CENSUS-FARMS | 5,420 | 136,555 | 141,975 |
| ROW PERCENT. | 3.8 | 136.2 | 100.0 |
| NUMBER OF CENSUS-FARMS. | 5,520 | 139,250 |  |
| ROW PERCENT. | 3.8 | 139.250 96.2 | $\begin{aligned} \begin{array}{rl} 44 & 765 \\ 100.0 \end{array} \end{aligned}$ |

Some difference in computer ownership is seen when operators are disaggregated by the language they first spoke and still understand. operators with Dutch as a mother tongue are somewhat more likely to own computers and operators with Ukrainian as a mother tongue are somewhat less likely to own computers (Table 14). However, these results may change if we were to make the comparisons within age groups.

### 4.8 Do Farmers with Computers Have Lower Costs?

The 1986 Census of Agriculture allows one to calculate a net farm cash income by subtracting total cash expenses from gross farm sales. One of the expense items was "wages paid to family members". For the purposes of this analysis, net income is calculated as net farm cash income plus the wages paid to family members.

Considering census-farms with gross sales above the median (sales of $\$ 30,777$ or more), we see that 17 percent ( 24,000 farms) report less than $\$ 5,000$ of net farm cash income (before depreciation and before paying wages to family members) (Table 15). Interestingly, this group has the highest proportion ( 5.5 percent) with computers (Figure 91 . This suggests that either:
(1) farmers with computers have higher costs; or
(2) farmers with computers have more accurate data on what their costs actually are.

A similar conclusion is obtained if we draw average cost curves for operators with computers and for operators without computers. We see that for almost all farm sizes, operators with computers have a higher cost per dollar of sales compared to operators without computers (Table 16 and Figure 10). This finding was consistent for farms regardless of the major type of farm enterprise (not reported here).



Census-farms with Computers (sales \$30,277 +), CANADA, 1986


Net cash farm inc (+ fam wages)

Table 16. Cash Cost per Dollar of Sales, by Size of Gross Fare Sales, by Presence of Computer on the fara(t), Camada, 1986

| Percentile class of gross fars sales |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 1-9 | 10-19 20 | 20-29 3 | 30-39 | 40-49 50 | 50-59 6 | 60-69 | 70-79 | 80-89 | $90-94$ | 95-98 | $99+$ | lotal |
| Itein ${ }^{\text {a }}$ Sixe class of gross fare sales |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | under $\$ 2,167$ | $\begin{gathered} \$ 2,167 \\ \text { to } \\ 5,387 \end{gathered}$ | $\begin{gathered} \$ 5,387 \\ 10 \\ 10,560 \end{gathered}$ | $\begin{gathered} \$ 10,561 \\ 10 \\ 18,999 \end{gathered}$ | $\begin{gathered} \$ 19,000 \\ 10 \\ 30,276 \end{gathered}$ | $\begin{gathered} \$ 30,277 \\ \text { to } \\ 66,999 \end{gathered}$ | $\begin{gathered} \$ 47,000 \\ \text { to } \\ 68,640 \end{gathered}$ | $\begin{gathered} 868,641 \\ 10 \\ 99,799 \end{gathered}$ | $\begin{gathered} 899,800 \\ \text { to } \\ 157,081 \end{gathered}$ | $\begin{gathered} \$ 157,082 \\ \text { to } \\ 235,380 \end{gathered}$ | $\begin{gathered} 235,381 \\ 10 \\ 562,549 \end{gathered}$ | $1562$ ans | Total |


| - nueber of census-fares | 29,150 | 29,160 | 29.140 | 28.845 | 29,420 | 29,020 | 29,250 | 29,125 | 29,085 | 14,465 | 11,370 | 2,410 | 290,480 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - percent of total | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 4 | 1 | 100 |
| - cueulative percent | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 95 | 99 | 100 |  |
| - average cost per $t$ of sales | 7.76 | 2.33 | 1.51 | 1.14 | . 95 | . 84 | . 78 | . 74 | . 74 | . 75 | . 78 | . 82 | 1.76 |
| - std. dev. of cost per sales | 17.67 | 2.85 | 1.37 | . 86 | . 59 | . 13 | . 35 | . 29 | . 25 | . 23 | . 22 | . 23 | 6.06 |
| - cost plus 1 std. dev. | 25.12 | 5.18 | 2.89 | 2.00 | 1.53 | 1.27 | 1.13 | 1.03 | 99 | . 98 | 1.00 | 1.05 | 7.82 |
| - cost tinus 1 std. dev. | -9.91 | -. 58 | .14 | . 27 | . 36 | . 10 | .43 | . 46 | . 48 | . 52 | . 56 | . 59 | -4.30 |
| operators with computer(1) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - nuaber of census-fares | 340 | 355 | 410 | 430 | 480 | 530 | 595 | 775 | 1,140 | 880 | 1,110 | 485 | 7,525 |
| - percent of total | 5 | 5 | 5 | 6 | 6 | 7 | 8 | 10 | 15 | 12 | 15 | 6 | 100 |
| - cumlative percent | 5 | 9 | 15 | 20 | 27 | 34 | 42 | 52 | 67 | 79 | 94 | 100 |  |
| - average cost per of sales | 15.52 | 3.20 | 1.98 | 1.45 | 1.10 | 1.02 | . 89 | . 83 | . 77 | . 79 | . 79 | . 82 | 1.72 |
| - std. dev. of cost per fales | 40.97 | 3.29 | 2.31 | 2.02 | . 69 | . 71 | . 55 | . 48 | . 26 | . 27 | . 22 | . 30 | 9.25 |
| - cost olus 1 sto. dev. | 56.49 | 6.49 | 4.29 | 3.47 | 1.79 | 1.73 | 1.44 | 1.31 | 1.03 | 1.06 | 1.01 | 1.11 | 10.97 |
| - cost dinus 1 std. dev. | $-25.15$ | -. 09 | -. 33 | -. 57 | . 11 | . 31 | .34 | . 36 | . 51 | . 52 | . 57 | . 52 | -7.54 |
| operators mithout a computer |  |  |  |  |  |  |  |  |  |  |  |  |  |
| - nueber of census-fares | 28,810 | 28,800 | 28,730 | 28,415 | 28,945 | 28,490 | 28,655 | 28,360 | 27,950 | 13,585 | 10,260 | 1,950 | 282,960 |
| - percent of total | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 4 | 1 | 100 |
| - cumulative percent | 10 | 20 | 31 | 41 | 51 | 61 | 71 | 81 | 91 | 96 | 99 | 100 |  |
| - average cost per of sales | 7.67 | 2.32 | 1.51 | 1.13 | . 94 | . 83 | . 78 | . 74 | . 73 | . 75 | . 78 | . 82 | 1.76 |
| - std. dev. of cost per sales | 17.18 | 2.84 | 1.36 | . 83 | . 59 | . 42 | . 35 | . 28 | . 25 | . 23 | . 22 | . 21 | 5.95 |
| - cost plus 1 std. dev. | 24.85 | 5.16 | 2.86 | 1.97 | 1.53 | 1.26 | 1.12 | 1.02 | . 98 | . 98 | 1.00 | 1.03 | 7.71 |
| - cost dinus 1 std. dev. | $-9.52$ | -. 52 | . 15 | . 30 | . 36 | . 11 | .13 | .16 | .48 | . 52 | . 56 | . 62 | -4.19 |

Source: Canada. Statistics Canada. Census of mgriculture, 1986.
(1) Presence of a conputer "used principally in anaging your fara business"

Wote : "Costs" are all cash costs except wages paid to fanily meabers

Cost per \$ of Sales
CANADA, 1986, all farms


## 6. Conclusion

According to the 1986 Census of Agriculture, only a small proportion of all census-farm operators have a computer that is used "principally in managing your farm business". This paper has shown some of the variables that are associated with the use of computers on farms and has suggested the size of the remaining potential market for computer products.

## REPERENCES

Bollman, Ray D., Pamela Smith and Monica Tomiak (1988), "Characteristics of Family-Sustaining Farms", Paper prepared for presentation to the World Congress for Rural Sociology, (draft, March).

Buggie, Geoffrey J. (1977), "Allocative Ability and Farm Management: A Comment", Review of Marketing and Agricultural Economics, Vol. 45, No. 1/2 (March), pp. 51-56.

Clemenson, Heather A. and Ray D. Bollman (1985), "A Profile of Managers of Agricultural Resources", Paper presented to the International Conference 'Management of Rural Resources: Problems and Policies', University of Guelph, July 14-20. Published as "Les agriculteurs canadiens des années 1980", Cahiers de recherche sociologigue, Vol. 5, No. 1, (printemps, 1987). pp. 70-102.

Coase, R. (1937), "The Nature of the Firm", Economica, Reprinted in Stigler and Boulding (ed.), Readings in Price Theory.

Ehrensaft, P, and Ray D. Bollman (1985), "The Farm Management Input and Structural Change in Modern Agriculture", Proceedings of the Canadian Agricultural Outlook Conference, December, pp. 156-166.

Funk, Thomas F. and Maryse J. Hudon (1988), "Psychographic Segmentation of the Farm Market", Agribusiness, Vol. 4, No. 2, pp. 119-141.

Lasley, Paul and Gordon Bultena (1986), "Farmers' Opinions about Third-wave Technologies", American Journal of Alternative Agriculture (summer), Vol. 1, No. 3, pp. 122-126.

Shumsky, Mike (1985), The Changing Profile of the Canadian Pig Sector, (Ottawa: Statistics Canada, Agriculture Division, Working Paper No. 9, Catalogue Number 21-521E).

## ANALYTICAL STUDIES BRANCH RESEARCH PAPER SERIES

No.

1. Behavioural Response in the Context of Socio-Economic Microanalytic Simulation, Lars Osberg
2. Unemployment and Training, Garnett Picot
3. Homemaker Pensions and Lifetime Redistribution, Michael Wolfson
4. Modelling the Lifetime Employment Patterns of Canadians, Garnet Picot
5. Job Loss and Labour Market Adjustment in the Canadian Economy, Garnett Picot and Ted Wannell
6. A System of Health Statistics: Toward a New Conceptual Framework for Integrating Health Data, Michael C. Wolfson
7. A Prototype Micro-Macro Link for the Canadian Household Sector, Hans J. Adler and Michael C. Wolfson
8. Notes on Corporate Concentration and Canada's Income Tax, Michael C. Wolfson
9. The Expanding Middle: Some Canadian Evidence on the Deskilling Debate, John Myles
10. The Rise of the Conglomerate Economy, Jorge Niosi
11. Energy Analysis of canadian External Trade: 1971 and 1976, K.E. Hamilton
12. Net and Gross Rates of Land Concentration, Ray D. Bollman and Philip Ehrensaft
13. Cause-Deleted Life Tables for Canada (1972 to 1981): An Approach Towards Analyzing Epidemiologic Transition, Dhruva Nagnur and Michael Nagrodski
14. The Distribution of the Frequency of Occurence of Nucleotide Subsequences, Based on Their Overlap Capability, Jane F. Genleman and Ronald C. Mullin
15. Immigration and the Ethnolinguistic Character of Canada and Quebec, Réjean Lachapelle
16. Integration of Canadian Farm and Off-Farm Markets and the Off-Farm Work of Women, Men and Children, Ray D. Bollman and Pamela Smith
17. Wages and Jobs in the 1980s: Changing Youth Wages and the Declining Middle, J. Myles, G. Picor and T. Wannell
18. A Profile of Farmers with Computers, Ray D. Bollman
19. Mortality Risk Distributions: A Life Table Analysis, Geoff Rowe
20. Industrial Classification in the Canadian Census of Manufactures: Automated Verification Using Product Data, John S. Crysdale
21. Consumption, Income and Retiremenh, A.L. Robb and J.B. Burbridge
22. Job Turnover in Canada's Manufacturing Sector, John R. Baldwin and Paul K. Gorecki
23. Series on The Dynamics of the Competitive Process, John R. Baldwin and Paul K. Gorecki
A. Firm Entry and Exit Within the Canadian Manufacturing Sector.
B. Intra-Industry Mobility in the Canadian Manufacturing Sector.
C. Measuring Entry and Exit in Canadian Manufacturing: Methodology.
D. The Contribution of the Competitive Process to Productivity Growth:

The Role of Firm and Plant Turnover.
E. Mergers and the Competitive Process.
F. (in preparation)
G. Concentration Statistics as Predictors of the Intensity of Competition.
H. The Relationship Between Mobility and Concentration for the Canadian Manufacturing Sector.
24. Mainframe SAS Enhancements in Support of Exploratory Data Analysis, Richard Johnson and Jane F. Gentleman
25. Dimensions of Labour Market Change in Canada: Intersectoral Shifts, Job and Worker Turnover, John R. Baldwin and Paul K. Gorecki
26. The Persistent Gap: Exploring the Earnings Differential Between Recent Male and Female Postsecondary Graduates, Ted Wannell
27. Estimating Agricultural Soil Erosion Losses From Census of Agriculture Crop Coverage Data, Douglas F. Trant
28. Good Jobs/Bad Jobs and the Declining Middle: 1967-1986, Garnett Picot, John Myles, Ted Wannell
29. Longitudinal Career Data for Selected Cohorts of Men and Women in the Public Service, 1978-1987, Garnett Picot and Ted Wannell
30. Earnings and Death - Effects Over a Quarter Century, Michael Wolfson, Geoff Rowe, Jane F. Gentleman adn Monica Tomiak
31. Firm Response to Price Uncertainty: Tripartite Stabilization and the Western Canadian Cattle Industry, Theodore M. Horbulyk
32. Smoothing Procedures for Simulated Longitudinal Microdata, Jane F. Gentleman, Dale Robertson and Monica Tomiak
33. Patterns of Canadian Foreign Direct Investment Abroad, Paul K. Gorecki
34. POHEM - A New Approach to the Estimation of Health Status Adjusted Life Expectancy, Michael C. Wolfson
35. Canadian Jobs and Firm Size: Do Smaller Firms Pay Less?, René Morissette
36. Distinguishing Characteristics of Foreign High Technology Acquisitions in Canada's Manufacturing Sector, John R. Baldwin and Paul K. Gorecki
37. Industry Efficiency and Plant Turnover in the Canadian Manufacturing Sector, John $\boldsymbol{R}$. Baldwin
38. When the Baby Boom Grows Old: Impacts on Canada's Public Sector, Brian B. Murphy and Michael C. Wolfson
39. Trends in the distribution of Employment by Employer Size: Recent Canadian Evidence, Ted Wannell
40. Small Communities in Atlantic Canada: Their Industrial Structure and Labour Market conditions in the Early 1980s, Garnett Picot and John Heath
41. The Distribution of Federal/Provincial Taxes and Transfers in rural Canada, Brian B. Murphy
42. Foreign Multinational Enterprises and Merger Activity in Canada, John Baldwin and Richard Caves
43. Repeat Users of the Unemployment Insurance Program, Miles Corak
44. POHEM .- A Framework for Understanding and Modelling the Health of Human Population, Michael C. Wolfson
45. A Review of Models of Population Health Expectancy: A Micro-Simulation Perspective, Michael C. Wolfson and Kenneth G. Manton
46. Career Earnings and Death: A Longitudinal Analysis of Older Canadian Men, Michael C. Wolfson, Geoff Rowe, Jane Gentleman and Monica Tomiak
47. Longitudinal Patterns in the Duration of Unemployment Insurance Claims in Canada, Miles Conak
48. The Dynamics of Firm Turnover and the Competitive Process, John Baldwin
49. Development of Longitudinal Panel Data from Business Registers: Canadian Experience, John Baldwin, Richard Dupuy and William Penner
50. The Calculation of Health-Adjusted Life Expectancy for a Multi-Atribute Utility Function: A First Attempt, J.-M. Berthelot, R. Roberge and M.C. Wolfson
51. Testing The Robustness of Entry Barriers, J. R. Baldwin, M. Rafiquzzaman
52. Canada's Multinationals: Their Characteristics and Determinants, Paul K. Gorecki
53. The Persistence of unemployment: How Important were Regional Extended Unemployment Insurance Benefits? Miles Corak, Stephen Jones
54. Cyclical Variation in the Duration of Unemployment Spells, Miles Corak
55. Permanemt Layoffs and Displaced Workers: Cyclical Sensitivity, Concentration, and Experience Following the Layoff, Garnett Picot, Wendy Pyper

For further information, contact the Chairperson, Publications Review Committee, Analytical Studies Branch, R.H. Coats Bldg., 24th Floor, Statistics Canada, Tunney's Pasture, Ottawa, Ontario, K1A OT6, (613) 951-8213.

( ? )
1010304965

