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BEEF COW/CALF PRODUCTIVITY

AND

FARM MANAGER CHARACTERISTICS

A Thesis

Submitted to the Graduate Faculty

in Partial Fulfillment of the Requirements

for the Degree of

Master of Science

in the Department of Health Management

Faculty of Veterinary Medicine

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ABSTRACT

A survey was conducted to determine the level of health and productivity on P.E.I. beef cow/calf farms, and to determine the sociodemographic and psychological characteristics of beef herd managers most likely to adopt health management.

Cow/calf health and productivity records were maintained on 30 randomly selected farms from January 1, 1988 to December 31, 1988. Calculation of health and productivity parameters was based on the animals in the herd as of January 1, 1988 and natural increases to that number. Purchased animals were not considered. Herd average adjusted weaning weight was 481 (219 kg) pounds. Pounds of calf weaned per cow ranged from 235 (107 kg) to 523 (238 kg) pounds. Average calving rate (93%), stillbirths (4%) and dystocias (5%) were close to goals commonly targeted by health management programs. Heifer calving rates showed substantial variation between farms. Calving seasons were highly variable. On average, it took a minimum of 132 days for 80% of cows to calve, which greatly exceeds the goal of 60 days recommended by most health management programs. Herd average culls (3%) and deaths (2%) were not excessive. However, a few herds had high death losses, one farm losing 27% of its calves. Disease was measured as the percentage of the herd treated at least once. The large variation in disease treatments between farms was partly due to real differences in disease levels and partly due to differences in the ways that farm managers detected and treated disease. Long calving seasons, and purchases and sales occurring throughout the year led to difficulties in comparing farms.

Incidence density was explored as an alternative method for measuring health and productivity. Farm rankings between the incidence density method and the cumulative incidence method used above were compared. There were substantial differences for 23 of the 30 farms in at least one of the parameters. Most differences occurred due to the ways cows and heifers were defined. Using cumulative incidence, cows and heifers were distinguished strictly on the basis of parity, while age was the sole criterion for differentiating between the two with incidence density. Purchases and sales were responsible for the remaining rank differences. Cumulative incidence is useful when cow/calf farms restrict breeding seasons, wean calves as a group, and overwinter only pregnant cows. Where herd populations are dynamic, incidence density can be used as an alternative. Although this method cannot easily be interpreted at the individual animal level, it may be used as an index to rank farms against each other. For comparison of performance among herds, incidence density is probably the method of choice.

A personal interview survey of 36 beef herd managers was used to develop a model that uses farm manager characteristics to predict the use of health management on beef cow/calf farms. Survey questions were grouped into sociodemographic, psychological, and health management variables. A combination of variable construction and factor analysis was used to reduce sociodemographic and psychological questions to 8 factors. Multiple regression of health management scores on sociodemographic and psychological factors and two-way interaction terms was performed. The farmers most likely to use health management had smaller farms, had at least some purebred cattle, were young and well educated, considered their beefherd important, worked off-farm and participated in continuing education, and liked to work independently. Farmers who raised purebred cattle and worked off-farm were more likely to use health management than commercial producers who worked off-farm. Similarly, independently oriented farmers who worked off-farm were more likely to use health management than group action oriented farmers who worked off-farm. Beef health management programs could be improved by developing a greater awareness of producer motivations, and by targeting specific groups of producers.

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The participating beef producers deserve special mention. Although we found great variation in the way farms were managed in this study, the kindness, cooperation, and hospitality I experienced on all the study farms was remarkably consistent.

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1. INTRODUCTION

In recent years, the role of the food animal veterinarian has been evolving from one of emergency care specialist to that of health and production specialist. Health management and emergency care programs are currently best developed in the dairy industry, followed by the swine and beef feedlot industries (1). An integrated approach, where both productivity and health measures are used, has become the method of choice for the development of farm health management programs (1, 2). By using both types of measures, relationships between disease and productivity can be established. This permits the determination of disease effects on herd profitability. It also allows for a multi-faceted approach to disease control, through management, nutrition, genetics, prophylaxis and intervention.

Improved profitability is a major goal of health management programs. Economic studies substantiating the benefits of dairy health management are available (3, 4). It is reasonable to expect these benefits to accrue to other livestock enterprises as well.

The beef cow/calf industry has generally lagged behind the dairy and swine industries in the development and adoption of health management programs. Most health management programs are geared towards large farms with at least 100 cows (5). Targets of performance are based on restricted breeding seasons and a relatively stable population of cows in the herd. For smaller, casually managed herds to adapt to these health management programs, it would, in most

cases, require a tremendous amount of change and re-organization of farm management. The lack of suitable programs may have reduced the use of health management by smaller cow/calf farms. Another reason for slow adoption may be that cow/calf farmers are not aware of the potential benefits of health management. A survey of 114 Saskatchewan cow/calf farms revealed that almost half were not interested in health management because they did not feel they had any problems (6). In situations where records are not maintained and where suitable targets of performance are unavailable, farmers may be unaware of deficiencies in productivity. Census data and surveys (1, 7, 8, 9) confirm that there is room for improvement in cow/calf productivity. Finally, sociological and psychological factors must be considered in the adoption of health management. It may be that beef cow/calf farmers differ in some respects from other livestock producers. These differences may influence their use of health management.

This study was undertaken in conjunction with the development of the Animal Productivity and Health Information Network (APHIN) (10). There were two major objectives. The first was to obtain baseline health and productivity data on beef cow/calf farms in Prince Edward Island. These data could be used in the future assessment of APHIN's impact on the industry. The second objective was to obtain a better understanding of the cow/calf industry in terms of the people involved and the current use of health management.

The first objective was accomplished through on-farm collection of health and productivity data from 30 randomly selected beef cow/calf farms over a one

year period (Chapter 2). The data were described using risk methods based on traditional targets of performance for beef cow/calf farms.

Due to the extreme variation between farms and dynamic herd populations on many farms, the health and productivity data were also described in terms of incidence density (Chapter 3). The two methods (risk and incidence density) were compared.

The second objective was accomplished through a personal interview survey on 36 randomly selected beef farms (Chapter 4). The survey measured selected demographic and psychological features of farmers, as well as their current use of health management. A predictive model for the use of health management on cow/calf farms in relation to farm manager characteristics was developed.

2. COHORT HEALTH AND PRODUCTIVITY

2.1 Introduction

Beef production on Prince Edward Island is a small but important industry. In 1988, 15% of provincial farm cash receipts were from cattle and calf production (11). Herd size averages about 10 cows; and, for the most part, herds are a casually managed, secondary enterprise (12). This is probably typical of small, casually managed beef farms in other parts of Canada.

Beef cow/calf profitability depends on cow reproduction, weaning weights of calves and feed efficiency (13). Reproductive inefficiency is probably the principal source of loss to beef herds (1, 7, 14, 15, 16). Therefore, a primary objective of most health management programs is the production of one weaned calf per cow per year for the lifetime of a cow in the herd (5, 17). Many factors are involved in achieving this goal (18). For example, pregnancy rate in a restricted breeding season must be above 95%, open cows must be culled and all calves must be raised to weaning. It is generally accepted that the breeding period be restricted for maximum efficiency so that cattle can be managed as a group.

The objective of this chapter is to describe overall beef cow/calf health and productivity on P.E.I. based on data collected over one calendar year. Data are reported at the individual animal level (the "provincial herd") and at the herd level, the herd being the main unit of concern. A comparison of results with a study of beef farms in Ontario (19) is also presented. As with most other beef surveys,

only the cohort of animals present on the farm at the beginning of the study was considered in the analysis.

2.2 Materials and Methods

The population of interest in this study was all beef farms on Prince Edward Island having 25 or more breeding females. A list of 286 farms of all sizes was compiled from the 1987 Beef Weaning Weight Program (P.E.I. Department of Agriculture) and a beef farm inventory conducted by the P.E.I. Joint Beef Breeds Association in 1983 (12). Eighty-six randomly selected producers were contacted to determine eligibility and willingness to participate. Forty-six producers were ineligible (31 had fewer than 25 breeding females, 11 had sold their beef herds, and 4 could not be contacted). Of the forty eligible farms, 31 agreed to participate. One farm was later removed when the records were lost and the information could not be recovered (final participation rate of 75%). The major reason for refusal to participate was lack of interest in keeping records. Incentives for participation included the provision of numbered eartags, payment of veterinary fees for pregnancy diagnosis, and information feedback to the farmer, including a confidential assessment of individual farm performance in comparison with others in the study.

Data were collected from individual animals on all farms for the period January 1, 1988 to December 31, 1988. Large, numbered plastic eartags were provided to farmers to individually identify animals. On eight farms, where tag loss

was a problem, animals were also tagged with metal eartags. On three farms, other forms of identification, such as cow names or descriptions, were kept in addition to the numbered eartags as an aid to farmers, who used these as the major method of differentiating individuals. Eartag numbers were used in maintaining the records. Since several pieces of information on an animal (such as name, metal tag number, breed, age and sex) were kept, records could be matched quickly and reliably.

The following forms (see Appendix A) were used for data collection:

1) Inventory Form;

2) Calving Record;

3) Herd Events and Health Record;

4) Changes to Inventory;

5) Weaning Weight Form; and

6) Pregnancy Diagnosis and Herd Procedures Form.

Inventory forms were completed once by all farms on January 1, 1988. Information included a complete list of all cattle in the herd along with eartag numbers, sex, age, breed or description, and, in the case of females, the number of times the animal had calved.

Pocket-sized record booklets were designed and given to farmers to record daily events. The booklets contained the calving record, the herd events and health record, and the changes to inventory records. Farmers were asked to record an age/sex code as follows:

C - Cow (calved at least once prior to January 1, 1988)

H - Heifer (eligible for calving for the first time in 1988)

RH - Replacement Heifer (bred for the first time in 1988)

B - Breeding bull

V - Calf

The calving record contained data on date of calving, cow or heifer number, body condition score, calf number, calving assistance, status of calf (live or dead), sex and sire of calf. Calving assistance was coded as unassisted, easy pull (manual), hard pull (complicated or very difficult to pull), or surgical. Farmers were provided with information containing text and photographs to assist with body condition scoring their cattle (20). A five-point scoring system was used, with score one being very thin and score five being very fat.

On the herd events and health record, farmers were asked to record date, animal number, age/sex code for herd events and for health events. Herd events included vaccinations, other prophylactic measures, castrations and dehornings. Health events included all cases of treated disease. Farmers recorded if a veterinarian examined the animal, the disease suspected, treatment used, and the number of days treated.

On the changes to inventory form, all purchases and removals from the herd were recorded. For all animals, the date and age/sex code were recorded. Herd, breed, age, and source were noted for animals entering the herd. For cattle

leaving the herd, farmers recorded if the animal was sold, culled, died or other reason for leaving. Under "Comments", farmers were asked to enter a reason for purchase or sale, reason culled or cause of death.

Calf weaning weights were recorded on the weaning weight form. These forms were automatically generated from the survey database and consisted of a list of all calves in the inventory that were born into each herd in 1988, their birthdates and sex, along with dam identification, breed and age, and sire identification and breed. Calf weights were measured by provincial Department of Agriculture extension personnel. Weights were recorded for those calves that were born into the herds during the year and at least 140 days of age at the time of weighing. Adjusted weaning weights were calculated by the provincial Department of Agriculture using the national Record of Performance computer program (21). When calculating pounds of calf weaned per cow, the number of calves weaned multiplied by the herd average adjusted weaning weight was used.

Pregnancy diagnosis information was recorded on the pregnancy diagnosis and herd procedures form. This form was generated from the survey database and contained a complete list of cows and heifers in inventory along with their age and breed, as well as a complete list of calves in inventory along with their age, breed and sex. Pregnancy diagnosis was made by the producer's veterinarian, and recorded by the producer along with other procedures that were carried out at the same time. Herds were checked at various times over the study period.

Some farms checked their herds for pregnancy twice over the study period. Eight farms did not examine any of their cattle for pregnancy.

Farms were visited from four to eight or more times over the year. Contact was also maintained with producers through periodic mailings and by telephone. Some farmers experienced difficulty in keeping records and frequent visits and calls were required to ensure the data were maintained. Whenever possible, herds were visited during herd procedures (e.g. pregnancy checking, calf weighing) in order to verify the inventory. A portable photocopier was used to copy records.

Data were entered into a microcomputer using database management software (10, 22). The database was divided into a demographic file and an event file. Both files were checked extensively for errors using dBASE (22) programs. File structure and coding are outlined in Appendix B.

Table I defines stratifications based on age and sex that were used in describing the data. Only the cohort of animals present on the farm on January 1, 1988, and the calves born to this group were considered in the analysis. Purchased animals and calves born to purchased cows were not included. Table II defines the parameters that were measured. Minitab (23) was used to generate descriptive statistics. Data are presented at the individual cow level (cluster sample) in Table III of the results. All other calculations were performed using herd averages. For example, in Table III the "Calved Rate" for cows was calculated using the total number of calvings for all cows in the study (855), dividing by the total number of cows (924) and multiplying by 100 for a result of

Table I. Definition of Age and Sex Groups Used for the Description of Health and Productivity on 30 Cow/Calf Farms

Herd	all animals in herd as of January 1, 1988, and calves born to those animals
Calves	all animals not coded as cows, heifers or bulls as of January 1, 1988, and the 1988 calf crop
Cows	breeding females that had calved at least once prior to January 1, 1988
Heifers	breeding females expected to calve for first time in 1988
Cows and Heifers	animals coded as cows and heifers in the herd as of January 1, 1988
Bulls	breeding males
1988 Calves	calves born to the cows and heifers present January 1, 1988. These are further subdivided into age groups.

Table II. Calculations of Productivity and Health Measures

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1) PRODUCTION MEASURES

AVERAGE ADJUSTED WEANING WEIGHT = (200 day adjusted weaning weight)/(number of eligible calves weighed)
- *eligible calf means a calf* that was born in 1988 and was at least 140 days at weighing

POUNDS OF CALF WEANED/COW = (sum of 200 day adjusted weaning weights for weighed calves + sum of estimated 200 day adjusted weaning weights)/(number of females on farm Jan.1)

2) REPRODUCTIVE MEASURES

CALVING RATE = (number of heifers or cows in group calving)/(number of heifers or cows in group)

CALVING INTERVENTIONS = (number of easy pulls, hard pulls and caesarians)/(number of calvings)

DYSTOCIAS = (number of hard pulls and caesarians)/(number of calvings)

STILLBIRTH RATE = (number of calves born dead)/(number of calvings)

PREGNANCY RATE = (number pregnant)/(number checked for pregnancy)

MINIMUM DAYS FOR 80% TO CALVE = (minimum number of days from Jan.1/88 to Dec.31/88 in which 80% of the calvings occurred)

MAXIMUM % CALVING IN 60 DAYS = (maximum percentage of calvings that occurred in any 60 day period from Jan.1/88 to Dec.31/88)

3) LOSSES TO HERD

SALES (HERD) = (number sold voluntarily in herd)/(number in herd on Jan.1 + number of liveborn calves)

SALES (COWS AND HEIFERS) = (number of cows and heifers sold for breeding or show)/(number of cows and heifers in herd on Jan. 1)

SALES (CALVES) = (number of calves sold voluntarily)/(number of calves in herd on Jan.1 + number of liveborn calves)

CULLS (HERD) = (number of forced sales in herd)/(number in herd on Jan.1 + number of liveborn calves)

CULLS (COWS AND HEIFERS) = (number of cows and heifers culled)/(number of cows and heifers in herd on Jan.1)

CULLS (CALVES) = (number of calves culled)/(number of calves in herd on Jan.1 + number of liveborn calves)

DEATHS (HERD) = (number of deaths in herd)/(number in herd on Jan.1 + number of liveborn calves)

DEATHS (COWS AND HEIFERS) = (number of cow and heifer deaths)/(number of cows and heifers in herd on Jan.1)

DEATHS (CALVES) = (number of calf deaths)/(number of calves in herd on Jan.1 + number of liveborn calves)

DEATHS (UNWEANED CALVES) = (number of calves dying under 6 months of age)/(number of liveborn calves)

DEATHS (1DAY-7DAYS) = (number of calves dying under 8 days of age)/(number of liveborn calves)

DEATHS (7DAYS-1MONTH) = (number of calves dying between 7 days and 29 days)/(number of liveborn calves - number dying under 8 days)

DEATHS (1MONTH-WEANING) = (number of calves dying between 28 days and 183 days)/(number of liveborn calves - number dying under 29 days of age)

4) DISEASE

VETERINARY TREATMENTS = (number of animals in group treated by veterinarian at least once)/(number of animals in group)

FARMER TREATMENTS = (number of animals in group treated by farmer at least once)/(number of animals in group)

5) PURCHASES*

PURCHASES = (number of animals purchased in group) / population time in group

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* calculated for modified incidence density only - see Chapter 3

Table III. Outcome from Birth to Weaning of Cows and Heifers (January 1, 1988) on a Random Sample of 30 P.E.I. Cow/Calf Farms

Outcome	Number of Cows	Rates (C.I.)	Number of Heifers	Rates (C.I.)
No. of Females Jan. 1/88	924	100.0	162	100.0
Culled	67	7.3 (4.7, 9.8)	5	3.1 (0, 6.9)
Sold for Breeding	35	3.8 (0.0, 7.6)	15	9.3 (3.3, 15.2)
Died	14	1.5 (0.1, 2.9)	1	0.7 (0, 2.7)
Calved	855	92.5 (89.3, 95.7)	137	84.6 (75.0, 94.1)
Liveborn Calves	843	91.2 (87.8, 94.1)	136	83.9 (74.7, 93.2)
Twin Births	10	1.1 (0.3, 1.8)	3	1.8 (0, 4.0)
Stillbirths	22	2.4 (1.1, 3.6)	4	2.5 (0.5, 4.5)
Calf Deaths	42	4.5 (2.5, 6.6)	5	3.1 (0.5, 5.6)

92.5%. This means that 92.5% of all the cows in the study produced a calf. The "Calving Rate" in Table VI, on the other hand, was calculated at the herd level. The percentage of cows calving on each of the 30 study farms was calculated. These percentages were summed and divided by 30. In this case, the result (93%) represents the mean calving rate of the study farms.

2.3 Results

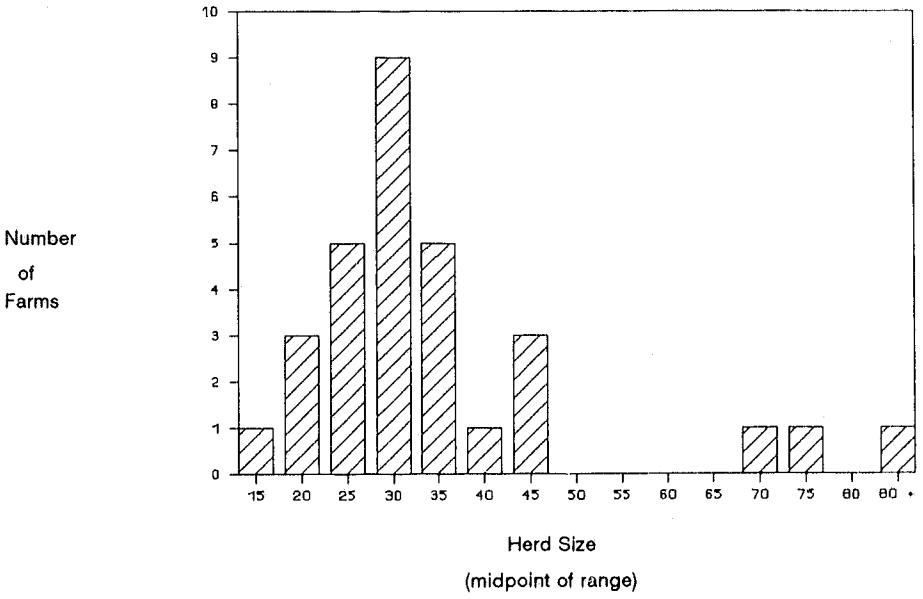
Data are presented for the cohort of animals on farm on January 1, 1988 for the thirty participating farms. Overall results for the cohort are listed in Table III. In all, records were kept on 1086 bred females. The rates presented are for cows and heifers in the inventory on January 1, 1988, as opposed to females exposed to the bull the previous breeding season. The assumption was made that most open cows would not be overwintered. Therefore, the reported rates do not consider losses due to failure to become pregnant.

Herd size (Table IV) is defined as the number of cows and bred heifers on the farm on January 1, 1988. Four farms had between 20 and 25 breeding females and one farm had only 15. On average, the percentage of heifers in a herd was about 16%. The distribution of herd size was skewed right (Figure 1). The 25th, 50th, and 75th percentiles were 25, 30, and 37 respectively. Only 3 farms had more than 50 breeding females. The total population of cow/calf farms on Prince Edward Island with twenty or more cows is estimated to be no more than 125 (12). Variance estimates for herd level parameters were, therefore,

Table IV. Average Herd Size (Number of Cows and Heifers) of a Random Sample of 30 P.E.I. Beef Cow/Calf Farms

Parameter /Group	Mean	S.D.	Median	Min	Max
Herd Size	36	18	30	15	122
Cows	31	17	25	14	109
Heifers	5	3	5	0	13
% Heifers	16	9	14	0	35

FIGURE 1. Herd Size Distribution (Number of Cows and Heifers) of 30 P.E.I. Beef Cow/Calf Farms



adjusted using the finite population correction factor.

Herd average adjusted weaning weights for twenty-nine farms are presented in Table V. One farm did not weigh any calves. A total of 719 calves were weighed, 112 were too young at the time of weighing, and 80 eligible calves were not weighed (a total of 192 calves not weighed). This represents all of the calves born into the study herds in 1988 with the exception of 68 that had died or been sold prior to the weigh date. Herd average adjusted weaning weight was calculated on actual weights for calves over 139 days of age at the time of weighing. Weights ranged from 353 pounds to 625 pounds, a spread of over 270 pounds (Figure 2). Weights were estimated for the 192 calves that were not weighed using the herd average adjusted weaning weight. The total number of estimated weights (total missing and too young) expressed as a percentage of calves on the farm at weaning ranged from 0 to 62%. The median number of weights estimated per farm was 4, which represented 13% of the calves on farm. In the calculation of pounds of calf weaned per cow, failure to become pregnant during the 1987 breeding season was not considered. As with the adjusted weaning weights, there was a wide range of weights among farms, with a difference of almost 300 pounds of calf weaned per cow between the lowest and highest farms (Figure 3).

Herd reproductive performance (Table VI) was measured by calving percentage, pregnancy rates, dystocia rates, stillborn rates, and calving distributions. The calving percentage was substantially lower for heifers. Dystocia

Table V. Herd Adjusted Weaning Weights (in Pounds) on 29 P.E.I. Beef Cow/Calf Farms

Parameter	Mean	S.D.	Median	Min	Max
Weaning Weights:					
Average Adjusted (lbs)	481	52	481	353	625
% Missing	10	13	5	0	62
% Too Young	9	11	4	0	36
Total Missing (%)	20	16	13	0	62
Pounds of Calf Weaned/Cow	411	59	422	235	523

FIGURE 2. Distribution of Herd Average Adjusted Weaning Weights on 29 P.E.I. Beef Cow/Calf Farms

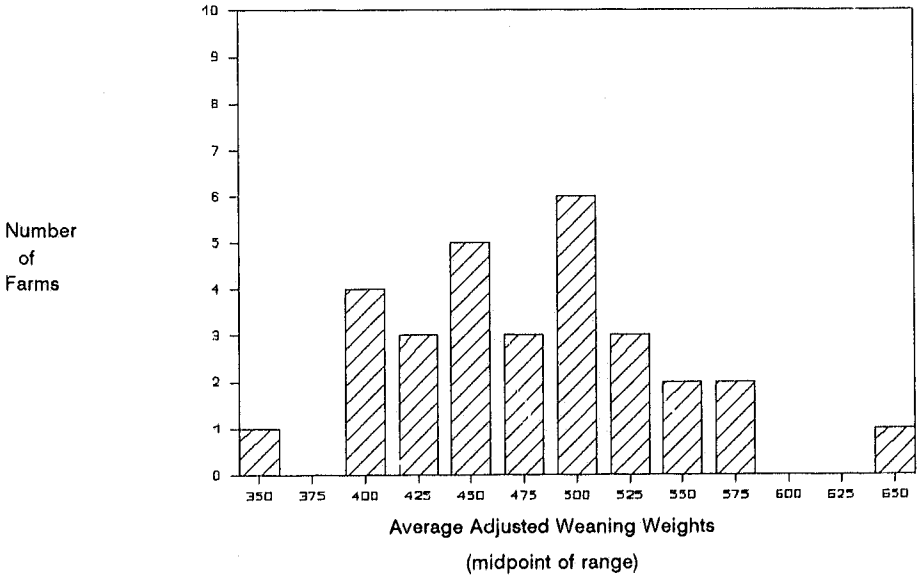


FIGURE 3. Distribution of Pounds of Calf Weaned Per Cow on 29 P.E.I. Beef Cow/Calf Farms (Herd Averages)

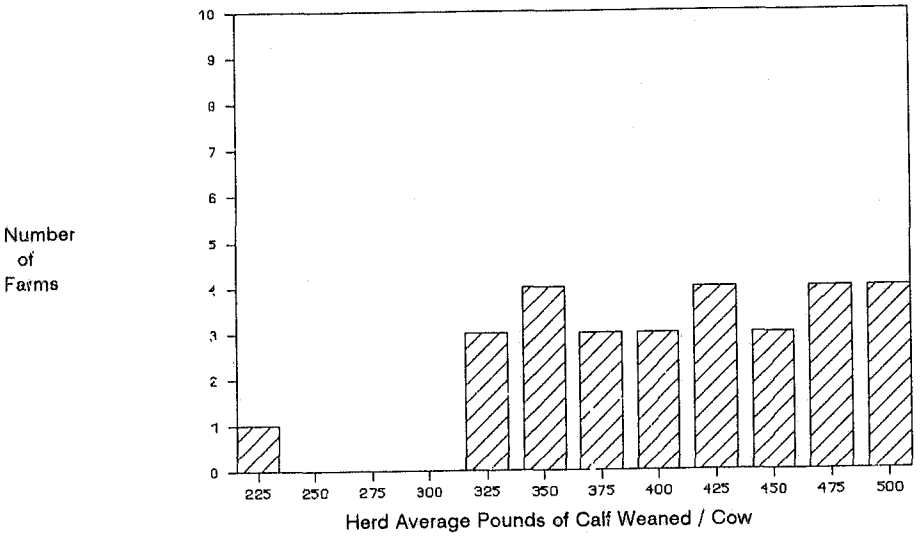


TABLE VI. Herd Average Reproductive Performance on 30 Randomly Selected Beef Cow/Calf Farms on P.E.I.
(Percent of Group)

Parameter/Group	Mean	S.D.	Median	Min	Max
Calving:					
Cows & Heifers (%)	91	8	93	65	111
Cows (%)	93	8	94	71	114
Heifers (%)	77	30	90	0	112
Calving Interventions (%)	11	8	10	0	43
Dystocias (%)	4	3	5	0	20
Stillbirths (%)	3	3	4	0	14
Pregnancy Rate (%) N=22	87	10	91	57	100
Minimum Days for 80% to Calve	132	70	103	27	283
Maximum % Calving in 60 Days	59	14	61	33	95

rates and stillbirth rates were calculated as proportions of the number of calvings (Figure 4). Pregnancy rate was represented by the percentage of animals pregnant of those that were checked for pregnancy on each farm (Figure 5). Pregnancy data were available for 22 farms. Calving distribution measures were calculated as a proportion of all calvings on a farm. The median time for 80% of calvings to occur exceeded 100 days (Figure 6). On average, about 60% of the calvings could be expected to occur in a 60 day period.

Losses to the herd (Table VII) included sales, culls, and deaths. The distribution of sales of breeding females was skewed right. Most farms sold no cows and heifers (median = 0), and a few sold a large percentage of their herds. Culling of breeding females averaged 7%. Nine farms culled no females and 5 farms culled more than 15% of their herds (Figure 7). A few farms suffered substantial death losses with one herd losing 27% of its calves.

Disease (Table VIII) is measured using first treatments. Multiple disease problems in individuals are not included; if an animal was treated once, it was no longer at risk, and further disease problems in that individual were not considered. The data therefore represent the proportion of animals in a herd that were treated for health problems. As such, this measure consists of a crude estimate of disease rates and an estimate of a farm manager's ability to detect disease.

2.4 Discussion

In this study, data were collected on randomly selected beef cow/calf farms at the individual animal level. Most other beef surveys (7, 17, 24, 25, 26)

FIGURE 4. Herd Average Percent Calving Interventions, Dystocias and Stillbirths on 30 P.E.I. Beef Cow/Calf Farms

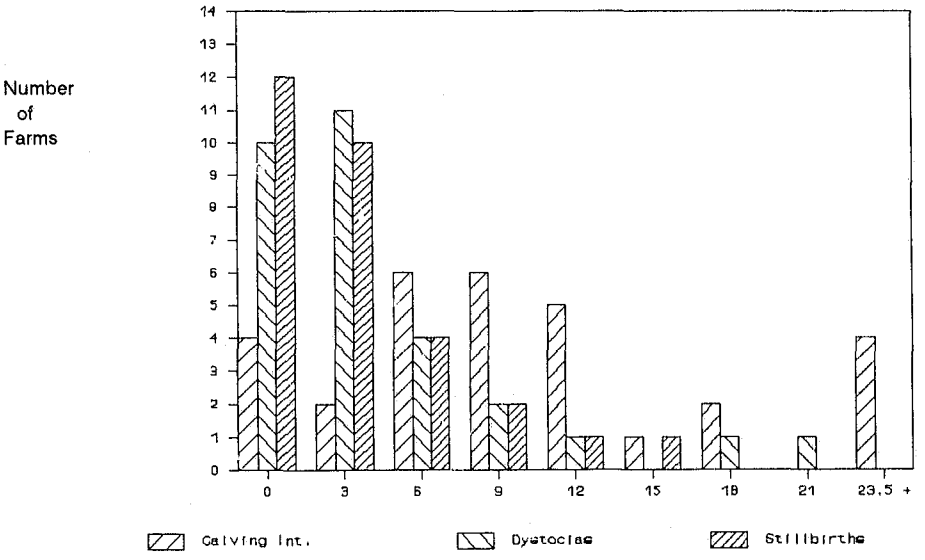


FIGURE 5. Distribution of Herd Average Pregnancy Rates on 22 P.E.I. Beef Cow/Calf Farms (Percent of Cows Checked for Pregnancy)

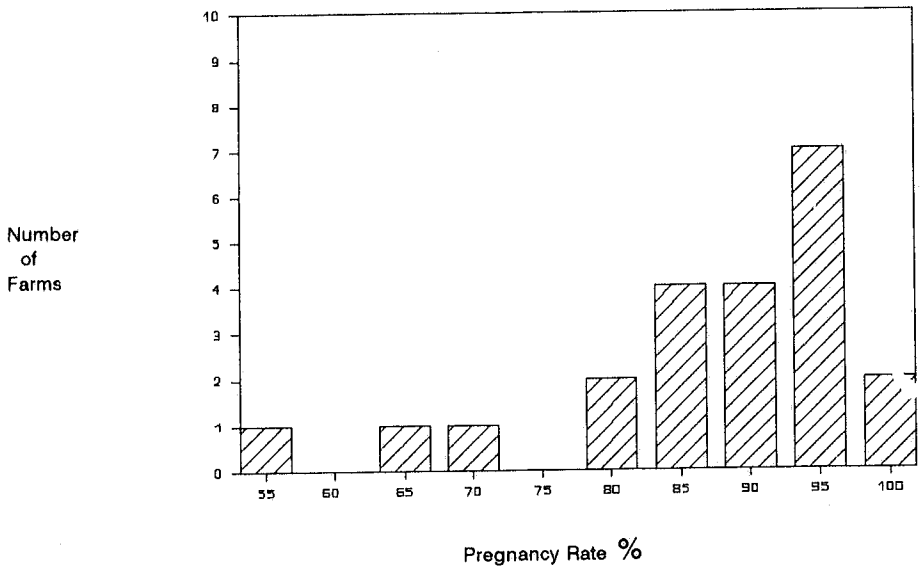


FIGURE 6. Minimum Number of Days for 80% of Calving to Occur on 30 P.E.I. Beef Cow/Calf Farms

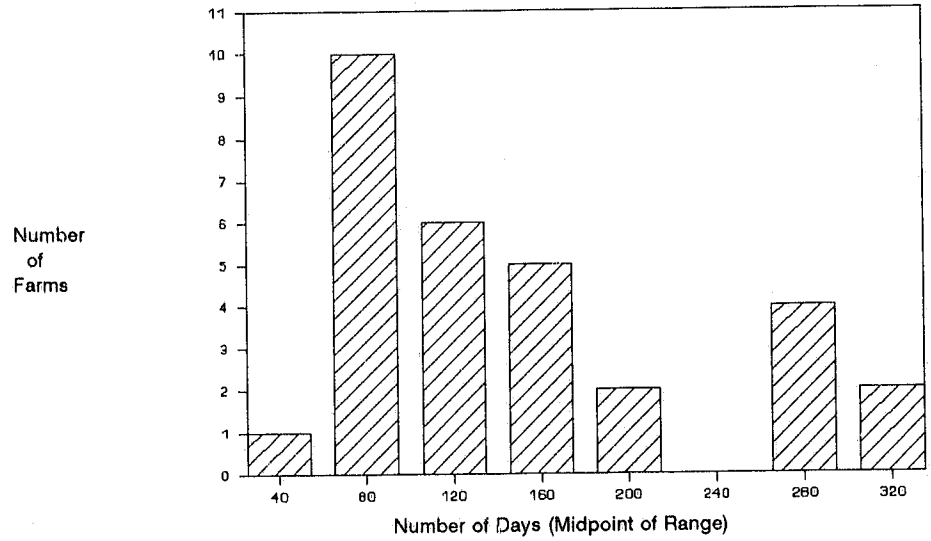


Table VII. Herd Average Losses of a Random Sample of P.E.I. Beef Cow/Calf Farms (Percent of Group)

Parameter/Group	Mean	S.D.	Median	Min	Max
Sales:					
Herd	20	14	17	0	62
Cows & Heifers	6	10	0	0	60
Calves	29	22	21	0	88
Culls:					
Herd	3	3	3	0	10
Cows & Heifers	7	5	5	0	20
Calves	0	1	0	0	5
Deaths:					
Herd	3	3	2	0	15
Cows & Heifers	2	3	0	0	19
Calves	4	5	3	0	27
Unweaned Calves	4	5	3	0	24
1day-7days	2	3	0	0	16
7days-1month	1	3	0	0	10
1month-weaning	1	2	0	0	7

FIGURE 7. Distribution of Herd Average Culling Rate for Cows and Heifers on 30 Randomly Selected P.E.I. Cow/Calf Farms

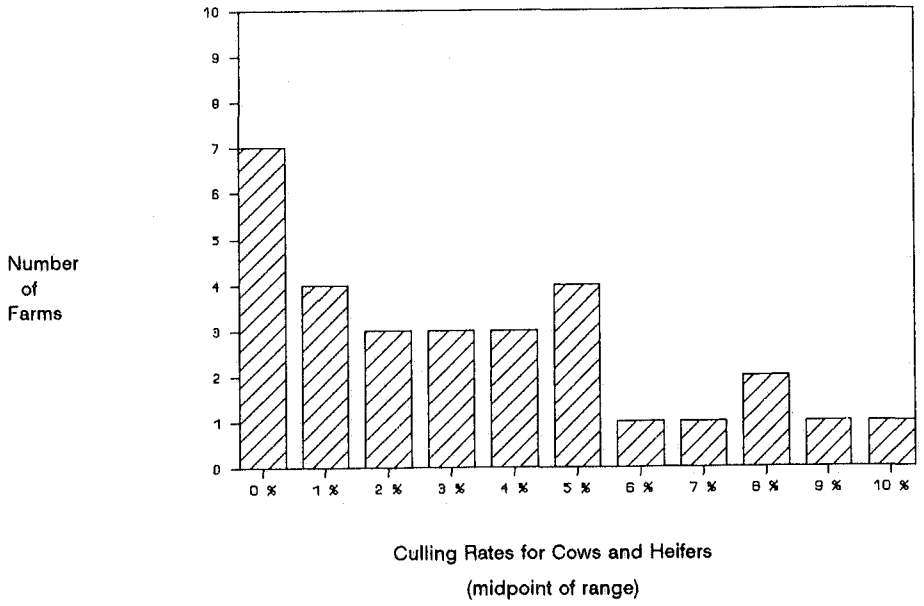


Table VIII. Percentage of Herd Treated for Disease at Least Once on 30 Randomly Selected P.E.I. Cow/Calf Farms

Parameter/Group	Mean	S.D.	Median	Min	Max
Overall Treatments					
Herd	11	9	10	0	37
Cows & Heifers	5	6	4	0	22
Calves	16	16	11	0	56
Unweaned Calves	17	18	12	0	63
1day-7days	10	11	4	0	42
7days-1month	6	8	4	0	38
1month-weaning	1	2	0	0	7
Veterinary Treatments					
Herd	2	2	1	0	12
Cows & Heifers	2	2	0	0	7
Calves	2	4	0	0	25
Unweaned calves	1	2	0	0	9
1day-7days	1	0	1	0	4
7days-1month	0	0	1	0	4
1month-weaning	0	0	1	0	4
Farmer Treatments					
Herd	9	8	7	0	35
Cows & Heifers	3	4	0	0	17
Calves	14	14	9	0	56
Unweaned calves	16	15	8	0	63
1day-7days	9	10	4	0	42
7days-1month	6	7	4	0	38
1month -weaning	1	2	0	0	7

have used either research herds or purposively selected herds. Mail surveys have been attempted on random samples but the response rates were typically low (8, 27). The only major cow/calf survey conducted on a random sample of herds (19) used individual animal data only on farms where it was readily available. Individual animal data can be very difficult to collect on beef farms because of problems with animal identification and with motivation for farmers to keep records. In most cases, herd level data may be adequate to determine baseline statistics for the province. In this study, collection of data at the individual animal level permitted thorough validation. As well, considering the small size of Prince Edward Island beef farms, it seemed that producers might have more interest in individual animal histories than in herd summaries. It seemed appropriate to explore if it was possible or desirable to gather these data at the individual animal level, and if meaningful comparisons between individual farms could be provided to producers.

Most farmers were interested in keeping individual animal records. Some expressed interest in being able to examine each cow's lifetime production and history. A major recurring problem was the lack of adequate identification systems on many farms. Eartag loss, duplication of eartag numbers, and the haphazard use of two or more identification numbers for the same animal provided numerous challenges in maintaining records. For data collection to occur at this level, it is essential that a visible, systematic, and reliable method of animal identification be established on the farm. Also, it is desirable that a secondary form of identification

be recorded so that individuals can be identified when the primary method fails.

Validity of the study was based on the large proportion of farms sampled and close monitoring of farm records. According to a beef census in 1982 (12), there were about 125 farms that had over 20 beef cows. As there have not been major changes in the provincial beef cow numbers since 1982, this study of 30 randomly selected farms comprised about one quarter of farms with more than 20 cows. Approximately 10% of the provincial beef cowherd was included in the study (28).

There was considerable variation in record-keeping among farms. For the most part, events that were clearly and easily defined (such as calvings or deaths) were consistently recorded. The thoroughness of disease recording varied considerably among farms. Farmers were instructed to record all disease that was treated. Farmers varied in their criteria for treatment of illness. On some farms, outbreaks of disease were likely under-recorded. Disease data recorded in this fashion are probably useful to individual farms for comparison from year to year. However, unless treatment criteria are somehow standardized, caution must be used in estimating disease prevalence from these data.

Data were collected for a one year period representing one production cycle. The Benchmark study (9, 19) based its reproductive statistics on the number of females exposed to breeding. In this study, the assumption was made that cows retained on January 1st were exposed to breeding the previous year, and were expected to produce a calf. Open cows that were culled in the fall (prior

to the start of data collection) were not considered in the statistics presented.

Beef cow/calf performance is usually measured based on the assumption that calving takes place in a short period during the year, usually in the spring (5, 17). The calculations are relatively easy to perform - the percentage of animals that calved, that weaned a live calf, the pounds of calf weaned per cow, the number of deaths, culls, and sales. The denominator used for these calculations is usually the number of cows exposed to breeding. In an effort to conform to this model of the typical beef farm, only the cohort of animals on the farm as of January 1st was used for the statistics in this chapter.

In Table IX, outcomes from this study and a survey of Ontario beef farms are presented (9). Although there are differences in the way the outcomes are derived (the Ontario study was based on the cows exposed to breeding, whereas the P.E.I. study is based on cows overwintered), there is some merit in comparing the two groups. The sold-for-breeding and died rates were similar in both studies. The higher culling rates in the Ontario cows was probably due to open cows that were culled before winter. The calving rates for the P.E.I. study do not take into account open cows that were culled, and are, therefore, considerably higher than the Ontario study. If a 5% to 10% culling rate for open cows is assumed, then the P.E.I. calving rates would be very similar to the Ontario study. Stillbirths were calculated differently in the two studies (the P.E.I. study considered calves born dead as stillbirths, the Ontario study defined all calves dying in the first 24 hours stillbirths). However, if the total calf losses (sum of stillbirths and calf deaths) are

Table IX. Comparison of Outcomes of Study Cohort of Females in Inventory as of Jan.1/88 with Cohort of Femals Exposed to Breeding in a 1986-87 Survey of Ontario Beef Cow/Calf Farms

	P.E.I. Study		Ontario Study	
Outcome	Cows %	Heifers %	Cows %	Heifers %
Culled	7.3	3.1	11.4	3.4
Sold	3.8	9.3	3.4	4.2
Died	1.5	0.7	0.5	0.3
Calved	92.5	84.6	81.0	87.7
Liveborn Calves	91.2	83.9	80.2	81.2
Twin Births	1.1	1.8	1.9	0.5
Stillbirths	2.4	2.5	2.8	7.9
Calf Deaths	4.5	3.1	2.6	3.3

compared, the rates are very similar in the two studies for calves born to cows (6.9 for P.E.I. and 5.4 for Ontario), while the calf loss rates seem to be much higher for calves born to heifers in the Ontario study (11.2 as compared to 5.6 in P.E.I.).

In designing this study, it was decided to restrict the sample to farms on which the beef herd contributed significantly to farm income. Farms with 25 or more breeding females were considered eligible. It was necessary to contact farmers by telephone to obtain estimates of herd size. Eligibility for the study was based on these estimates. After individually identifying and accounting for animals on each farm, four farms had slightly fewer cows than the minimum of 25. Over the course of a year, minor fluctuations in herd size can be expected. Therefore, these farms were retained in the study.

Overall productivity is measured by pounds of calf weaned per cow. Because of the long calving seasons and the wide range of calf ages at the time of weaning, adjusted weaning weights were used. The average adjusted weaning weight of 481 pounds is similar to the provincial averages determined from the Weaning Weight Program, which range from about 460 pounds to 540 pounds depending on the breed. The herd average pounds of calf weaned per cow ranged widely from a low of 235 pounds to 523 pounds, indicating that there is room for improvement for a number of producers. There are several factors that contribute to maximizing this measure of productivity (5, 17, 29). There is a tendency for many farmers to over-emphasize weaning weights, and to under-value factors (such as reproductive efficiency and calf mortality) that contribute to

maxmimizing productivity. This is probably due to the emphasis on weaning weights in provincial government programs, and because weights are easy to measure and compare with other farms. If farmers' enthusiasm and desire to excel could be re-directed to measuring pounds of calf weaned per cow exposed to breeding (as opposed to weaning weights alone), more interest would likely be generated in improving reproduction and calf survivability.

The herd median calving rates for cows and heifers shown in Table VI (page 21) are close to commonly targeted values (5, 29). However, there was substantial variation (s.d.= 34%) between herds in the heifer calving rates. This may reflect the lack of attention to heifers on some beef farms. For the most part, heifers were not handled as a separate group with special needs. Stillbirths and dystocias are in line with what might be expected (5, 29). There were, however, four farms with stillbirth rates over 9% which is unacceptably high.

Calving season was described by two parameters, minimum number of days for 80% of cows to calve, and maximum percentage of cows calving in 60 days. Normally, the calving season is calculated as the number of days from the first to last calving. Using this definition, the calving season from beginning to end can be very long due to a few cows that calve very early or very late. However, most farms have a period of time when the majority of calves are born. These two parameters (based on the target of having 80% of the calvings occurring within a 60 day period) provide a more meaningful description of the calving distribution than the usual method of measuring the time from the first to last calving. The

graph presented in Figure 6 provides an indication of what might be feasible if farms on this study were to try to restrict their calving periods. For example, there were 10 farms on which 80% of the calvings occurred within 40 to 80 days. On these farms, calving periods could be restricted to less than 80 days, if that was a goal of the farm.

There was a large range in losses to the herd due to deaths. While the average death losses are within target range, there are some farms that experienced excessive losses (up to 19% of the breeding herd, and up to 27% of the calves). These losses at the top end of the range represented an exceptional year for a few farms. Many of these death losses were due to injury because of inadequate facilities, dystocias resulting in stillbirths and weak calves, and neonatal calf diarrhea. On these farms, some simple management changes could result in significant improvements in death losses.

Disease treatments are calculated for first treatment only. These numbers represent the proportion of the herd treated and not the incidence of disease. Again there was considerable variation among farms in disease treatments. This variation was due in part to real differences in disease levels between farms and in part to differences in the ways that farm manager's detected and treated disease.

In conclusion, the descriptive statistics presented in this section provide an overview of provincial averages for cow/calf herds with over 25 cows and heifers. Although they initially required considerable support, most farmers indicated an

interest in maintaining individual animal records. For the most part, P.E.I. beef farms are small, and have very long calving seasons. As well, purchases and culling occur throughout the year. The cohort method of calculating descriptive statistics is adequate in calculating provincial herd averages. However, unless a farm conforms to the model of a typical beef farm (e.g spring calving, restricted breeding period, fall weaning), this method of measuring productivity may not be as useful for individual farmers in comparing their farm to others. If beef farmers are to be encouraged to keep records, other methods of summarizing farm data may be required.

3. INCIDENCE DENSITY FOR MEASURING HEALTH AND PRODUCTIVITY

3.1 Introduction

There are two basic methods of measuring the frequency of events in a population, risk and rate (30). Risk is the probability that an individual will experience an event of interest during a specified period. In beef cow/calf herds, this time period is generally one year, equivalent to one production cycle. In its simplest form, cumulative incidence, risk is calculated by counting the events of interest over the specified time period and dividing by the population at the beginning of the period. Risk is dimensionless and lies between 0 and 1. The following formula can be used to calculate, for example, the one year risk of calving on a beef farm:

$$CI = I / N$$

where CI is the cumulative incidence, I is the number of events of interest, and N is the number of subjects at the beginning of the period. If there were 100 cows in a herd at the start of the year and there were 90 calvings over the course of the year, then the cumulative incidence would be:

$$CI = 90 / 100 = 0.90$$

Therefore, the calving risk would be 0.90 or 90%.

Rate, on the other hand, has been defined as the potential for change (30) or the average speed at which an event occurs (31) per unit of animal time at risk. Individuals are followed throughout the study period to determine the amount of time at risk. Animals may enter into or leave the study at any time. Average

rates, also known as incidence density (30), are calculated by counting the events of interest over a specified period and dividing by the animal time at risk over that period. For cow/calf herds, it is logical to tally cow events over one year (one production cycle) and divide by the cow years at risk over that same time period. Rates may vary from 0 to infinity and are expressed as events per unit of animal time at risk. The following formula is used to calculate incidence density (ID):

$$ID = I / PT$$

where I is the number of events of interest and PT is the population time accrued over the study period. For example, if a beef farm started the year with 100 cows, sold 20 cows halfway through the year, and recorded 90 calvings over the period of the year, the calving rate would be calculated as follows:

$$ID = 90 / [(80 \text{ cows} * 1 \text{ year}) + (20 \text{ cows} * 0.5 \text{ years})]$$

$$= 1 \text{ calving event / cow-year}$$

Therefore, the calving rate would be 1 calving per cow-year or 100 calvings per 100 cow-years at risk.

Traditional approaches to measuring beef cow/calf health and productivity have used a cumulative incidence approach (5, 29, 32). Typically, events of interest or measures are expressed as proportions of the population at the beginning of the production cycle. Herd productivity might be measured by the percentage of cows producing a live calf, the percentage of cows weaning a live calf, and the pounds of calf weaned per cow in a particular year. For these measures to be accurate, the population must be stable. For example, if a farmer

sold half of his cows prior to their expected calving dates, the calving risk on the farm would be much lower than it would have been had he retained those cows. Cumulative incidence measures are most useful in beef herds that are handled as a unit, in which all calvings, breeding, and weaning take place within certain defined time periods over the year. Where herd populations fluctuate or where calving occurs over an extended period of time, these measures lose their validity.

Based on the survey results reported in Chapter 2, there appears to be great variation in the way cow/calf farms are managed in P.E.I. On the study farms, purchases, sales, and culls occurred at any time of the year. Calving was spread out over the year on most farms, or very loosely divided into two main calving periods. The concept of a one year production cycle was non-existent on many of these farms.

The farmers who participated in this survey were particularly interested in measuring the performance of their beef enterprise in comparison with other farms in the province. Because of the herd population dynamics and the great variation between farms, cumulative incidence measures for farm to farm comparison were not expected to be very meaningful for a large number of producers. It was hypothesized that incidence density might provide a more precise method of ranking farms against each other based on a one year production cycle. This method could potentially provide the farmer with an index of farm productivity and thereby indicate where improvements could be made.

The objective of this chapter is to explore the use of incidence density in

measuring beef cow/calf health and productivity, and to compare this approach with the use of cumulative incidence. Differences in results between the two methods are discussed.

3.2 Materials and Methods

The sample of farms and the record-keeping system were the same as those used in Chapter 2. The demographic and event databases were as described in Chapter 2. Parameters were calculated at the herd level over one calendar year. All demographic and event records were considered in the analysis, including those of purchased animals. Animals were grouped on the basis of age and sex (see Table X). Age, not parity, was used in differentiating cows and heifers.

The parameters examined were the same as those listed in Table II (see Chapter 2), using population time as the denominator. Population time was calculated by counting the number of days each individual was present on each farm. The days at risk were summed for each age/sex category on each farm and with the exception of unweaned calves, divided by 366 to convert to years at risk. In general, results were reported as events per 100 animal years. For unweaned calves, events per 100 calf weeks were used.

Under this system, an animal could change categories as its age changed over the one year period. For example, if a calf was born on March 1st and remained on the farm until December 31st, it would have contributed 7 days as a

Table X. Definition of Age and Sex Groups for the Description of Health and Productivity on 30 Cow/Calf Farms Using Incidence Density.

Herd	total population time contributed by whole herd
Breeding Herd	population time contributed by cows and heifers
Calves	population time contributed by calves from birth to 1.5 years of age
Cows	population time contributed by females over 3.0 years of age
Heifers	population time contributed by females over 1.5 years of age and less than 3.0 years of age
Bulls	population time contributed by males over 1.5 years of age
Weaned Calves	population time contributed by calves over 0.5 years of age and less than 1.5 years of age
Unweaned Calves	population time contributed by calves less than or equal to 183 days of age (0.5 years of age)
Older Calves	population time contributed by calves over 28 days of age and less than or equal to 183 days of age
Young Calves	population time contributed by calves over 7 days of age and less than 29 days of age
Newborn Calves	population time contributed by calves less than 8 days of age

newborn, 21 days as a young calf, 155 days as an older calf, and 123 days as a weaned calf. Similarly, a heifer that was 2.5 years of age on January 1 would contribute 0.5 heifer years and 0.5 cow years if it remained in the herd for the entire year.

Breeding herd size was calculated as the total population time contributed by females over 1.5 years of age. It was subdivided into cow-years (females greater than or equal to 3.0 years of age) and heifer-years (females over 1.5 years and less than 3.0 years of age).

Herd average adjusted weaning weights were calculated as in Chapter 2 with the exception that all calves born into the herd, including those born to purchased cows, were incorporated into the estimate. Pounds of calf weaned per cow year was the sum of the adjusted weaning weights on a farm divided by total cow and heifer years.

Calving rate was the sum of all calving events on a farm during the study year divided by cow and heifer years on that farm. It was further subdivided into heifer calvings and cow calvings. In the calculation of this rate because individuals contributed population time after they had already experienced the event. For example, a cow that calved in June would no longer be at risk for calving in that calendar year yet she still contributed to the population time. In addition, it was possible for cows to calve more than once over the one year period.

Losses to the herd were the sums of sales, culls and deaths in each age group divided by the population time in each age group. In calculating these rates

an animal no longer contributed to population time when it was removed from the herd.

Disease was measured using first treatments only. The denominator used was total population time in each age group.

Minitab (23) was used to generate descriptive statistics. Variances were adjusted using the finite population correction factor (33).

Farms were ranked for each of the measured parameters using both cumulative incidence (see Chapter 2) and incidence density results. The Spearman rank correlation coefficient (33, 23) was used to test for differences in farm rankings between the two methods. Rankings for each parameter were examined in detail. Where a farm's ranking differed substantially between the two methods of calculation (e.g. where the difference in rankings squared was greater than 50 for a particular farm), the farm's data was investigated to determine the reason for the difference.

3.3 Results

Data are presented for the thirty study farms using both incidence density (ID) and cumulative incidence or cohort methods. Although in many cases, the data look similar for the two methods, the results are not directly comparable because animal groups and methods of calculation are defined differently. The ID method should be considered an index, not a percentage.

Herd size (Table XI) was based on the cow and bred heifer population time. Minimum herd size accepted into the study was about twenty-five cows and bred heifers as of January 1, 1988. On average, the percentage of heifers in a herd was 21% using the ID method and 16% using the cohort method. This difference is due to the way in which heifers were defined. Using the cohort method, heifers were defined as females that were expected to calve for the first time this year. Using the ID method, heifers were defined as females between 1.5 and 3.0 years of age. The distribution of herd size was skewed right, with the majority of the farms being close to the minimum size of 25 (as measured by population time). Using the ID approach, the 25th, 50th, and 75th percentiles were 25, 33, and 38, with cow and heifer population time ranging from a minimum of 16 to a maximum of 117. Only 3 farms had more than 50 cow and heifer years.

There were nine farms where rankings for herd size were substantially different between the two methods of calculation. The differences were mostly due to the way that heifers and cows were defined under the two methods. On three farms, heifers were calving for the first time at three years of age and older. The farmer would have coded these as heifers, but using the ID method, they were considered to be cows. Three farms had females that had calved at very young ages. These animals were considered cows using the cohort method and heifers using ID. One farm had purchased several cows, thus changing its ranking as purchased animals were ignored under the cohort method. Six farms had enough heifers from 1 to 1.5 years of age on January 1st to affect their rankings.

Table XI. Average Breeding Herd Size (Cow and Heifer Years) of a Random Sample of 30 P.E.I. Beef Cow/Calf Farms Using an Incidence Density Approach to Calculating Herd Size.

Parameter/ Group	Mean	S.D.	Median	Minimum	Maximum
Herd Size	37 (36)[1]	17 (18)	33 (30)	16 (15)	117 (122)
Cows	30 (31)	16 (17)	25 (25)	12 (14)	103 (109)
Heifers	7 (5)	3 (3)	7 (5)	0 (0)	15 (13)
% Heifers	21 (16)	9 (9)	20 (14)	1 (0)	44 (35)

Spearman Rank Correlation Coefficient for Average Breeding Herd Size Using Incidence Density and Cumulative Incidence Approaches to Calculating Herd Size on 30 P.E.I. Beef Cow/Calf Herds

Herd	0.91	$p<.001$
Cows	0.91	$p<.001$
Heifers	0.78	$p<.001$
% Heifers	0.73	$p<.001$

[1] For comparison purposes, the comparable values calculated from the cohort (cumulative incidence) approach are presented in brackets.

Upon reaching 1.5 years of age, these animals started to contribute breeding herd population time using ID, thereby increasing breeding herd size.

Herd average adjusted weaning weights for twenty-nine farms are presented in Table XII. One farm did not weigh any calves. The very small difference between the cohort and ID results for weaning weights is due to the inclusion of calves born to purchased cows when using the latter method. In all, 744 calves were weighed, 114 were too young to weigh, and 80 calf weights were missing. On one farm, the pounds weaned per cow year were considerably less using the ID method. This farm retained a large number of replacement heifers. Although they were not expected to calve in 1988, these heifers started to contribute breeding herd population time in the latter part of the year, thereby, increasing breeding herd size and decreasing the pounds of calf weaned per cow.

The calving rate is described in Table XIII. The cow calving rate tended to be higher and the heifer calving rate tended to be lower using the ID method. Cows that did not calve or that lost their calves were more likely to be culled, thereby reducing population time and creating an apparent increase in calving rate. The heifer rate is lower because of the way heifer population time was calculated. For example, on many farms, unbred yearling heifers contributed breeding herd population time while on others, heifers were typically not expected to calve until they were about three years of age. The calving rates tended to be lower for heifers compared to cows using both methods of calculation. The Spearman Rank Correlation Coefficent was significant in all cases at $p < 0.001$.

Table XII. Herd Average Adjusted Weaning Weights on 29 P.E.I. Beef Farms Using an Incidence Density Approach to Calculating Herd Size.

Parameter	Mean	S.D.	Median	Min	Max
Weaning Weights:					
Average Adjusted	480 (481)[1]	51 (52)	487 (481)	353 (353)	614 (625)
% Missing	10 (10)	12 (13)	5 (5)	0 (0)	62 (62)
% Too Young	9 (9)	10 (11)	4 (4)	0 (0)	36 (36)
Pounds of Calf Weaned/Cow Year	410 (411)	65 (59)	398 (422)	264 (235)	553 (523)

Spearman Rank Correlation Coefficient for Calculation of Pounds of Calf Weaned/Cow Using Incidence Density and Cumulative Incidence Approaches to Calculating Herd Size

Pounds of Calf Weaned/Cow	0.90	$p<.001$

[1] For comparison purposes, the comparable values calculated from the cohort (cumulative incidence) approach are presented in brackets.

Table XIII. Herd Average Calvings per 100 Animal Years on 30 Randomly Selected Beef Cow/Calf Farms on P.E.I. Using an Incidence Density Approach to Calculating Herd Size.

Parameter/ Group	Mean	S.D.	Median	Minimum	Maximum
Calving:					
Cows & Heifers	91 (91)[1]	10 (10)	95 (93)	64 (65)	113 (111)
Cows	99 (93)	9 (9)	99 (94)	84 (71)	128 (114)
Heifers	58 (77)	30 (34)	69 (90)	0 (0)	106 (112)

Spearman Rank Correlation Coefficient for Calculation of Calvings Using Incidence Density and Cumulative Incidence Approaches to Calculating Herd Size

Cows & Heifers	0.66	$p<.001$
Cows	0.55	$p<.002$
Heifers	0.72	$p<.001$

[1] For comparison purposes, the comparable values calculated from the cohort (cumulative incidence) approach are presented in brackets.

Of thirty farms, seventeen had substantially different rankings for calving percentage between the cohort and ID methods of calculations. Eleven of these were due to the differences in heifer definition between the two methods (e.g. age as opposed to parity). Six were related to changes in denominator due to purchases (not considered under the cohort method), and four were due to cattle sales early in the year or herd reductions.

Losses to herd, which include sales, culls, and deaths, are presented in Table XIV. When losses to herd are calculated using ID, as the numerator increases, the denominator decreases because the animal is no longer contributing population time. Consequently, when the herd population fluctuates (e.g. when there are a large number of deaths or sales) or when the population time contributed is small in comparison with the total number of individuals present over the year (as with newborn calves), parameter values start to range widely and variances increase dramatically.

In comparing sales using the two methods of calculation, five farms were ranked differently. The differences in rankings in all cases were in the breeding herd only and were due to the sales of replacement heifers in the latter part of the year. Using cumulative incidence, these were considered to be calf sales. Using ID, they were considered heifer sales because the animals were over 1.5 years of age. Similarly, the two herds which ranked differently for culling resulted from replacement heifers which were culled in autumn.

Of the four rank differences between the two methods in the calculation of

Table XIV. Herd Average Losses on a Random Sample of P.E.I. Beef Cow/Calf Farms Using an Incidence Density Approach to Calculating Herd Size. Events per 100 Animal Years Unless Otherwise Noted.

Parameter/Group	Mean	S.D.	Median	Min	Max
Sales:					
Herd	25 (20)[1]	20 (14)	17 (17)	0 (0)	94 (62)
Cows & Heifers	8 (6)	15 (10)	3 (0)	0 (0)	91 (60)
Calves	48 (29)	38 (22)	28 (21)	0 (0)	149 (88)
Culls:					
Herd	4 (3)	3 (3)	3 (3)	0 (0)	13 (10)
Cows & Heifers	8 (7)	6 (5)	6 (5)	0 (0)	23 (20)
Calves	1 (0)	2 (1)	0 (0)	0 (0)	8 (5)
Deaths					
Herd	4 (3)	4 (3)	3 (2)	0 (0)	21 (15)
Cows & Heifers	2 (2)	1 (3)	0 (0)	0 (0)	24 (19)
Calves	7 (4)	8 (5)	5 (3)	0 (0)	41 (27)
Unweaned Calves (per 100 Calf Weeks)	0.22 (4)	0.22 (5)	0.16 (3)	0 (0)	1.35 (24)
1day-7days (per 100 Calf Weeks)	2.48 (2)	2.84 (3)	0 (0)	0 (0)	14.49 (16)
7days-1month (per 100 Calf Weeks)	0.56 (1)	0.85 (3)	0 (0)	0 (0)	5.4 (10)
1month-weaning (per 100 Calf Weeks)	0.06 (1)	0.08 (2)	0 (0)	0 (0)	0.33 (7)

[1] For comparison purposes, the comparable values calculated from the cohort (cumulative incidence) approach are presented in brackets.

deaths, three were due to purchased animals that had died. Thus, using ID, the frequency of death was higher for these farms than it was using the cohort method which ignored purchased animals. The remaining farm was ranked higher for deaths in the breeding herd when using ID. This was due to death of a replacement heifer which was considered a calf under the cohort method and a heifer under ID.

Veterinary and farm initiated treatments of disease are shown in Table XV. First treatments only are included. Wide ranges in values are seen where the population time contributed by individuals is small (e.g. newborns). Between the two methods of calculation, one farm ranked differently for farmer treatments, and two for veterinary treatments. Two of these were due to treatment of purchased animals, resulting in a higher rate of treatments using ID, the other was due to differences in the way heifers were defined between the methods.

Purchases are presented in Table XVI. On average about 6% of a herd's population time at risk was replaced in 1988. The range is quite large (from 0% to 41%) among farms for percent purchases. By using cumulative incidence (which does not consider purchased animals), there is potential for substantial amounts of information to be lost.

Table XVII lists the number of herds in various age categories where there were large differences in rankings between the cumulative incidence and ID methods of calculations. In all, 23 of the 30 farms ranked differently in at least one of the parameters.

Table XV. Herd Average of Animals Treated for Disease at Least Once on 30 Randomly Selected P.E.I. Beef Cow/Calf Farms Using an Incidence Density Approach to Calculating Herd Size.
Events per 100 Animal Years Unless Otherwise Noted.

Parameter/Group	Mean	S.D.	Median	Min	Max
Veterinary Treatments					
Herd	3 (2)[1]	3 (2)	1 (1)	0 (0)	15 (12)
Cows & Heifers	3 (2)	3 (2)	0 (0)	0 (0)	14 (7)
Calves	3 (2)	7 (4)	0 (0)	0 (0)	38 (25)
Unweaned calves (per 100 Calf Weeks)	0.06 (1)	0.08 (2)	0 (0)	0 (0)	0.48 (9)
1day-7days (per 100 Calf Weeks)	0.70 (1)	1.39 (0)	0 (1)	0 (0)	7.65 (4)
7days-1month (per 100 Calf Weeks)	0.14 (0)	0.28 (0)	0 (1)	0 (0)	1.13 (4)
1month-weaning (per 100 Calf Weeks)	0.02 (0)	0.04 (0)	0 (1)	0 (0)	0.19 (4)
Farmer Treatments					
Herd	13 (9)	12 (8)	9 (7)	0 (0)	58 (35)
Cows & Heifers	4 (3)	4 (4)	1 (0)	0 (0)	16 (17)
Calves	22 (14)	23 (14)	15 (9)	0 (0)	111 (56)
Unweaned calves (per 100 Calf Weeks)	0.79 (16)	0.69 (15)	0.42(8)	0 (0)	3.26 (63)
1day-7days (per 100 Calf Weeks)	9.02 (9)	8.53 (10)	4.55(4)	0 (0)	34.46 (42)
7days-1month (per 100 Calf Weeks)	2.02 (6)	2.26 (7)	1.31(4)	0 (0)	14.83 (38)
1month-weaning (per 100 Calf Weeks)	0.24 (1)	0.18 (2)	0 (0)	0 (0)	1.37 (7)

[1] For comparison purposes, the comparable values calculated from the cohort (cumulative incidence) approach are presented in brackets.

Table XVI. Purchases per 100 Animal Years on 30 Randomly Selected P.E.I. Beef Cow/Calf Herds.

Herd	11	10	6	0	41
Cows & Heifers	7	9	3	0	34
Calves	15	15	9	0	55

Table XVII. Comparison of Incidence Density and Cohort Methods for Calculating Herd Level Parameters on 30 Randomly Selected P.E.I. Beef Cow/Calf Farms. Number of Farms Where Rankings Between Methods Were Substantially Different (Spearman Rank Correlation Coefficient Test Statistic Greater Than 50).

	Parameter			
	Breeding Herd	Cows	Heifers	Calves
Parameter				
Herd Size	3	2	6	NA
Weaning Weights	NA[1]	NA	NA	1
Calvings	6	8	11	NA
Sales	5	NA	NA	0
Culls	0	NA	NA	2
Deaths	2	NA	NA	2
Veterinary Treatments	1	NA	NA	1
Farm Treatments	1	NA	NA	0

[1] Not Applicable

3.4 Discussion

The estimation of beef health and productivity is described in various textbooks (29, 5, 32). Most summaries of herd performance use a simple cumulative incidence method of calculating various risks. The number of cows and heifers in the herd at the start of the production cycle is used as the denominator, and some very simple measures, such as percentage of cows producing and weaning a live calf, pounds of calf weaned per cow, pregnancy and culling rates, are calculated. When using cumulative incidence to quantify events of interest, it is necessary to restrict additions to and withdrawals from the population (30). All individuals must either be followed for the entire period, or must experience the event of interest during the follow up period for this measure to be accurate (30). Where there are losses to a population (e.g. from deaths or sales), various adjustments can be made to the population at risk (31). However, these adjustments are not usually made when measuring beef cow/calf performance. The assumption is made that the herd population is stable throughout the production cycle.

Cumulative incidence can provide a reasonable estimate of events of interest under certain restricted circumstances. These measures were devised for cow/calf farms that calve in a limited period of time, pasture breed in the summer, wean calves and check cows for pregnancy in the fall, and overwinter only pregnant cows. Under this system, herd populations remain fairly stable throughout the year, with most inventory changes occurring in the fall after the

calves are weaned. However, when farms deviate from this pattern, cumulative incidence becomes questionable as a measure of production efficiency.

With few exceptions, the farms used in this study do not fit the recommended methods of commercial calf production (17). Figure 8 shows the distribution of calvings, and Figure 9 shows the distribution of sales, and purchases of cows and heifers over the year. Although there is a trend for most calvings to occur in March and April, a substantial number of calvings occurred outside this period. Furthermore, with the exception of the summer months, sales and purchases of cows and heifers seem to be fairly evenly dispersed throughout the year. In order to fit these data into the cumulative incidence method of analysis, additions to herds must be ignored. In Chapter 2, only those animals present on January 1, 1988 were considered, and it was also assumed that this cohort remained more or less fixed over the period of the study. However, in some herds, up to 60% of the breeding animals in the herd were sold, culls ranged up to 20%, purchases up to 34%, and calving seasons exceeded 280 days in length. It is apparent that simple cumulative incidence will not provide an accurate measure for quantifying events on many of the farms in this sample.

It might be argued that the population dynamics in this study do not have a great effect on the overall averages. Probably there is a balancing effect with some farms selling animals and others buying. If the sole objective in maintaining health and productivity records is to estimate population averages, cumulative incidence calculations may be adequate. However, the system breaks down when

FIGURE 8. Distribution of Calvings Over One Calendar on 30 Randomly Selected P.E.I. Beef Cow/Calf Farms

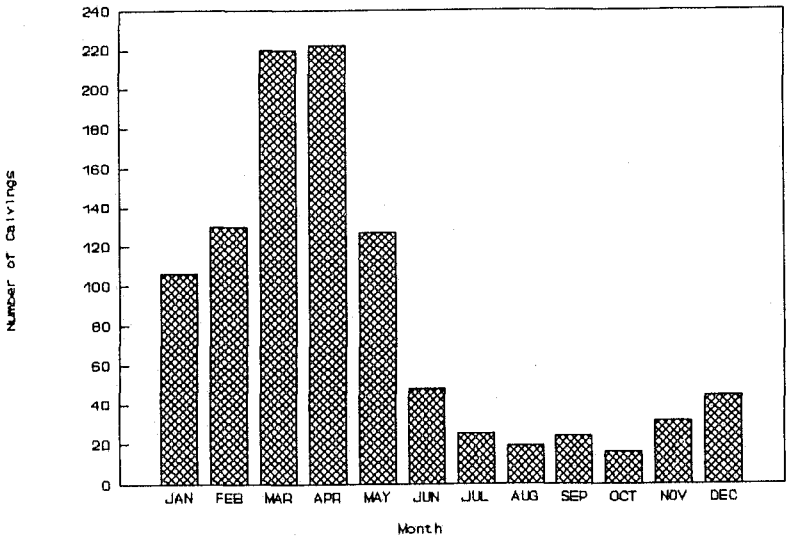
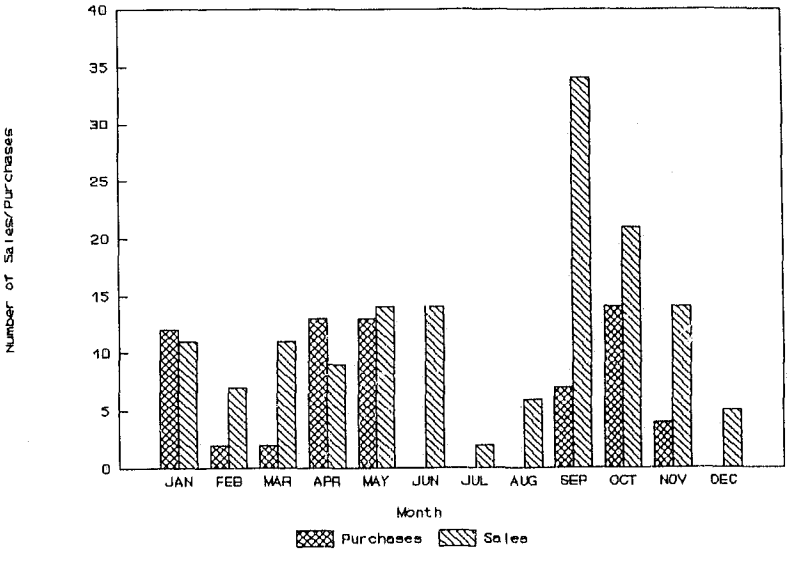


FIGURE 9. Distribution of Sales and Purchases of Cows and Heifers Over One Calendar Year on 30 Randomly Selected P.E.I. Beef Cow/Calf Herds.



individual farmers want to apply these measures to their own farms. In many cases, results do not accurately reflect the individual farm situation, comparisons among individual animals on the farm and comparisons with other herds are questionable, and the farmer loses faith in the value of keeping records. For example, a commercial cow or herd that calves early one year and late the following year is less productive than one that calves consistently every twelve months (17). Using cumulative incidence to measure performance on one year's data, this difference in productivity would not be apparent.

Other methods that might be used under these circumstances include actuarial calculation of risk or incidence density. The actuarial method usually requires a discrete event to signal the beginning of the follow up period (30). Using multiple years' data, this method could be used with calving as the initiating event. With such variation in time of calving, the actuarial method is of limited use in a one year data set.

Incidence density is used where the population is dynamic and individual follow up times are known. However, it is very difficult to determine the precise population time at risk for many of the parameters. For example, in a herd that typically calves year round, the calculation of cow time at risk for calving is complex. Because of the difficulties with calculating time at risk, and because many of the events of interest occurred throughout the year, a modified approach to incidence density was used to calculate calving rates and disease rates. This method is referred to as modified because although animal time was used as a

denominator, not all animals would be considered at risk for all events and animals still contribute time after the event. A similar method was used by Williamson et al in a study describing disease problems in dairy herds (34). This denominator is probably more realistic in an economic sense because the animal remains in the herd after experiencing the event, and is an economic burden on the herd. In essence, the method provides a slightly different way of quantifying herd size taking into account the dynamics of the herd populations. This results in a more meaningful picture of herd performance in herds where there are large fluctuations in populations.

One difficulty with the use of incidence density is that the relevance of measures may not be as intuitively apparent. Incidence density cannot be interpreted at the individual animal level (30) as can risk. The measures can be made more meaningful if used as an index to rank farms from high to low. The knowledge of how a herd compares to other herds in the same area may be more useful to some farmers than the actual magnitude of the measures.

Differences in farm rankings were compared using the cohort (cumulative incidence approach) and the ID approach. Because the Spearman rank correlation coefficient was significant in all cases, there was an association between the two methods of calculation. For example, farms that were ranked high for calving risk using the cohort method would generally rank high for calving rate using the ID method. There were, however, individual farms that deviated between the two methods, and these farms were examined in detail to determine

the reasons for the differences.

Perhaps the most frequent difference between the two methods occurred as a direct result of how heifers and cows were defined. It was for this reason eleven of the thirty farms ranked differently for calving. Using ID, heifers were defined strictly on the basis of age. Using the cohort approach, animals were designated as heifers if they were bred females that had not previously calved. The differences in rankings between the methods occurred for two reasons. First, some farms bred their heifers to calve for the first time at three or four years of age, which is considerably older than the generally recommended age of two years (17). These older heifers were counted as cows using ID. Second, many young replacement heifers contributed population time as heifers towards the end of the year using the ID method. These heifers were considered yearling calves by the cohort method, even though some would calve for the first time by the end of the year.

Using the cohort method, parity was chosen to distinguish heifers from cows because it is a stable method of categorizing animals over a one year production cycle. All animals on the farm must be classified at the beginning of the study when using cumulative incidence measures. Since a beef animal is unlikely to calve more than once over a one year period, it is unlikely to change categories over that time. The use of parity in defining heifers is the method used in most beef studies. In order to compare results with other studies, it was necessary to use the same definitions. As well, this method of distinguishing

heifers provides the farmer with measures of productivity based on the way he chooses to manage his farm.

The advantage of using age (over parity) to describe heifer productivity is that heifer age is standardized across farms to the normally accepted standard. A farm that breeds heifers to calve at three or four years of age is at an economic disadvantage compared to one that successfully calves heifers at two years of age (17). This disadvantage is reflected in the ID method but is inapparent when using the cohort method. A potential disadvantage is the fact that replacement heifers start to contribute population time towards the year end. If a farm maintains a large number of replacements, this additional population time can bias the results in relation to farms that do not raise their own replacements.

Purchases and sales on farms were also important in changing the ranking of farms. Purchases and sales of breeding animals were responsible for changing the rankings of 10 farms for calving rates. Purchased animals increase the denominator, and many breeding females that were purchased had already calved. This resulted in an apparent reduction in the calving rate. Animals that were sold were no longer counted at risk by ID. A number of farms culled cows very early in the study period. Under the cohort method, it was assumed these animals spent the production cycle on the farm. Using ID, they were no longer counted after they were sold, and therefore, the measure becomes more precise. Purchases also resulted in a change in rankings for three farms in measuring disease and death. Using the cohort method, disease and death in purchased

animals are ignored. Using the ID method, events of interest in purchased animals can be considered, resulting in a more complete description of farm productivity.

It appears that a primary motivation for farmers in keeping health and productivity records is the ability to set goals, and measure farm performance in comparison to other local farms. In a group as diverse as P.E.I. beef cow/calf farms, it seems that the standard methods of measuring farm performance will not provide many farmers with an accurate method of comparing their farms to others. Farmers also need accurate within farm comparisons of cow performance. In order to promote the use of health management, it may be necessary to adjust traditional methods of describing productivity to provide farmers with more accurate information. With the advent of beef computer programs, it is feasible to manipulate data to provide more meaningful indices of production, and consequently reach more of the farming population.

4. CHARACTERISTICS OF FARMERS WHO USE HEALTH MANAGEMENT

4.1 Introduction

Since agricultural extension services were established by government in the early 1900's to encourage farmers to accept and use improved farming practices, farm performance has been the subject of many studies (35). Much of this work has been undertaken by sociologists, psychologists, economists, production specialists, veterinarians and others, with relatively little interaction between the various fields of study (35).

Farm management practices have been investigated for their impact on livestock health and productivity (36, 37, 38, 39). For the most part, these studies have attempted to identify or quantify management practices and relate them to efficiency of production. The resulting information has been used by farmers and production specialists to modify farm management and thereby improve performance.

Adoption behaviour has been the subject of massive investigation by rural sociologists in their attempt to determine why many farm managers don't take steps to improve farm performance. At the individual level, adoption is a multi-stage process involving awareness of an innovation, interest in the innovation, evaluation which may lead to a trial stage and eventually, acceptance and use (35, 40). There are several farm manager characteristics (such as, education, knowledge, risk acceptance and conservatism) which influence how quickly a new innovation is accepted. Within a social system, adoption of innovations follows a

normal distribution with a small percentage of individuals practicing early adoption, a small percentage being very slow, and the majority of individuals falling somewhere in the middle (35, 40). There are characteristics of different social systems which influence the rate of adoption.

Agricultural economists have investigated the impact of land, labour and capital on farm income, and discovered that a large part of the variance between farms must be explained by management (41). As a result, several studies have been undertaken to determine the influence of human factors (such as, age, education, ambition, and motivation) on farm management performance.

In recent years, the relationship between farm manager characteristics, management practices, and productivity has been investigated on dairy farms (42, 43). Farm manager characteristics were found to be important sources of variation in productivity between herds.

In summary, there are a number of farm management practices which have been shown to improve farm performance. However, many farmers are slow to adopt new practices. Furthermore, there are substantial differences in farm income and herd productivity which can be explained by human factors. Therefore, farm manager characteristics are important in the adoption and implementation of innovative agricultural practices, and in subsequent farm performance.

Beef producers have lagged behind dairy and swine producers in the adoption of health management (1). It may be that this category of farm manager

is different in some critical ways and this results in the reduced use of health management, or perhaps the farm service sector is not providing the health management services the cow/calf farmer wants and needs. In an attempt to determine why there is a lag in the adoption of health management, a personal interview survey was conducted to provide a clearer picture of the people involved in cow/calf farming and to look at their current usage of health management. Many of the survey questions, particularly those relating to farm manager characteristics, were borrowed from similar studies. Because these questions had already been tested and evaluated on other populations of farm managers, it was anticipated the measures would be more reliable than would be those resulting from a new set of questions. The objectives of this study were: to describe beef cow/calf farmers on Prince Edward Island in terms of sociodemographic and psychological characteristics; to describe the current utilization of health management practices by cow/calf producers; and, to develop a predictive model for the use of health management in relation to farm manager characteristics.

4.2 Materials and Methods

A survey was conducted on 36 randomly selected beef farms on P.E.I. in the spring of 1989. Farms were selected from a previously described sampling frame (see Chapter 2). Forty producers were asked to complete the survey. Thirty of these had participated in a one year study of beef cow/calf health and productivity (see Chapters 2 and 3). The remaining 10 producers had refused to

participate in the health and productivity study; of these, 6 agreed to complete the survey and 4 refused. Minimum eligible herd size was about 25 breeding females. The survey was conducted by personal interview. In all cases, the interview was conducted by the principle investigator and the manager of the beef herd provided the answers.

The purpose of the questionnaire was to measure both demographic and personal characteristics of beef farmers, and to measure use of health management on farm. The questionnaire was divided into three sections. The first section dealt with demographic questions such as age, education, herd size, off farm work, and income. The second section contained personal questions such as satisfaction with farming, value orientations, and goals. The third section measured health management in terms of record-keeping, facilities for health management, and various management policies. Many of the demographic and personal questions were either taken directly or adapted from questionnaires developed by Wilson (44) and Bigras-Poulin (43). Some questions relating to record-keeping and management practices were adapted from surveys developed by Trant (45) and Wittum et al (38). The complete questionnaire, along with descriptive statistics, is found in Appendix C.

Data were analyzed in the following manner:

1) Sociodemographic Questions

The 28 sociodemographic questions were reduced to 5 factors using factor analysis with varimax rotation.

2) Psychological Questions

Scores of related psychological questions were summed to yield 13 variables, from which 3 factors were generated using factor analysis with varimax rotation.

3) Health Management Questions

Questions on the use of records, farm health management facilities, and management practices were scored and summed to generate the health management score.

4) Regression Analysis

Multiple regression of health management scores on sociodemographic and psychological factors and two-way interaction terms was performed using stepwise linear regression followed by backwards elimination. Collinearity between the sociodemographic factors, psychological factors, and interaction terms was assessed and adjusted.

4.2.1 Socio-Demographic Variables:

There were a total of 28 questions included in the socio-demographic section of the questionnaire. The questions related to such topics as the number of years farming, the size of the farm, gross income, education and continuing education activities. The factor analysis procedure from the statistical package SAS (46) was used to condense the socio-demographic questions into five factors. Varimax rotation was used to improve the conceptual interpretation of the

generated factors. The five factors explained 68% of the total variance in the socio-demographic variables, and were named as follows: size of farm (SIZE), importance of the beef herd (IMPORT), purebred breeder as opposed to commercial breeder (PB), year of birth and education of farmer (YRBIRTH), and off-farm work (OFFARM). The variables that were highly correlated with the individual factors are presented in Table XVIII.

4.2.2 Psychological Variables:

The psychological variables were used to describe some aspects of personality among beef farm managers. These variables were divided into four categories: satisfaction, value orientations, goals, and self-concept. Most of the questions, with minor modifications, were taken from a previous study (43), where they were used to measure the influence of behavioural characteristics of farm managers on dairy herd productivity.

To improve the reliability of the psychological questions, several questions related to one topic were often asked. Scores of related questions were summed to yield 13 variables. Variable construction is described in detail below. Factor analysis was subsequently used to reduce the constructed variables to a smaller group of factors.

Satisfaction:

Two variables (SAT1 and SAT2) were used to describe the farmer's satisfaction with his way of life on the farm and with beef cow/calf farming in

Table XVIII. Sociodemographic Factors - Correlation of Factors with Questionaire Questions in a Survey of 36 P.E.I. Beef Cow/Calf Producers (correlation coefficient).

Factor	High Correlation (more than 0.60)	Moderate Correlation (0.45 to 0.60)
SIZE	number of full-time workers (0.82)	gross income from beef (0.56)
	number of adults supported (0.79)	acres rented (0.54)
	acres farmed (0.77)	
	multiple owners (0.72)	
	herd size (0.62)	
IMPORT	rated importance of beef (0.78)	few part-time workers (-0.59)
	dependance on beef income (0.77)	negative attitude towards credit (-0.46)
	% income from beef (0.76)	
	reliance on beef to support standard of living (0.62)	
PUREBRED	purebred breeder (0.82)	acres rented (0.56)
	sell calves at older age (0.81)	
	high participation in farm organizations (0.66)	
	high gross income from beef (0.61)	
YRBIRTH	year began farming current land (0.92)	number of years farming (0.51)
	year of birth (0.88)	
	education (0.64)	
OFFARM	high participation in education through mass media (0.71)	high participation in personal contact education (0.55)
		number of days work off-farm (0.51)

general. The following five questions were used to calculate SAT1:

1) How satisfied are you with your way of life on the farm?

2) What would your answer have been if you had been asked this same question two years ago?

3) How satisfied are you with raising beef cows and calves?

4) What would your answer have been if you had been asked this same question two years ago?

The above four questions were coded as follows:

1 very satisfied

2 slightly satisfied

3 slightly dissatisfied

4 very dissatisfied

5) Which statement most closely represents your personal desire to stay in this community:

1 I would never consider leaving

2 I might leave if I had to but I would really prefer not to

3 I would leave if I had a good opportunity elsewhere

4 I would really like to leave if I had any other opportunity

The above 5 questions were summed and subtracted from 20. SAT1 could range from 0 to 15, with lower scores representing dissatisfaction and higher scores indicating greater satisfaction.

The following question was used for the variable SAT2:

1) If you had children, would you advise them to consider farming as an occupation?

0 No

1 Yes

Value Orientations:

Value orientations are defined by Blackburn et al (47) as:

"...an organized system of values within an individual that determine desired ends of behaviour and prescribes norms or socially acceptable means of attaining them."

In this study, values at opposing ends of four continua were measured. The first three were used by Bigras-Poulin (43), the fourth by Wilson (44). The continua were as follows:

1) Economic vs. social (ECON)

measures the relative importance of financial success to the farmer as opposed to social success

2) Scientific vs. traditional (SCIEN)

measures the value the farmer places on scientific information as opposed to traditional practices

3) Risk vs. risk avoidance (RISK)

measures the willingness of the farmer to take risks

4) Group action vs. independence (GRP)

measures the value the farmer places in working in groups as

opposed to working independently

For each continuum, five questions were asked. The questions consisted of paired statements, each relating to one end of the spectrum (e.g. for the economic vs. social continuum, one statement would be an economic choice, the other would be a social choice). The farmer was forced to chose one statement of the two that most closely represented his own personal beliefs. Each continuum was coded as follows: 1 if the economic statement was chosen, 0 for the social statement; 1 for a scientific choice, 0 for traditional; 1 for risk oriented choice, 0 for risk avoidance; and, 1 for group action choice, 0 for independence. The range for each continuum was 0 to 5, with 5 being the most economically, scientifically, risk, or group action oriented, and 0 having the most sociable, traditional, risk avoiding, or independent orientations, respectively. Individual questions and descriptive statistics are contained on pages 127 to 131 of Appendix C.

Self Concept:

This series of questions measured the farmer's perception of himself with respect to sociability (SOCIAL), assertiveness (ASSERT), achievement (ACHIEV), innovativeness (INNOV), and working behaviour (WORK). The farmer was presented with a statement and asked to assess how well the statement described them by choosing one of the following responses: very definitely describes me, describes me, partially describes me, does not describe me, definitely does not

describe me. Responses were coded from 0 to 4, with 0 representing the answer definitely does not describe me and 4 representing the answer definitely describes me. There were four statements each related to sociability, assertiveness, and innovativeness, and five statements each related to achievement and working behaviour. The responses for each characteristic were added together. The ranges for each variable were 0 to 16 for sociability, assertiveness, and innovativeness, and 0 to 20 for achievement and working behaviour. Individual questions and descriptive statistics are found on pages 131 to 134 of Appendix C.

Goals:

These questions measured the relative importance of farm, household, and social goals to the farm manager. The participant was presented with nine cards in random order, each with a goal statement. The three farm goal statements were:

1) To develop high producing, good quality livestock.

2) To get my farm well organized and easy to manage.

3) To make a higher profit from my farm.

The three household goal statements were:

1) To improve my family's standard of living.

2) To have an attractive up-to-date home and vehicle.

3) To provide for a comfortable retirement income.

The three social goal statements were:

1) To take an active part in social clubs and events, and/or sports events.

2) To take an active part in farm organizations, extension programs or other educational activities.

3) To take an active part in service club, charitable or community activities.

The farm manager was asked to review all the cards and choose the goal statement most important to him. The selected card was removed from the pile, and the answer recorded. The farmer was then asked to choose the least important goal statement. Again the selected card was removed from the group and the answer recorded. The farmer was then asked to review the remaining answer cards, and choose the two most important. The selected cards were removed and the answers recorded. Finally, the farmer was asked to choose the two least important of the remaining cards.

From this exercise, three variables were constructed - farm goals (GOALF), household goals (GOALH), and social goals (GOALS). Scores for each of these variables were calculated as follows. For the statement chosen as the most important, two points were allotted to the appropriate goal category. For example, if a farm goal statement was chosen as most important, the variable GOALF would be increased by two. The statements chosen as the two next important were allotted one point each to the appropriate goal category. Similarly, for the least

important statements, the one chosen as least important resulted in a decrease of two points to the goal category, and the two statements chosen as the next least important resulted in a decrease of one point each, according to the goal category selected.

To eliminate collinearity among the three constructed variables, negative values were converted to zero value. The variable GOALS was zero for all observations except for one, and was therefore, dropped from further analysis.

Factor Analysis of Psychological Variables:

The constructed variables used in the factor analysis of the psychological section of the questionnaire are found in Table XIX. The factor analysis procedure from the statistical package SAS (46) was used to condense the psychological variables into three factors. Varimax rotation was used to improve the conceptual meaning of the generated factors. The three factors explained 34% of the total variance in the psychological variables, and were named as follows: importance of farm (IMPFARM), management characteristics (MANAGER), and group action orientation (GROUP). The variables that were highly correlated with the individual factors are presented in Table XX.

4.2.3 Health Management Score

The outcome variable (use of health management) was calculated as follows. There were several questions that covered three main areas: the use of records, farm health management facilities, and a sampling of management

Table XIX. Psychological Variables - Constructed Variables from Psychological Questions in a Survey of 36 P.E.I. Beef Cow/Calf Producers.

Variable	Explanation
SAT1	satisfaction with way of life and with beef farming
SAT2	would advise children to farm
ECON	economic orientation (vs. social)
SCIEN	scientific orientation (vs. traditional)
GRP	group action orientation (vs. independence)
RISK	risk orientation (vs. risk avoidance)
SOCIAL	social self-perception
ASSERT	assertive self-perception
ACHIEV	achievement self-perception
INNOV	innovative self-perception
WORK	methodical working behaviour self-perception
GOALH	household goals
GOALF	farm goals

Table XX. Psychological Factors - Correlation of Factors with Questionaire Variables in a Survey of 36 P.E.I. Beef Cow/Calf Producers (correlation coefficient).

Factor	High Correlation	Moderate Correlation
IMPFARM	GOALH - Household goals not important (-0.79)	
	SAT2 - Advise children to farm (0.72)	
	GOALF - Farm goals are important (0.69)	
	SAT1 - Satisfied with way of life (0.53)	
MANAGER	ACHIEV - Achievement self-perception (0.67)	RISK - Risk orientation (0.44))
	WORK - Methodical self-perception (0.61)	INNOV - Innovative self-perception (0.42))
	ASSERT - Assertive self-perception (0.60)	SOCIAL - Social self-perception (0.42)
GROUP	GRP - Group action orientation (0.81)	SOCIAL - Social self-perception (0.48)
		ECON - Social orientation (-0.46)
		SCIEN - Scientific orientation (0.41)

practices. The use of records was calculated by scoring answers for several questions on the use of animal identification, use of financial records on the beef herd, use of production records, and use of disease records. The score for facilities was determined by summing points allocated if the following facilities were in use on the farm: chute, corral, sick area, calving area, maternity pens. Management was scored by determining the farmer's management practices in the following situations: criteria for selection of heifers and culling of cows, age at which heifers were first bred, use of bull breeding soundness examinations, use of pregnancy diagnoses, sorting of females into groups for feeding, knowledge of treatment and prevention of neonatal calf diarrhea. Records, facilities, and management scores were summed to give the outcome variable, use of health management. The component parts of this score were weighted as follows: records was worth 40% of the total, facilities 20%, and management 40%.

4.2.4 Regression Analysis

Regression analysis was used to create a predictive model for the use of health management. The five sociodemographic factors and three psychological and all possible two-way interaction terms were used as predictors; the dependent variable was health management score (SCORE). Health management scores were evaluated for normality using a normal probability plot (23). Minitab's stepwise linear regression (23) was used. The p-value for entry or removal of terms from the model was set at 0.10. The model was further refined by backwards elimination (48) performed manually using a p-value of 0.05.

Collinearity between the sociodemographic factors, psychological factors, and interaction terms was evaluated using the eigenvalues of the predictor correlation matrix (48). Because collinearity was present in the model, variance inflation factors (VIF) were calculated for the regression coefficients and the respective t-values were adjusted by dividing by the square root of the VIF. Non-significant coefficients were removed from the model one by one until the remaining adjusted t-values were all significant (p values less than 0.05). The resultant model consisted of six factors and two interaction terms.

An analysis of residuals was carried out on the final model. Jacknife residuals, leverages, and Cook's distance were calculated. Residuals were plotted against the predicted values, and a normal probability plot of the residuals was evaluated.

4.3 Results

4.3.1 Descriptive Statistics

Descriptive statistics along with the survey questions can be found in Appendix C. All survey respondents were male. Because the primary objective of this exercise was to develop a predictive model for the use of health management, only those variables that loaded heavily on a factor will be discussed here.

The five demographic factors and the continuous variables that were highly correlated with each are presented in Table XXI.

TABLE XXI. Demographic Characteristics of a Randomly Selected Sample of 36 P.E.I. Beef Cow/Calf Farmers. Descriptive Statistics for Continuous Variables that were Highly Correlated with Demographic Factors

Factor	Mean	S.D.	Median	Range
SIZE				
Number of workers	1.5	1.1	1.0	0 - 6
Number of adults supported	2.6	1.1	2	1 - 6
Acres farmed	373.3	336.6	280	90 - 2000
Herd size	41.0	23.1	47.5	18 - 110
IMPORT				
Reliance on beef income (0 - 10)	3.1	2.8	3.4	0 - 10
PUREBRED				
Participation in farm organizations (number of organizations)	2.1	2.3	1	0 - 7
YRBIRTH				
Year began farming this land (1900)	66.9	12.8	71	42 - 85
Year of birth (1900)	42.5	12	43.5	17 - 64
OFFARM				
Mass media education (hours/month)	20.1	15.9	14.4	3.2 - 68.0
Personal contact education (hours/month)	9.8	8.7	7.7	0.9 - 40.9
Off-farm work (days/year)	52	81	0	0 - 250

The factor SIZE was positively correlated with the number of full-time workers on the farm, the number of adults supported by the farm, the number of acres farmed, and herd size. It was negatively correlated with a single owner/manager type of management structure. In this study, 24 farmers (67%) owned and managed their own farms. All other farms were either co-owned, family owned or had some other multiple ownership arrangement. In interpreting the factor SIZE, only one variable (herd size) related to the size of the beef herd. All others related to the general size of the farm. The factor SIZE was therefore interpreted as being an indicator of the general size of the farm, and not necesarily the size of the beef herd.

The second demographic factor, IMPORT, was positively correlated with the farmer's rating of the importance of his beef herd, his dependence on income from beef, the percentage of gross income earned from beef, and reliance on beef to maintain the family's standard of living. Forty-two percent of the farmers surveyed rated the overall importance of their beef herd higher than off-farm jobs or other farm enterprises. Thirty-three percent rated beef second in importance, and the remaining 25% ranked beef as less important. Most farmers (61%) indicated a moderate dependence on income from their beef herd. Eight percent depended very little on beef income, 28% depended on it a great deal, and one producer depended completely on income from his beef herd. Fifty-three percent of respondents earned less than one third of their total income from beef, 39% earned from one third to two thirds, and 8% derived more than two thirds of their

income from their beef herds. Respondents were asked to rate their reliance on beef in maintaining their family's standard of living by placing a mark on a 10 cm. bar. A mark low on the bar indicated very little reliance, while a mark close to the top indicated great reliance. On average, the surveyed farmers placed their mark about one third of the way up the bar, at 3.1 cm. The median was 3.4 cm. and the range was from 0 to 9.9 cm. All of the above variables measure specific items related to the beef herd, and therefore, the factor, IMPORT, was interpreted as indicating the importance of the beef herd to the producer.

The third demographic factor, PUREBRED, was positively correlated with raising purebred cattle, selling calves at an older age, participation in farm organizations, and gross income from beef production. Of the producers surveyed, 69% were producing for the commercial market only and 31% had purebred cattle only or a combination of purebred and commercial herds. Thirty-one percent of farms sold the majority of their animals as weaned calves, 19% sold feeder or finishing animals, 28% sold the majority as slaughter cattle, and 19% sold mainly breeding stock. On average, respondents actively participated in 2 farm organizations (median of 1) with a range from 0 to 7. Seventeen percent of respondents said their gross income from beef production was less than $15,000, 47% had beef incomes from $15,000 to $30,000, 17% ranged from $30,000 to $45,000, while 19% grossed over $45,000 from beef. This factor was interpreted as indicating whether or not the farm was raising predominantly purebred animals.

The fourth demographic factor, YRBIRTH, was positively correlated with the

year the farmer began farming his current land, year of birth, and level of education. Forty-four percent of respondents had completed elementary school, 25% had completed high school, and 28% held a college diploma or university degree. This factor was interpreted as an indication of how young a producer was at the time of the survey.

The final demographic factor, OFFARM, was positively correlated with high participation in continuing education (both mass media and personal contact), and with the number of days of off-farm work per year. On average, respondents spent 20 hours per month reading farm papers, listening to farm radio programs, or watching farm programs on television. Personal contact with veterinarians, extension specialists, other farmers, financial advisors, and others to discuss farming issues averaged about 10 hours per month. About 39% of respondents held off-farm jobs and worked an average of 133 days per year at these jobs. For the whole group of respondents, the average days of off-farm work per year was 52. The interpretation of this factor is not straightforward, as the variables did not fall into easily explained patterns. In this case, the factor was interpreted as an indicator of off-farm work for two reasons. First, off-farm workers may be working in agricultural sector jobs, bringing them into contact with veterinarians, specialists and others. This could result in great increases in the personal contact education variable. Second, in looking for a model to predict the use of health management, it was felt that time spent working off-farm would likely play a much greater role in this relationship than the amount of time spent reading or

discussing farm issues with others.

The three psychological factors and the variables that were highly correlated with each are discussed below.

The first psychological factor, IMPFARM, was negatively correlated with household goals, and positively correlated with advising children to consider farming as an occupation, with farm goals and with satisfaction. The average score for household goals was 1 (out of four) with a range of 0 to 3. The average for farm goals was 2 out of a possible four points with the range from 1 to 4. There was a high degree of satisfaction with farming as a way of life and beef farming. The average score was 12 out of a possible 15 and the range was from 6 to 15. Sixty-one percent of the respondents said they would advise their children to consider farming as an occupation. Of the 39% who answered no to this question, many indicated they would advise their children to farm on a part-time basis only and to earn their living at some other occupation. This factor was interpreted as an indication of the overall importance of the farm and farming to the producer.

The second psychological factor, MANAGER, was positively correlated with the producers' self-perceptions of achievement, assertiveness, and working behaviour. On average, respondents scored 15 points out of a possible 20 for achievement self-perception, indicating most felt pride in their work and were interested in getting their work done. The range was 12 to 20. The average score for assertiveness self-perception was 9 out of a possible 16 points with a range of

4 to 15. Working behaviour self-perception scores averaged 12 out of a possible 20 points and ranged from 8 to 16. Achievement, assertiveness, and good working behaviour are characteristics that are generally held to be important in the success of managers and entrepreneurs. This factor was interpreted as an indicator of some of the personal characteristics required for good management.

The final psychological factor, GROUP, was highly correlated with group action orientation. The average score for group action orientation was 3 out of a possible 5 points and ranged from 0 to 5. This factor was interpreted as measuring the degree an individual likes to work co-operatively in groups, as opposed to working independently in a competitive environment.

The descriptive statistics for the outcome variable (use of health management) are presented in Table XXII. Scores for the use of records, on-farm facilities for health management and the use of management practices are presented, along with the health management score. The health management score, which was used in the regression analysis, was a weighted sum of records, facilities, and management.

4.3.2 Regression Analysis

Regression analysis was used to create a predictive model for the use of health management. The final model is presented in Table XXIII. The five demographic factors (SIZE, IMPORT, PUREBRED, AGE, and OFFARM) and one psychological factor (GROUP) were retained in the final model along with two

TABLE XXII. Use of Heaith Management by a Randomly Selected Sample of 36 P.E.I. Beef Cow/Calf Farmers. Descriptive Statistics.

Variable	Mean	S.D.	Median	Range
Records (range 0 - 24)	10.5	3.9	11.0	1 - 18
Facilities (range 0 - 6)	3.4	1.5	4.0	0 - 6
Management (range 0 - 9)	3.8	1.6	4.0	1 - 7
Health Management Score (range 0 - 58)	26.9	7.5	25.7	12 - 41

TABLE XXIII. Prediction of the Use of Health Management Using Regression Analysis for 36 Randomly Selected Cow/Calf Farms.

Predictor	Coefficient	S.D.	P-value
SIZE	-4.18	1.20	0.002
IMPORT	4.72	0.99	0.000
PUREBRED	2.23	0.79	0.009
YRBIRTH	5.02	0.95	0.000
OFFARM	5.50	0.99	0.000
GROUP	-6.27	1.25	0.000
PUREBRED*OFFARM	3.81	1.18	0.003
GROUP*OFFARM	-6.33	1.62	0.001
Constant	27.67	0.78	0.000
R-sq = 71.5%			

interaction terms (PUREBRED*OFFARM, and GROUP*OFFARM).

Residual analyses did not reveal unusual observations or departures from linearity assumptions. The factors SIZE, IMPORT, and AGE were checked for confounding by regressing them separately on health management score, and removing them from the regression one at a time to assess their impact on the coefficients of the remaining two factors. There was no confounding among these three factors. The other factors could not be assessed for confounding because of their presence in interaction terms in the model. This was not considered to be a problem as the major objective in this analysis was to create a predictive model, and not to accurately quantify the relationship of any one particular factor with the outcome. The final model explained 71.5% of the variance in health management score.

4.4 Discussion

The objectives of this study were: to describe beef cow/calf farmers on Prince Edward Island in terms of sociodemographic and psychological characteristics; to describe the current utilization of health management practices by cow/calf producers; and, to develop a predictive model for the use of health management in relation to farm manager characteristics. The first objective was accomplished through the descriptive statistics from survey questionnaire (Appendix C) and from the factor analysis of the questionnaire variables. The second objective was accomplished through regression analysis of demographic

and psychological factors on health management score.

None of the farmers in this sample participated in formal herd health programs. The outcome variable, health management score, was assessed by collecting information on the current level of management practices. Three main areas were investigated: the use of records, on-farm facilities for health management and current use of some common management practices.

The use of records was considered important (accounting for 40% of the total health management score) as records form the basis of most health management programs. Farms that maintained individual animal records scored higher than those that maintained herd level records only. Although herd level recording is generally considered to be sufficient for large commercial beef herds (49), individual record-keeping may be more important in Prince Edward Island (in terms of health management) because of the small size of beef herds and the extended calving seasons on many farms.

The availability and use of farm health management facilities was the second area of interest in scoring health management. The majority of beef cattle on Prince Edward Island are maintained on pasture during the summer and in loose housing (such as pole barns) in the winter. In order to carry out health management procedures, animals must be easily restrained. A farmer who is committed to the use of health management has likely invested in certain minimal facilities (such as a chute and headgate) to restrain and separate animals. Farm health management facilities accounted for 20% of the total score.

The final area investigated in developing the health management score, was the current use of certain management practices. The questions touched on several areas of interest but were by no means an exhaustive list of all possible management practices. Use of management practices accounted for 40% of the total health management score.

The answers for each of the three areas (records, facilities, and management practices) were summed to give the health management score. It is interesting to note that the correlations between records and facilities ($r = 0.\_08$), and records and management ($r = 0.136$) are very low. The correlation between facilities and management is higher ($r = 0.445$). A more detailed analysis might reveal differences between farmers who keep records and farmers who implement health management procedures. However, the main interest here was an integrated health management score, and such additional analysis was beyond the scope of this study.

The choice of variables and weighting of the answers to calculate health management score were somewhat subjective. Attempts have been made to develop a more objective management score in the dairy industry (37). No standard scoring instruments were located for the beef cow/calf industry. It was necessary to review several other studies, and create, integrate and modify scoring criteria based on knowledge of the cow/calf industry on Prince Edward Island. The scoring of health management is certainly open to debate. However,

regardless of how it is measured, it is more important that what the score measures is fully understood so that the regression model may be interpreted accordingly.

Variable reduction for the independent variables was accomplished by a combination of methods. The independent variables were loosely grouped into sociodemographic questions and psychological questions. By their very nature, individual psychological questions are not very reliable. They are subject to interpretation, and respondents may often feel compelled to chose the "right" (or the most socially acceptable) answer, particularly in a personal interview situation. To overcome this lack of reliability, multiple questions covering the same information were used. These were summarized using methods similar to those used by Bigras-Poulin (43), resulting in thirteen psychological variables.

The psychological and demographic variables were further reduced using factor analysis. Kleinbaum et al (48) define factor analysis as:

> "...a multivariable method intended to explain relationships among several difficult-to-interpret, correlated variables in terms of a few conceptually meaningful, relatively independent factors."

Factor analysis is used for variable reduction, and to assess underlying dimensions in the data. Essential information from a large group of variables is summarized in terms of a few factors. Because the factors are relatively independent of each other, collinearity is virtually eliminated and the factors can subsequently be used in regression or discriminant analysis.

A factor is a weighted sum of all the original variables. The weights are determined by the correlations of the variables with each factor. Variables that are highly correlated with a particular factor have a higher weight, and therefore, contribute more to value of that factor. The conceptual meaning of a factor is determined by examining the variables that are highly correlated with it and interpreting what those variables are in essence measuring.

The demographic variables were reduced to five factors (SIZE, IMPORT, PUREBRED, AGE, and OFFARM). These factors accounted for 68% of the variation in the data, which was reasonable for these data. The addition of a few more factors did not substantially increase the total variation explained. With the exception of OFFARM, all the factors were easily interpreted and fell into logical categories.

The psychological variables were reduced to three factors (IMPFARM, MANAGER, and GROUP). The psychological factors were limited to three because a very high proportion of total variation (84%) was explained, and because the factors were easily interpreted. Addition of more factors did not explain substantially more variance, and resulted in less meaningful, more difficult to interpret factors.

Regression analysis was used to create a predictive model for the outcome variable, use of health management. All five demographic factors, one psychological factor, and two interaction terms were retained in the final model. In interpreting the regression model, it should be remembered that all the

independent variables in the model are factors. Each factor is a weighted, linear combination of the original variables. In the case of the five demographic factors, each is made up of a combination of all the original demographic variables. With the psychological factors, each is a combination of the summarized psychological variables from the questionnaire. Care must be taken in the interpretation of the model to ensure the conceptual meaning of each of the factors is clearly understood.

In the model, the demographic factor SIZE had a coefficient of -4.18 ($p=0.002$). This means that larger farms score lower in the use of health management. Larger farms may be heavily involved in other farm enterprises (such as potatoes or dairy) in which case, management of the beef herd may be a lower priority. Alternatively, it may be that farmers with large beef herds are less inclined to manage their herds as intensively as those with smaller herds.

The demographic factor, IMPORT, had a coefficient of 4.72 ($p<0.001$). IMPORT measures the importance of the beef herd in terms of the farmer's rating of its importance, and dependance on income from the herd. Therefore, those farmers who considered their beef herds important were more likely to use health management. This also supports the notion that the negative coefficient for SIZE was due to interest in other activities.

The demographic factor, PUREBRED, had a coefficient of 2.23 ($p=0.009$). Purebred breeders, farmers that participated in farm organizations, and who earned a higher gross income from beef were more likely to participate in the use

of health management.

The demographic factor, YRBIRTH, had a coefficient of 5.02 ($p<0.001$). In this sample, young farmers and farmers with more education were more likely to use health management.

The demographic factor, OFFARM, had a coefficient of 5.50 ($p<0.001$). Farmers who worked off-farm and participated in continuing education activities were more likely to use health management. With one exception, none of the farmers in this sample depended entirely on their beef herd for their total income. Farmers who work off-farm may have fewer farm enterprises competing for their attention. In these cases, the beef herd could take on greater importance and hence, may be managed more intensively.

The psychological factor, GROUP, had a coefficient of -6.27 ($p<0.001$). Farmers who like to work in a cooperative atmosphere and who like to make decisions within groups were less likely to use health management.

There were two interaction terms. PUREBRED*OFFFARM had a coefficient of 3.81 ($p=0.001$). The relationship between off-farm work and health management changed depending on whether a farmer was purebred breeder or a commercial producer. Producers who raised purebred cattle and worked off-farm were more likely to use health management than those who raised purebred cattle and did not work off-farm. The use of health management by commercial producers was not affected by off-farm work. The second interaction term, GROUP*OFFARM, had a coefficient of -6.33 ($p<0.001$). Independently oriented

farmers who worked off-farm were more likely to use health management than were independently oriented farmers who did not work off-farm. The use of health management by group action oriented farmers was not affected by off-farm work.

In considering this predictive model for the use of health management, results should not be viewed as conclusive. One of the pitfalls in using factor analysis is that the factors may be unstable, changing easily with small changes in the data (48). This can be partially offset by using split-sample techniques or by validating the results on similar populations. The small sample size in this case precluded the use of split-sample analysis. No studies on similar populations were found. Therefore, confirmatory studies are required before this model can be considered to be reliable.

Rural sociologists, agricultural economists, and anthropologists have been studying farm manager characteristics in the adoption of agricultural innovations and in farm performance over many years (35, 41, 47). In contrast, veterinary epidemiologists are just beginning to examine the human factor as it relates to herd performance (42, 43). However, these studies have shown that a number of characteristics of the farm manager do affect adoption behaviour and farm performance.

The beef cow/calf industry has lagged behind in the adoption of health management (1). There are several health management packages available for cow/calf producers. There are organizational plans and strategies, ways to measure tangible items, graphs and analyses to show farmers how to become

more "efficient". Unfortunately, many of these plans and strategies may have been formulated without having an in-depth knowledge of the client.

On average, the farmers in this sample spent about an hour every two months in personal contact time with veterinarians. They spent even less time with extension workers. This small amount of time is not adequate to develop a rich and detailed knowledge of what the beef cow/calf client wants and needs out of a health management program. The value of studies such as this one, is to help provide that knowledge so crucial in developing innovative responses to client needs (50).

Most health management programs have become based almost entirely on economics. Veterinarians and extension workers attempt to "sell" these programs to the farmer on the basis of cost/benefits. It is interesting in interpreting the health management regression model that economics is not a predominant theme in the model. Indeed some studies have shown that people who are oriented to farming as an occupation, in many cases, are not highly oriented towards profit maximization (51, 52).

The farmers who were most likely to use health management have smaller farms, have at least some purebred cattle, are young and educated, consider their beefherd important, work off-farm and participate in continuing education, and like to work independently, in a competitive environment and make their own decisions. Only 8% earned more than two thirds of their total income from beef, and most felt their standard of living would not change dramatically if their

beefherd disappeared today. Yet 42% rated the overall importance of their beefherd first compared with off-farm jobs or other farm enterprises. It seems there are other important motivations (such as, personal importance of the herd to the farmer, pride in the herd, and competition) to be considered in the use of health management. Perhaps one of the reasons there is such low uptake of health management programs in the cow/calf industry is that the efficiency aspect of health management has been emphasized at the expense of the human factor.

In conclusion, the descriptive statistics presented in this section provide an overview of certain sociodemographic and psychological characteristics of beef cow/calf farm managers and a summary of the current use of health management practices on Prince Edward Island. Factor analysis was used to reduce the sociodemographic and psychological variables to eight conceptually meaningful factors. The eight factors and two-way interaction terms were regressed against health management scores to create a predictive model for the use of health management. The importance of having an in-depth knowledge of client needs and desires was discussed in relation to the development and promotion of health management programs.

5. SUMMARY OF RESULTS AND CONCLUSIONS

5.1 Cohort Health and Productivity

Health and productivity data were collected over a one year period on a random sample of 30 beef cow/calf farms having 20 or more cows and bred heifers. Data were collected at the individual animal level and were summarized at the herd level for the cohort of animals in inventory as of January 1, 1988.

Median herd size was 30 and ranged to 122 cows and bred heifers.

Herd average adjusted weaning weight was 481 pounds. Pounds of calf weaned per cow ranged from 235 to 523 pounds, which indicates that there is considerable room for improvement on some farms.

Average calving rate (93%), stillbirths (4%) and dystocias (5%) were close to targeted values of 96%, 2%, and 5% respectively (5). Heifer calving rates showed substantial variation which reflects lack of attention paid to these animals on some farms. Calving seasons were highly variable between farms. A common target is to have 80% of cows calving in a 60 day period. On the study farms, a maximum of 59% of cows calved in 60 days on average, and it took a minimum of 132 days, on average, for 80% of cows to calve.

Losses to herds included sales, culls, and deaths. Herd average culls (3%) and deaths (2%) were not excessive. However, a few herds had unacceptably high death losses, one farm losing 27% of its calves.

Disease was measured as the percentage of herd treated at least once. The large variation in disease treatments between farms was partly due to real

differences in disease levels and partly due to differences in the ways that farm managers detected and treated disease.

There was great variation in the way farms were managed. Long calving seasons and dynamic herd populations on many farms led to difficulties in comparing farms with each other. On some farms substantial information was lost because purchased animals could not be considered using the cohort method. Other methods of summarizing farm data may be required.

5.2 Incidence Density for Measuring Health and Productivity

Incidence density was used as an alternative method for measuring health and productivity on 30 randomly selected beef cow/calf farms. Records from one calendar year were summarized using both cumulative incidence and incidence density. Parameters measured were the same as in Chapter 2. The Spearman rank correlation coefficient was used to compare the two methods.

In all, 23 of the 30 farms ranked differently in at least one of the parameters. Nine farms ranked differently for herd size. Eight were due to differences in definition of cows and heifers between the two methods. Using cumulative incidence, cows and heifers were defined by the farmer strictly on the basis of parity. Some farmers did not breed their heifers until they were two or three years of age. Hence, there was considerable variation in the ages of animals defined as heifers under this method. When incidence density was used, age was the sole criterion for differentiating between the two groups of animals. This method was

more objective because the definition for heifers was standard across all farms. The remaining farm ranked differently in size because of purchased cattle.

Pounds of calf weaned per cow was lower for one farm using incidence density because the farm retained a large number of replacement heifers. This increased the denominator even though the heifers were not expected to calve in 1988.

Seventeen farms ranked differently between the two methods in calving rate. Eleven were due to differences in defining heifers between the two groups. Six were due to cattle purchases.

Differences in rankings for sales were due to sales of replacement heifers. Using incidence density, they were considered heifer sales, using cumulative incidence, they were considered calf sales.

Three farms ranked differently in death rate because of purchased animals that had died (these were ignored using cumulative incidence).

Differences in disease treatments on two farms were due to treatment of purchased animals, one farm ranked differently because of differences in heifer definition between the two methods.

Purchase population time averaged about 6% of herd population time and ranged from 0% to 41%. Information on purchased animals was ignored when using cumulative incidence.

Cumulative incidence is useful when cow/calf farms have restricted breeding seasons, when calves are weaned as a group, and when only pregnant cows are

overwintered. Under this system, populations remain relatively stable throughout the year. Most farms on P.E.I. do not conform to this model, and hence, the summarization of data using cumulative incidence is of limited use to the farmer and of very limited use in comparing one farm against another.

Incidence density can be used as an alternative method of measuring health and productivity. For the most part, measurements are probably more precise particularly on farms where there are a large number of sales and purchases. Information about all animals on the farm is considered, including purchased animals. Incidence density cannot be interpreted at the individual animal level (30) as can cumulative incidence. However, it could be used as an index to rank farms against each other. For farmers who want to compare their herd's performance against similar herds, incidence density is probably the method of choice.

5.3 Characteristics of Farmers Who Use Health Management

A personal interview survey was conducted with 36 beef herd managers to develop a model that uses farm manager characteristics to predict the use of health management on beef cow/calf farms.

Survey questions were grouped into sociodemographic, psychological, and health management variables.

Factor analysis with varimax rotation was used to reduce 27 sociodemographic variables to 5 factors. Based on factor loadings, the factors were named: SIZE (size of farm), IMPORT (importance of beef herd to the

producer), PUREBRED (raise purebred cattle), YRBIRTH (year of birth, education), and OFFARM (work off-farm). The 5 factors accounted for 68% of the variation in the data.

Thirteen psychological variables were constructed from the psychological questions. Factor analysis reduced the psychological variables to 3 factors. They were named: IMPFARM (importance of the farm and farming to the producer), MANAGER (personal characteristics required for good management), and GROUP (group action oriented). The 3 factors accounted for 84% of the variation in the data.

Health management questions were scored and summed to generate the health management score.

Multiple regression of health management scores was performed on sociodemographic and psychological factors and their two-way interaction terms. The final model contained all 5 sociodemographic factors, one psychological factor (GROUP) and two interaction terms (PUREBRED*OFFARM, GROUP*OFFARM). All terms were highly significant. The model explained 71.5% of the variance in health management score.

The farmers in this sample who were most likely to use health management had smaller farms, had at least some purebred cattle, were young and educated, considered their beefherd important, worked off-farm and participated in continuing education, and liked to work independently. Purebred farmers who worked off-farm were more likely to use health management than purebred farmers who did

not work off-farm. Off-farm work did not affect the use of health management by commercial producers. Similarly, independently oriented farmers who worked off-farm were more likely to use health management than those who did not work off-farm. The use of health management by group action oriented farmers was not affected by off-farm work.

Profit maximization did not seem to be a strong motivation for the use of health management on the study farms. Instead of trying to sell health managment programs on the basis of cost/benefits, uptake might be improved by developing a greater awareness of producer motivations, and by targeting specific groups of producers.

5.4 Directions for Future Research

There are a number of directions for future research which can be identified. First, an objective standardized method for gathering morbidity data on farms needs to be developed. There was a great deal of variability in the way individual farmers recorded disease data in this study. Objective, reliable disease data are difficult to collect in this type of extensive survey. Clear guidelines are required. For example, a simple form on which farmers are prompted to record objective clinical findings could be developed. Without such guidelines, it is very difficult to have faith in use of these data for estimating disease frequencies.

Incidence density as a usable index of health and productivity needs further investigation. This method has the potential to be developed into a system which

could be used and understood by farmers. One of the major advantages of incidence density over cumulative incidence is that farm to farm comparisons are more meaningful.

There is a need to develop a more objective method of measuring the use of health management on beef farms. The model developed in Chapter 4 that uses farm manager characteristics to predict the use of health management on beef farms needs to be confirmed and further refined. It is necessary to assess current methods of marketing health management programs and to identify the needs of potential clients.

The relationship between productivity, farm manager characteristics and use of health management needs to be investigated. This will require a much larger sample size than was possible for this study. Finally, the economics of health management on cow/calf farms in terms of increased profitability remains to be explored.

HOW TO USE YOUR POCKET RECORDER

Breeding Record:
For Natural Service, enter Bull ID, date the bull was turned in with cattle and the date the bull was removed. If your cows and heifers are placed into groups for breeding, record the cow and heifer ear-tags in each group. Otherwise, indicate by writing the word "all" that the bull was turned in with all the heifers and/or all the cows.
For Artificial Insemination, record the date of service, bull registration and cow or heifer ID.

Calving Record:
Enter date of calving, ID of dam, whether dam is a cow or heifer and her Body Condition Score (BCS - see Codes). Enter calf's ID, record type of assistance given (see Codes) and indicate if the calf was born dead. Record sex (male or female) and sire of calf. Recording of weights, comments and BCS is optional.

Herd Event and Health Recorder:
Enter date, ID, and age and sex code.
Under "Herd Events", enter procedures such as vaccinations, implants, castrations, treatment for worms, etc. Under ID, you may enter "all" if the event affects the whole herd, "all calves" if the event affects only calves or "all except" if the event affects all except a few individuals and enter the ID numbers of those not affected.

Under "Health Record", enter date, ID, age and sex code and record all health problems. Indicate if a veterinarian saw the animal, record the disease suspected, treatment used and numbers of days treated.

Changes to Inventory:
Enter date, ID and age and sex code. For new cattle entering the herd, record breed, age and source. For all cattle leaving the herd, indicate if the animal was sold, culled, died or other.
Under "Comments", enter reason for purchase or sale, reason culled, cause of death (and indicate if the carcass was examined by the diagnostic laboratory or your veterinarian) or explain "other".

CODES

Age and Sex Code
C — Cow
H — Heifer (calving this year)
RH — Replacement Heifer (bred this year)
B — Breeding Bull
V — Calf

BCS
(Body Condition Score)
1 — very thin
2 — thin
3 — good
4 — fat
5 — very fat

Assistance
U — Unassisted
E — Easy Pull (manual)
H — Hard Pull (complicated or very difficult to pull)
S — Surgical

CALVING RECORD

DATE	*COW DATA*			*BIRTH AND CALF DATA*						COMMENTS
	ID	C / H	BCS	CALF ID	ASSISTANCE	BORN DEAD	SEX	SIRE	WEIGHT	
Example Mar. 1	161	C	3	210	U		M	10U		

HERD EVENT AND HEALTH RECORDER

DATE	ID	AGE AND SEX CODE	***HERD EVENTS***		***HEALTH RECORD***		
				VET	DISEASE SUSPECTED	TREATMENT USED	DAYS TREATED
Example Mar. 1	15	H		✓	Pneumonia	Penicillin	4
Example June 3	All		Ivomec				

CHANGES TO INVENTORY

DATE	ID	AGE AND SEX CODE	*PURCHASES*			*SALES OR DEATHS*				COMMENTS
			BREED	AGE	SOURCE	SOLD	CULL	DIED	OTHER	
Example Mar. 1	129	C	Her.	3Y	Sales Barn					Replacement
Example Mar. 29	15	H						✓		Pneumonia - lab

Name:_____ Phone:_____

Inventory January 1,____

Total Animals _____ Page ____ of ____

ID NUMBER	SEX	BREED	AGE	FOR FEMALES, ENTER # OF TIMES CALVED

Weaning Weight Report

Name/Address:

IDENT #:
WEIGH DATE:

COW I.D.	BREED OF COW	COW AGE	BULL I.D.	BULL BREED	CALF I.D.	BIRTH SEX	BIRTH DATE	ACTUAL WEIGHT	WEIGHT
982	HE	5.0	165	HE	81	M	14 Mar 88	0	
139	HEXX	2.0	165	HE	82	M	19 Mar 88	0	
974	HEXX	6.0	165	HE	83	M	21 Mar 88	0	
958	HE	5.0	165	HE	84	F	24 Mar 88	0	
990	HEXX	5.0	165	HE	85	M	25 Mar 88	0	
994	HEXX	6.0	165	HE	86	M	25 Mar 88	0	
980	HEXX	6.0	165	HE	87	F	1 Apr 88	0	
450	UN	0.0	165	HE	88	M	13 Apr 88	0	
959	HEXX	5.0	165	HE	89	F	16 Apr 88	0	
992	HE	5.0	165	HE	90	M	25 Apr 88	0	
973	HEXX	5.0	165	HE	91	M	29 Apr 88	0	
144	HE	5.0	165	HE	92	M	30 Apr 88	0	
956	HEXX	5.0	165	HE	93	M	13 May 88	0	
76	HE	5.0	165	HE	94	F	20 May 88	0	
954	AY	5.0	165	HE	95	F	14 Jun 88	0	
970	AYHE	4.0	165	HE	96	M	14 Jun 88	0	
998	HOXX	7.0	165	HE	97	F	7 Aug 88	0	

Beef Cow Calf Survey

Herd Fall Procedures Report

Farm I.D. Code: C09 Name: XXXXXXXXXXXXXXXXXXXXX Phone: XXXXXXXXXXX

Date: 31 Jan 89

COWS IN INVENTORY - FARM C09

ID #	Age	Breed	Days Preg	Procedures
144	6.0	HEREFORD		
148	9.0	HEREFORD CROSSBRED		
450	1.0	HEREFORD		
476	6.0	HEREFORD		
954	6.0	HEREFORD		
956	6.0	HEREFORD CROSSBRED		
958	6.0	HEREFORD		
959	6.0	HEREFORD		
959	6.0	HEREFORD CROSSBRED		
970	5.0	AYRSHIRE HEREFORD		
973	6.0	HEREFORD CROSSBRED		
974	7.0	HEREFORD CROSSBRED		
980	7.0	HEREFORD CROSSBRED		
982	6.0	HEREFORD		
990	6.0	HEREFORD CROSSBRED		
992	6.0	HEREFORD		
994	7.0	HEREFORD CROSSBRED		
998	8.0	HOLSTEIN CROSSBRED		

17 Cows

7. APPENDIX B: Database Structure

The structure of the databases used in Chapter 2 (IN88_DEM.dbf and IN88_EV.DBF) and Chapter 3 (NEW_ALL.dbf and CCEVNT.DBF) are the same. Differences in the information contained between the two groups of databases are outlined below.

NEW_ALL.DBF is a database containing demographic information about individual animals in the herd as of 01/01/88 and all animals entering the herd between 01/01/88 and 12/31/88.

IN88_DEM.DBF is a database containing demographic information about individual animals in the herd as of 01/01/88 and calves born to animals in the herd who meet this criteraia.

CCEVNT.DBF is a database containing information concerning various events in the life of animals found in the NEW_ALL database

IN88_EV.DBF is a database containing information concerning various events in the life of animals found in the IN88_DEM database

Structure for databases: **NEW_ALL.DBF** and **IN88_DEM.DBF**

Name	Type	Width	Description
FHHN	Character	3	Farm Identification
AID	Character	8	Animal Identification
CHC	Character	1	Age/Sex Code of Animal
IDATE	Date	8	Date animal entered Herd
REIN	Character	2	Reason animal entered Herd
ODATE	Date	8	Date animal left Herd
REOUT	Character	2	Reason animal left herd
AGE	Numeric	4,1	Age of animal as of IDATE
SEX	Character	1	Sex of animal
BREED	Character	4	Breed of Animal - 2 two character code

Structure for databases: **NEW_ALL.DBF** and **IN88_DEM.DBF** (continued)

NOTES:

FHHN
A three character code that uniquely identifies each farm in the database.

AID
An identification number which uniquely identifies each animal in a herd.

CHC
Identification of animal type. "F"-> calf,"C"-> cow,
"H"-> heifer, "B"-> bull

IDATE
The date an animal becomes part of the herd.

REIN
The reason an animal becomes part of the herd - see CODEBOOK "reason in codes" for an expansion of the codes used

ODATE
The date an animal is no longer part of herd.

REOUT
The reason an animal left the herd - see CODEBOOK "out table codes" for an expansion of the codes used

AGE
Age of the animal at the time of IDATE. If CHC of animal is "F", then number represents DAYS old while if CHC is "B","H" or "C" then number represents YEARS old.

SEX
Sex of a calf. "F" -> female, "M" -> male

BREED
Four characters representing 2 two-character breed codes. The first two-character code indentifies the dominant breed of the animal. The second two-character breed code identifies the less dominant breed of the animal. - see CODEBOOK "breed codes" for an expansion of the codes used

Structure for databases: **CCEVNT.DBF** and **IN88_EV.DBF**

Name	Type	Width	Description
FHHN	Character	3	Farm identification
AID	Character	8	Animal Identification
CHC	Character	1	Age/Sex Code of Animal
DATE	Date	8	Date event occurred
EVNT	Character	2	Event code
Q1	Character	2	Qualifier 1 code
Q2	Character	3	Qualifier 2 code
SRDIAG	Character	1	Source of Diagnosis
CVAINAT	Character	1	Breeding code
DIFF	Character	1	Calving difficulty
NBA	Numeric	1	Number of calves born alive
NBD	Numeric	1	Number of calves born dead
C1ID	Character	8	Calf #1 id - see notes
C2ID	Character	8	Calf #2 id - see notes
CVBAID	Character	8	Calf sire ID
CVBCSR	Numeric	1	Body condition score of cow at calving
PRSLT	Character	1	Pregnancy diagnosis result
PAINAT	Character	1	Breeding code
PBAID	Character	8	Bull id
PBCSR	Numeric	1	Body condition score at pregnancy exam
DAYSPREG	Numeric	3,1	Number of days pregnant
AGE_AT_EV	Numeric	5,1	Age at time of event
SEX	Character	1	Sex code of animal

Structure for databases: **CCEVNT.DBF** and **IN88_EV.DBF** (continued)

NOTES:

FHHN
A three character code which uniquely identifies each farm in the database.

AID
An identification number which uniquely identifies each animal in a herd.

CHC
Identification of animal type. "F"-> calf,"C"-> cow,
"H"-> heifer, "B"-> bull

DATE
The date on which the event occurred.

EVNT
A two character code which uniquely identifies any of the predefined events (see CODEBOOKS "event codes")

Q1
Qualifier 1 code that is used in conjunction with EVNT (see CODEBOOKS "event codes").

Q2
Qualifier 2 code that is used in conjunction with EVNT (see CODEBOOKS "event codes").

SRDIAG
The Source of Diagnosis is either (F)armer, (V)et, or (L)ab.

CVAINAT
For a calving event, indicates if the cow was bred naturally or by artificial insemination the previous year.

DIFF
Degree of difficulty of delivery. (H)ard pull, (E)asy pull, (S)urgical or (U)nassisted.

NBA
The number of calves delivered by Dam which were born alive.

NBD
The number of calves delivered by Dam which were born dead.

C1ID
Where the event ="CV" -> An identification number which uniquely identifies the first calf born
Where the event ="WW" -> actual weaning weight of calf

C2ID
Where the event ="CV" -> An identification number which uniquely identifies the second calf born
Where the event ="WW" -> adjusted weaning weight of calf

Structure for databases: **CCEVNT.DBF** and **IN88_EV.DBF** (continued)

NOTES

CVBAID
For a calving event, calf sire I.D. number

CVBCSR
The cow's body condition at calving is given a score from 1 - 5. The scores are: (1) very thin, (2) thin, (3) good, (4) fat, and (5) very fat.

PRSLT
An one character code which identifies if prengancy diagnosis is positive or negative. (P/N)

PAINAT
An one character code or used to signify how the cow or heifer was bred by artificial insemination or naturally.

PBAID
The sire's Animal I.D. Number for pregnancy event

PBCSR
A two digit number which indicates the body condition of an animal at pregnancy diagnosis.

DAYSPREG
A three digit number which shows the estimated number of days pregnant.

AGE_AT_EV
Age of animal at time of event. If CHC ="F" number is days, else years

SEX
Sex of a calf. (M/F)

8. APPENDIX C: Beef Cow/Calf Survey

Survey Number_____

Date_____

Start Time_____

EndTime_____

BEEF COW/CALF SURVEY

HEALTH MANAGEMENT QUESTIONNAIRE

Spring 1989

The purpose of this survey is to gather some information on beef cow/calf farms on P.E.I. In particular, I am interested in finding out a little bit about your farm and about how you manage your beef herd. I'd also like to ask for your personal opinions about a few things. At present, we have very little information on beef farms. Questionnaires such as this one are important in identifying the needs of beef farmers. I will be interviewing about forty farmers in total. I will not be releasing any information from individual questionnaires. However, averages from all the completed questionnaires will be published in summary form.

Section A - Sociodemographics

I. General

1. How old were you when you began farming?
2. When did you begin farming this land?
4. How many adults and children are supported by this farm?
5. In what year were you born?

	N	Mean	S.D.	Median	Range
Age	36	45.5	11.7	44.5	24 - 71
Age Started Farming	36	21.3	5.4	20.5	15 - 35
Year Began Farming this Land	36	66.9	12.8	71	42 - 85
Adults Supported by Farm	36	2.6	1.1	2	1 - 6
Children Supported by Farm	36	1.9	1.8	2	0 - 6

II. Education

3. What was the highest level you completed at school?
   1) Elementary
   2) High School
   3) Vocational Training
   4) Community College/University Diploma
   5) University Degree
   6) Other

Education	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Elementary	16	44.4	16	44.4
High School	9	25.0	25	69.4
Vocational Training	1	2.8	26	72.2
Community College/Diploma	6	16.7	32	88.9
University Degree	4	11.1	36	100.0

III. Off Farm Work

6. Do you have other jobs besides farming?
   1) Yes
   2) No - go to question 8
7. How many days do you work off-farm per year?

Off Farm Work	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	14	38.9	14	38.9
No	22	61.1	36	100.0

Days Off Farm Work	N	Mean	S.D.	Median	Range
Days per year	14	133.4	78.2	115.0	42 - 250

IV. Farm Labour

8. How many people work full-time on this farm?
9. How many people work part-time on this farm?
10. Over the average year, how many full-time workers are needed to look after your beef cow/calf herd. You should include time spent by you, your family and employees in feeding, cleaning, cropping, repairing fences and buildings for your beef cow/calf herd. Would you say you need half a person, one, one and a half, two or more? (Record in person years).

Farm Labour	N	Mean	S.D.	Median	Range
No. Full-Time	36	1.5	1.1	1	0 - 6
No. Part-Time	36	3.1	2.5	2	0 - 10
Person Years for Cow/Calf Herd	36	1.0	0.4	1	0.3 - 2.0

V. Disposition of Cattle

12. Are you producing beef cattle for the:
    1) Commercial market
    2) Purebred market or for show (go to Qu.14)
    3) Both
13. At what point do you normally sell the majority of your calves? Do you sell them as:
    1) weaned calves
    2) feeder or finishing cattle
    3) slaughter cattle
    4) breeding stock

Disposition of Cattle	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Cattle Production				
Commercial	25	69.4	25	69.4
Purebred	3	8.3	28	77.8
Both	8	22.2	36	100.0
Calf Sales				
Weaned Calves	11	30.6	11	30.6
Feeders/Finish	7	19.4	18	50.0
Slaughter	10	27.8	28	77.8
Breeding Stock	7	19.4	35	97.2
Other	1	2.8	36	100.0

VI. Farm and Cow/Calf Income

14. What proportion of your total income do you derive from beef:

1) less than 1/3
2) more than 1/3 and less than 2/3
3) more than 2/3
4) don't know
5) don't want to answer

% Income from Beef	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Less than 1/3	19	52.8	19	52.8
1/3 to less than 2/3	14	38.9	33	91.7
More than 2/3	3	8.3	36	100.0

125. In an average year, your gross income (before expenses) from beef production would fall into which of the following categories?

1) less than $15,000
2) more than $15,000 and less than $30,000
3) more than $30,000 and less than $45,000
4) $45,000 or more
5) don't want to answer
6) don't know

Gross Income Beef	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Less than 15K	6	16.7	6	16.7
15K to less than 30K	17	47.2	23	63.9
30K to less than 45K	6	16.7	29	80.6
More than 45K	7	19.4	36	100.0

VII. Farm Size and Diversity

15. Besides beef, what other livestock and crops do you grow to sell for a profit?
    1) hogs
    2) dairy
    3) sheep
    4) other livestock _____
    5) potatoes
    6) grains
    7) forages
    8) other crops _____

17. How many cows and bred heifers do you normally keep?
18. How many acres of land do you normally farm?
19. Of the land that you farm, how many acres do you normally rent from other landowners?

Farm Size/Diversity	N	Mean	S.D.	Median	Range
Other crops and livestock	36	1.2	0.8	1	0 - 3
Herd Size	36	41	23.1	47.5	18 - 110
Acres Farmed	36	373.3	336.6	280	90 - 2000
Acres Rented	36	96.3	138.2	45	0 - 600

Other Farm Enterprises	Yes freq (%)	No freq (%)
Hogs	10 (27.8)	26 (72.2)
Dairy	3 (8.3)	33 (91.2)
Sheep	2 (5.6)	34 (94.4)
Other livestock	4 (11.1)	32 (88.9)
Potatoes	9 (25.0)	27 (75.0)
Grains	7 (19.4)	29 (80.6)
Forages	3 (8.3)	33 (91.7)
Other crops	4 (11.1)	32 (88.9)

VIII. Management Structure

2. What is the management structure of your farm?
    1) Owner/Manager
    2) Co-owner/Manager
    3) Family owned/Manager
    4) Other _____

Management Structure	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Owner/Manager	24	66.7	24	66.7
Co-owner/Manager	6	16.7	30	83.3
Family owned/Manager	4	11.1	34	94.4
Other	2	5.6	36	100.0

IX. Perception of Cow/Calf Herd's Importance

11. How much do you depend on income from your beef herd?
    1) not at all
    2) very little
    3) a moderate amount
    4) a great deal
    5) depend on it completely

16. How would you rate the overall importance of your beefherd compared with off-farm jobs or other farm enterprises? Would you rate beef:
    1) first
    2) second
    3) third
    4) fourth or more

Perception of Herd's Importance	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Dependance on Beef Income				
Not at all	0	0	0	0
Very little	3	8.3	3	8.3
Moderate amount	22	61.1	25	69.4
A great deal	10	27.8	35	97.2
Complete	1	2.8	36	100.0
Overall Importance of Beef Herd				
First	15	41.7	15	41.7
Second	12	33.3	27	75.0
Third	7	19.4	34	94.4
Fourth or more	2	5.6	36	100.0

21. I am going to give you a sheet with a bar on it. Would you please mark an 'x' on the bar to show how your family's standard of living would change if your beef herd was taken away today. The bottom of the bar represents no change while the top represents financial ruin for your famiiy.

Perceived Contribution of Beef to Standard of Living	N	Mean	S.D.	Median	Range
Scale of 0 to 10	36	3.1	2.8	3.4	0 - 9.9

X. Educational Activities

During the average month how much time do you spend with the following people; include personal contact meetings or telephone calls. I would like to know the number of times and the total number of hours per month.

75. Number of times and total number of hours spent with your veterinarian in an average month
76. Extension specialists
77. Other farmers for farm discussions
78. Any type of financial advisor
79. Other specialists

During the average week how many hours do you spend doing the following?

80. Reading farm papers and magazines?
81. Listening to farm radio programs
82. Watching farm TV programs

Number of Contact Times per month	N	Mean	S.D.	Median	Range
Veterinarian	36	1.1	1.1	0.6	0.1 - 5
Extension Specialists	36	1.1	1.5	0.6	0 - 6
Other Farmers	36	10.5	8.4	9	0.5 - 30
Finanancial Advisors	36	0.6	0.7	0.5	0.1 - 2
Other Specialists	36	1.3	1.3	1	0 - 4
Number of Contact Hours per month	**N**	**Mean**	**S.D.**	**Median**	**Range**
Veterinarian	36	0.7	0.8	0.5	0.06 - 4
Extension Specialists	36	0.9	1.7	0.4	0 - 9
Other Farmers	36	7.0	8.5	5	0.25 - 40
Financial Advisors	36	0.5	0.8	0.3	0 - 4
Other Specialists	36	0.7	0.8	0.5	0 - 4
Farm Media Contact Hours per week	**N**	**Mean**	**S.D.**	**Median**	**Range**
Farm Papers	36	3.1	2.9	2	0.3 - 10
Farm Radio Programs	36	1.3	1.6	0.5	0 - 2
Farm TV Programs	36	0.7	0.6	0.5	0 - 3

Average Total Educational Contact Time per month	N	Mean	S.D.	Median	Range
Personal Contact (Q75-Q79)	36	9.8	8.7	7.7	0.9 - 40.9
Media Contact (Q80-Q82)	36	20.1	15.9	14.4	3.2 - 68
Total Contact (Q75-Q82)	36	29.9	20.6	24.1	6.9 - 86.9

83. In what farm organizations do you actively participate? (Record as total number of organizations)
    1) Breed Associations
    2) Joint Beef Breeders
    3) Cattleman's Association
    4) Artificial Breeders Association
    5) Easter Beef Show
    6) 4-H
    7) Federation of Agriculture
    8) National Farmers Union
    9) Other commodity groups
    10) Other

Participation in Farm Organizations	N	Mean	S.D.	Median	Range
No. of Organizations	36	2.1	2.3	1	0 - 7

No. in Each Organizion	Yes freq (%)	No freq (%)
Breed Associations	12 (33.3)	24 (66.7)
Joint Beef Breeders	5 (13.9)	31 (86.1)
Cattleman's	12 (33.3)	24 (66.7)
Artificial Breeders	3 (8.3)	33 (91.7)
Easter Beef Show	8 (22.2)	28 (77.8)
4-H	5 (13.9)	31 (86.1)
Fed. of Agriculture	10 (27.8)	26 (72.2)
Nat. Farmers Union	3 (8.3)	33 (91.7)
Other	13 (36.1)	23 (63.9)

Section B - Psychological Factors

I. Satisfaction

22. How satisfied are you with your way of life on the farm? Would you say you are:
    1) very satisfied
    2) slightly satisfied
    3) slightly dissatisfied
    4) very dissatisfied
    5) don't know
23. What would your answer have been if you had been asked this same question two years ago?
    1) very satisfied
    2) slightly satisfied
    3) slightly dissatisfied
    4) very dissatisfied
    5) don't know
24. How satisfied are you with raising beef cows and calves?
    1) very satisfied
    2) slightly satisfied
    3) slightly dissatisfied
    4) very dissatisfied
    5) don't know
25. What would your answer have been if you had been asked this same question two years ago?
    1) very satisfied
    2) slightly satisfied
    3) slightly dissatisfied
    4) very dissatisfied
    5) don't know

Satisfaction	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Way of Life				
Very satisfied	21	58.3	21	58.3
Slightly satisfied	12	33.3	33	91.7
Slightly dissatisfied	3	8.3	36	100.0
Way of Life 2 Years Ago				
Very satisfied	22	61.1	22	61.1
Slightly satisfied	11	30.6	33	91.7
Slightly dissatisfied	3	8.3	36	100.0
Beef Cow/calf Farming				
Very satisfied	17	47.2	17	47.2
Slightly satisfied	16	44.4	33	91.7
Slightly dissatisfied	2	5.6	35	97.2
Very dissatisfied	1	2.8	36	100.0
Beef Cow/calf Farming Two Years Ago				
Very satisfied	20	55.6	20	55.6
Slightly satisfied	12	33.3	32	88.9
Slightly dissatisfied	4	11.1	36	100.0

26. Would you like to raise beef for at least the next five years?

0) No
1) Yes

Continue Beef Farming	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	2	5.6	2	5.6
Yes	34	94.4	36	100.0

27. If you had children, would you advise them to consider farming as an occupation?

0) No
1) Yes

Satisfaction with Farming as an Occupation	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No	14	38.9	14	38.9
Yes	22	61.1	36	100.0

28. Could you please tell me which statement most closely represents your personal desire to stay in this community?

1) I would never consider leaving
2) I might leave if I had to but I would really prefer not to
3) I would leave if I had a good opportunity elsewhere
4) I would really like to leave if I had any other opportunity.

Attachment to Community	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Never leave	9	25.0	9	25.0
Leave if had to	21	58.3	30	83.3
Good opportunity only	6	16.7	36	100.0

Satisfaction Variables
Satis_farm = 9 - (Q22 + Q23 + Q28)
Satis_beef = 9 - (Q24 + Q25 + Q28)

Variable	N	Mean	S.D.	Median	Range
Satis_farm	36	7.1	1.6	8.0	3 - 9
Satis_beef	36	6.9	1.7	7.0	3 - 9

II. Value Orientations

Choose which one, a or b, most closely represents your personal feelings or beliefs.

Economic vs. Social

29. 1) I most admire the farmer who has the best cattle and the most modern tools and equipment.

OR

0) I most admire the farmer who is friendly, kind and gets along well with others.

35. 1) Probably the greatest satisfaction in farming is making it pay.

OR

0) Having a lot of friends is a more important goal in life than being a success financially.

36. 1) Farming is first of all a business in which the major goal is profit.

OR

0) There are so many desirable things about farming that a person can afford to get along on a lower income to maintain these advantages.

69. 1) Farming is a good occupation because it provides the farmer with a chance to make a capital gain; it is a challenge and offers a chance to achieve.

OR

0) Farming is a good occupation because it provides the farmer with independence, a healthy way of life and a good place to raise a family.

71. 0) I most admire farmers that are the first to contribute help or money if a community need arises.

OR

1) I most admire farmers that are good business-people and have developed profitable farms.

Economic vs. Social freq (percent)	Q29	Q35	Q36	Q69	Q71
Social	32 (91.4)	13 (36.1)	27 (75.0)	30 (83.3)	24 (66.7)
Economic	3 (8.6)	23 (63.9)	9 (25.0)	6 (16.7)	12 (33.3)

Scientific vs. Traditional

30. 0) About the only thing science has accomplished for the farmer is to make life more complicated

OR

1) Research information is a necessity for a farmer in making decisions.

32. 1) The best thing a young farmer can do is learn as much about new developments in agriculture as he or she can.

OR

0) I think traditional ways are the best way of doing things.

37. 0) Many farmers waste too much time keeping up on specific developments.

OR

1) Time spent finding out about new farming ideas is time well spent.

67. 0) A farmer can generally get more useful and practical information from other farmers than the ag. rep. or other specialists.

OR

1) On the whole a farmer can get better information from specialists or the ag. rep. than from neighbours or relatives.

72. 1) In general the farmer with the most education is the best soure of information on farming ideas and practices.

OR

0) Older farmers in the community are probably the best source of information on farming ideas and practices.

Scientific vs. Traditional

freq (percent)	Q30	Q32	Q37	Q67	Q72
Traditional	1 (2.9)	3 (8.6)	4 (11.1)	19 (52.8)	30 (83.3)
Scientific	34 (97.1)	32 (91.4)	32 (88.9)	17 (47.2)	6 (16.7)

Group Action vs. Independence

31. 0) Many farmers should spend less time at farm organization meetings and more time on the farm.

OR

1) It is important for farmers to take an active part in organizations that serve farmers' interests.

34. 1) Farmers who work co-operatively with other farmers are generally more successful.

OR

0) These days farming is a competitive business and other farms are the competition.

38. 1) Unless farmers stick together, the price situation in agriculture is going to get worse.

OR

0) A farmer should be free to make his or her own decisions without any outside interference.

65. 1) Farmers are too independent, they should work together to solve farm problems.

OR

0) A person can best be successful by striking out boldly on his or her own and not by following the advice of others.

74. 1) In general, I think decisions made by a group usually turn out to be the best decisions over the long term.

OR

0) In general, I like to make my own decisions because I know best about my own situation.

Group Action vs. Independance

freq (percent)	Q31	Q34	Q38	Q65	Q74
Independance	8 (22.2)	8 (22.2)	15 (41.7)	4 (11.1)	28 (77.8)
Group Action	28 (77.8)	28 (77.8)	21 (58.3)	32 (88.9)	8 (22.2)

Risk vs. Risk Avoidance

33. 1) It is better to specialize in order to get a higher income even if it is more risky.

OR

0) A farmer should diversify his or her farming operation to hedge against the greater risks in specialization.

66. 0) It is better to make a smaller profit each year than to attempt something where there is a chance of losing.

OR

1) I would rather take a chance on making a big profit than to be content with a smaller but more sure profit.

68. 1) The young farmers who are going broke these days are the ones who are scared to take a few chances.

OR

0) Young people today are too willing to take chances because they don't know how tough times can be.

70. 0) The major goal of young farm families should be to stay out debt as much as possible.

OR

1) It is best to borrow as much as you need to get your farm to a state that really pays.

73. 0) In order to provide my family with a sense of security, I would likely avoid making major changes in my farm operation.

OR

1) If a major change in my farm operation provided the possibility of bringing in substantially more income, I would consider that change even if it meant risking some of my family's financial security.

Risk Taking vs. Risk Avoidance freq (percent)	Q33	Q66	Q68	Q70	Q73
Risk Avoidance	30 (83.3)	33 (91.7)	32 (94.1)	26 (74.3)	13 (36.1)
Risk Taking	6 (16.7)	3 (8.3)	2 (05.9)	9 (25.7)	23 (63.9)

Summary of Value Orientations

Values	Science freq (%)	Economics freq (%)	Group Action freq (%)	Risk freq (%)
0	0 (0.0)	8 (22.9)	1 (2.8)	9 (27.3)
1	0 (0.0)	15 (42.9)	2 (5.6)	14 (42.4)
2	4 (11.8)	2 (05.7)	4 (11.1)	7 (21.2)
3	15 (44.1)	8 (22.9)	11 (30.6)	3 (9.1)
4	12 (35.3)	2 (5.7)	16 (44.4)	0 (0.0)
5	3 (8.8)	0 (0.0)	2 (5.6)	0 (0.0)

Descriptive Statistics for Value Orientations

Value	N	Mean	S.D.	Median	Range
Science	34	3.4	0.8	3	2 - 5
Economics	35	1.5	1.2	1	0 - 4
Group Action	36	3.3	1.1	3.5	0 - 5
Risk	33	1.1	0.9	1	0 - 3

III. Self Perception

Choose one from the following categories to show how well each of the statements describes you.

	Score
1) very definitely describes me	4
2) describes me	3
3) partially describes me	2
4) does not describe me	1
5) very definitely does not describe me	0

Social
39. I am friendly.
43. I am easy to get along with.
47. I am likeable.
56. I support others in what they say and do.

Social Self-Perception freq (percent)	Q39	Q43	Q47	Q56
Strongly agree	3 (8.3)	1 (2.8)	0 (0.0)	1 (2.8)
Agree	27 (75.0)	23 (63.9)	21 (58.3)	20 (55.6)
Partly	6 (16.7)	12 (33.3)	14 (38.9)	13 (36.1)
Disagree	0 (0.0)	0 (0.0)	1 (2.8)	2 (5.6)
Strongly disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Assertiveness
40. I enjoy positions of leadership.
44. I say what I think in a group.
53. I am not hesitant to make suggestions to others.
57. I take the lead in a group when it is necessary to get something done.

Assertiveness Self-Perception freq(percent)	Q40	Q44	Q53	Q57
Strongly agree	2 (5.6)	10 (27.8)	6 (16.7)	1 (2.8)
Agree	7 (19.4)	11 (30.6)	11 (30.6)	7 (19.4)
Partly	12 (33.3)	13 (36.1)	15 (41.7)	20 (55.6)
Disagree	11 (30.6)	2 (5.6)	4 (11.1)	7 (19.4)
Strongly disagree	4 (11.1)	0 (0.0)	0 (0.0)	1 (2.8)

Achievement
41. I am interested in getting things done.
45. I am conscientious.
54. I accept responsibility readily.
58. I am determined to succeed.
59. I am proud of my work.

Achievement Self-Perception freq(percent)	Q41	Q45	Q54	Q58	Q59
Strongly agree	14 (38.9)	8 (22.2)	6 (16.7)	9 (25.0)	13 (36.1)
Agree	18 (50.0)	24 (66.7)	19 (52.8)	21 (58.3)	15 (41.7)
Partly	4 (11.1)	4 (11.1)	10 (27.8)	6 (16.7)	8 (22.2)
Disagree	0 (0.0)	0 (0.0)	1 (2.8)	0 (0.0)	0 (0.0)
Strongly disagree	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Innovation
42. I am interested in new methods and devices.
46. I like to try new things.
55. I am inventive.
60. I like to experiment.

Innovation Self-Perception freq(percent)	Q42	Q46	Q55	Q60
Strongly agree	6 (16.7)	4 (11.1)	1 (2.8)	3 (8.3)
Agree	21 (58.3)	17 (47.2)	7 (19.4)	15 (41.7)
Partly	8 (22.2)	14 (38.9)	14 (38.9)	16 (44.4)
Disagree	1 (2.8)	1 (2.8)	12 (33.3)	2 (5.6)
Strongly disagree	0 (0.0)	0 (0.0)	2 (5.6)	0 (0.0)

Working Behaviour
48. I am methodical.
49. I seek information before making changes.
50. I am knowledgeable about what I manage.
51. I am a good mechanic.
52. I use intuition to solve problems.

Working Behaviour Self-Perception freq(percent)	Q48	Q49	Q50	Q51	Q52
Strongly agree	1 (8.3)	3 (8.3)	2 (5.6)	1 (2.8)	1 (2.8)
Agree	11 (30.6)	17 (47.2)	16 (44.4)	9 (25.0)	15 (41.7)
Partly	19 (52.8)	15 (41.7)	18 (50.0)	12 (33.3)	17 (47.2)
Disagree	4 (8.3)	1 (2.8)	0 (0.0)	11 (30.6)	3 (8.3)
Strongly disagree	0 (0.0)	0 (0.0)	0 (0.0)	3 (8.3)	0 (0.0)

Self-Perception Totals/Category freq(percent) Score	Social	Assert	Achieve	Innovation	Working Behaviour
0					
1					
2					
3					
4		2 (5.6)			
5		1 (2.8)		1 (2.8)	
6		2 (5.6)		1 (2.8)	
7	1 (2.8)	5 (13.9)		4 (11.1)	
8	2 (5.6)	6 (16.7)		3 (8.3)	1 (2.8)
9	6 (16.7)	4 (11.1)		5 (13.9)	
10	6 (16.7)	3 (8.3)		7 (19.4)	8 (22.2)
11	6 (16.7)	8 (22.2)		6 (16.7)	9 (25.0)
12	13 (36.1)	2 (5.6)	3 (8.3)	5 (13.9)	7 (19.4)
13	1 (2.8)	1 (2.8)	6 (16.7)	4 (11.1)	7 (19.4)
14	1 (2.8)	1 (2.8)	3 (8.3)		
15		1 (2.8)	8 (22.2)		2 (5.6)
16			5 (13.9)		2 (5.6)
17			5 (13.9)		
18			2 (5.6)		
19			1 (2.8)		
20			3 (8.3)		
0 - 4	0 (0.0)	2 (5.6)	0 (0.0)	0 (0.0)	0 (0.0)
5 - 8	3 (8.3)	14 (39.0)	0 (0.0)	9 (25.0)	1 (2.8)
9 -12	31 (86.2)	17 (47.2)	3 (8.3)	23 (63.9)	24 (66.6)
13-16	2 (5.6)	3 (8.3)	22 (61.1)	4 (11.1)	11 (30.6)
17-20	N/A	N/A	11 (30.6)	N/A	0 (0.0)

Self-Perception Totals Descriptive Statistics	N	Mean	S.D.	Median	Range
Social	36	10.7	1.6	11	7 - 14
Assertive	36	9.1	2.6	9	4 - 15
Achieve	36	15.4	2.3	15	12 - 20
Innovation	36	9.9	2.1	10	5 - 13
Working Behaviour	36	11.8	1.8	11.5	8 - 16

IV. Goals

Household
1) To improve my family's standard of living.
2) To provide for a comfortable retirement income.
3) To have an attractive up-to-date home and vehicle.

Farm
4) To develop high producing, good quality livestock.
5) To get my farm well organized and easy to manage.
6) To make a higher profit from my farm.

Social
7) To take an active part in social clubs and events, and/or sports events.
8) To take an active part in farm organizations extension programs or other educational activities.
9) To take an active part in service club, charitable or community activities.

61. Here are nine cards, each with one goal statement on it. I would like you to choose the one that is most important to you. (Remove selected card.)
62. Next, I would like you to choose the statement which is least important to you. (Remove selected card from group).
63. Of the seven cards remaining, would you please choose the two statements that are most important to you. (Remove selected cards).
64. Of the five cards remaining, I would like you to choose the two statements that are least important to you

Goals
Most Important
Percent (Frequency)

	61	63A	63B	Total
1	30.6(11)	6.1(13)	5.6(2)	72.3(25)
2	19.4(7)	11.1(4)	2.8(1)	33.3(12)
3	0 (0)	0 (0)	2.8(1)	2.8(1)
House-hold	50.0(18)	47.2(17)	11.2(4)	108.4(38)
4	2.8(1)	30.6(11)	22.2(8)	55.6(20)
5	36.1(5)	16.7(6)	27.8(10)	80.6(29)
6	11.1(4)	2.8(1)	27.8(10)	41.7(15)
Farm	50.0(18)	50.1(18)	77.8(28)	177.9(64)
7	0 (0)	2.8(1)	0 (0)	2.8(1)
8	0 (0)	0 (0)	8.3(3)	8.3(3)
9	0 (0)	0 (0)	2.8(1)	2.8(1)
Social	0 (0)	2.8(1)	11.1(4)	13.9(5)

Least Important

	62	64A	64B	Total
1	0 (0)	2.8(1)	0 (0)	2.8(1)
2	8.3(3)	8.3(3)	8.3(3)	19.4(9)
3	25.0(9)	19.4(7)	13.9(5)	58.3(21)
House-hold	33.3(12)	30.5(11)	16.7(8)	80.5(31)
4	0 (0)	0 (0)	2.8 (1)	2.8(1)
5	0 (0)	2.8(1)	0 (0)	2.8(1)
6	0 (0)	0 (0)	5.6(2)	5.6(2)
Farm	0 (0)	2.8(1)	8.4(3)	11.2(4)
7	41.7(15)	13.9(5)	19.4(7)	75.0(27)
8	11.1(4)	30.6(11)	13.9(5)	55.6(20)
9	13.9(5)	22.2(8)	41.7(15)	77.8(28)
Social	66.7(24)	66.7(24)	75.0(27)	208.4(75)

Section C - Use of Health Management

I. Identification of Animals

84. How do you tell your cattle apart?
    0) No method used, go by appearance only (go to question 90)
    1) Tattoos or small tags, have to catch animal in order to read the number (go to question 90).
    2) Large tags that can be read from a distance
    3) Other_____
    (go to question 90).
85. What percentage of your herd is tagged?
86. How quickly do you replace lost eartags?
    0) Only when necessary, for example, when a tag number is needed for the weaning weight program
    1) When it is convenient, for example when putting cattle through the chute for some other purpose
    2) Reasonably soon after a lost eartag is noticed.
87. How are eartags used on a day to day basis?
    0) Not used, know cattle mostly by appearance
    1) Used occasionally to keep records for special programs like the Weaning Weight Program
    2) Use frequently for different purposes

Animal Identification	Frequency	Percent	Cumulative Frequency	Cumulative Percent
How Identified (N=36)				
No Method	0	0	0	0
Tattoos/Sm tags	0	0	0	0
Large tags	33	91.7	33	91.7
Other	3	8.3	36	100.0
Replacement of Lost Tags (N=34)				
When necessary	5	14.7	5	14.7
When convenient	24	70.6	29	85.3
Soon after noticed	5	14.7	34	100.0
Use of Tags (N=34)				
Not used	4	11.8	4	11.8
Use occasionally	12	35.3	16	47.1
Use frequently	18	52.9	34	100.0

% Herd Tagged	N	Mean	S.D.	Median	Range
	34	95.9	14.2	100	30 - 100

II. Financial Records

88. Do you keep financial records on your beef herd?
    0) No - go to question 94.
    1) Yes

89. How are your beef financial records kept?
    0) Bills/receipts in boxes or folders
    1) Record book and ledgers
    2) Computerized accounting package
    3) Other

90. How are your beef financial records used?
    0) Not used, don't know
    1) Used to determine income tax, payment to Canada Pension Plan
    2) Used to estimate profit or loss of beef herd
    3) In addition to estimating profit or loss, used as an aid in improving herd management and to analyze specific segments of the operation.

Financial Records	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Records (N=36)				
No	12	33.3	12	33.3
Yes	24	66.7	36	100.0
Method (N=24)				
Boxes/Folders	14	58.3	14	58.3
Ledgers/Books	10	41.7	24	100.0
Use of Records (N=24)				
Not used	3	12.5	3	12.5
Income tax	7	29.2	10	41.7
Estimate profit	10	41.7	20	83.3
Management aid	4	16.7	24	100.0

III. Production Records

91. Do you keep written records on your herd's production (other than weaning weights)?
    0) No - go to question 98
    1) Yes
92. On what proportion of your herd do you keep production records?
93. How are your herd's production records kept?
    0) Receipts (sales, purchases), notes and/or Weaning Weight booklets kept in box or file folders
    1) Formal system of record-keeping such as ROP or individual cow cards
    2) Computer program
    3) Other
94. How often do you update your production records?
    4) daily
    3) weekly
    2) every two weeks
    1) monthly
    0) less often than monthly
95. How do you use your production records?
    0) Not used, don't know
    1) Used occasionally, mostly for making decisions about individual animals
    2) Used in evaluation of herd performance and management as well as making decisions about individual animals.

Production Rec	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Records (N=36)				
No	0	0.0	0	0.0
Yes	36	100.0	36	100.0
Method (N=36)				
Boxes/Files/W.W.	22	61.1	22	61.1
ROP/Cow Cards	10	27.8	32	88.9
Computer Prog	0	0.0	0	0.0
Other	4	11.1	36	100.0
Frequency of Updating				
Less than month	1	2.8	1	2.8
Monthly	0	0.0	0	0.0
Every 2 weeks	3	8.3	4	11.1
Weekly	6	16.7	10	27.8
Daily	26	72.2	36	100.0
Use of Records				
Not used	6	16.7	6	16.7
Use occasionally	24	66.7	30	83.3
Management aid	6	16.7	36	100.0

IV. Disease Records

96. Do you normally keep written records on disease problems and preventive treatments used in your beef herd?
    0) No - go to question 100
    1) Yes

97. How are your disease records and treatment records kept?
    0) Receipts (veterinary, drug purchases), notes on paper, in Weaning Weight booklets or notepads kept in a box or file folder
    1) Formal record-keeping system such as individual cow cards
    2) Computerized health management program
    3) Other

98. How often do you update your disease and treatment records?
    4) daily
    3) weekly
    2) every two weeks
    1) monthly
    0) less often than monthly

99. How are your disease and treatment records used?
    0) Not used, don't know
    1) Used occasionally, mostly for making decisions about individual animals.
    2) Used in evaluation of herd performance and management as well as making decisions about individual animals.

Disease Records	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Records (N=36)				
No	21	58.3	21	58.3
Yes	15	41.7	36	100.0
Method (N=15)				
Boxes/Folders	12	80.0	12	80.0
Cow Cards	1	6.7	13	86.7
Computerized	0	0.0	0	0.0
Other	2	13.3	15	100.0
Frequency of Updating (N=15)				
Less than month	1	6.7	1	6.7
Monthly	0	0.0	0	0.0
Every 2 weeks	0	0.0	0	0.0
Weekly	1	6.7	2	13.3
Daily	13	86.7	15	100.0
Use of Records (N=15)				
Not used	2	13.3	2	13.3
Use occasionally	11	73.3	13	86.7
Management aid	2	13.3	15	100.0

V. Farm Health Management Facilities

100. Do you have a chute and headgate?
101. About how many days per year do you use the chute and headgate?
102. Do you have a sturdy working corral or crowding pen?
103. Do you have a separate area where sick cattle can be isolated from the main herd.

Farm Health Management Facilities

	Yes	No
Chute	61.1% (22)	39.8% (14)
Corral	63.9% (23)	36.1% (13)
Sick Pen	77.8% (28)	22.2% (8)

Chute Use	N	Mean	S.D.	Median	Range
Days/year	22	21.0	18.5	16.0	2 - 70

104. Is your calving area:
0) the same as the overwintering area
1) an area sectioned off from the overwintering area
2) completely separate from the overwintering area?

	Same	Sectioned	Separate	Other
% (freq)	72.2% (26)	11.1% (4)	13.9% (5)	2.8% (1)

105. How many nursing or maternity pens do you have for individual cows with new calves?

Pens	N	Mean	S.D.	Median	Range
	36	2.1	2.5	1	0 - 12

VI. Selection of Breeding Animals

106. What things do you consider when selecting replacement heifers? (Record number of responses selected.)
1) Breed
2) Weaning Weight
3) Yearling Weight
4) Birthdate
5) Conformation
6) Pelvis size
7) Health status
8) Temperament
9) Dam's production
10) Other_____

107. On your farm, for what reasons would you usually or always cull a cow? (Record number of answers selected).

1) Thin, poor doing
2) Old age
3) Abortion
4) Assisted birth
5) Raised light calf
6) Bred to calve late
7) Open
8) Structural unsoundness (e.g. udder, legs)
9) Genetic problems
10) Other

Selection of Breeding Animals	N	Mean	S.D.	Median	Range
Heifer Selection	36	5.6	1.5	5	3 - 9
Culling of cows	36	5.0	1.7	5	2 - 8

Selection Criteria	Yes freq (%)	No freq (%)
Heifers		
Breed	27 (75.0)	9 (25.0)
Weaning Weight	30 (83.3)	6 (16.7)
Yearling Weight	9 (25.0)	27 (75.0)
Birthdate	13 (36.1)	23 (63.9)
Conformation	36(100.0)	0 (0.0)
Pelvis Size	0 (0.0)	36(100.0)
Health Status	13 (36.1)	23 (63.9)
Temperament	25 (69.4)	11 (30.6)
Dam's Production	32 (88.9)	4 (11.1)
Other	15 (41.7)	21 (58.3)
Culling of Cows		
Thin, poor doing	20 (55.6)	16 (44.4)
Old Age	28 (77.8)	8 (22.2)
Abortion	12 (33.3)	24 (66.7)
Assisted Birth	7 (19.4)	29 (80.6)
Raised Light Calf	25 (69.4)	11 (30.6)
Bred to Calve Late	13 (36.1)	23 (63.9)
Open	25 (69.4)	11 (30.6)
Structural Unsoundness	31 (86.1)	5 (13.9)
Genetic Problems	1 (2.8)	35 (97.2)
Other	16 (44.4)	20 (55.6)

VII. Reproductive Management

108. What is the average age of your heifers when first bred? (Record in months, 0 for don't know).

109. What is the average weight of your heifers when first bred? (Record in pounds, 0 for don't know).

Heifer Breeding	N	Mean	S.D.	Median	Range
Age	36	17.6	5.8	15	12 - 42
Weight	36	844.4	172.3	900	0 - 1025

110. Were breeding soundness exams performed on any bulls used in your herd? (6 months prior to breeding season through start of breeding season)

0) No - go to question 112
1) Yes

111. What tests were included in the breeding soundness exam?

1) Sperm motility
2) Sperm morphology
3) Scrotal circumference

Breeding Soundness Exams Performed

	Yes	No
BSE Performed	5.6% (2)	94.4%(34)

# of Tests	
One	2.8% (1)
Two	2.8% (1)
Three	0.0% (0)

112. Do you usually have all or some of your cows and heifers checked by a veterinarian for pregnancy?

0) No - go to question 114
1) Yes

113. How many cows and heifers do you generally have checked for pregnancy?

Pregnancy Diagnosis	Yes	No
Pregnancy Check	72.2% (26)	27.8% (10)

% Herd Checked	N	Mean	S.D	Median	Range
	36	57.94	48.35	100	0 - 100

VIII. Use of Veterinarian

114. When cattle in the breeding herd require medical attention, who provides the diagnosis and treatment?

0) always farm manager/employee
1) usually farm manager/employee, sometimes veterinarian
2) sometimes farm manager/employee, usually veterinarian
3) always veterinarian

Q114	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Farm Manager	9	25.0	9	25.0
Sometimes vet	17	47.2	26	72.2
Usually vet	7	19.4	33	91.7
Always vet	3	8.3	36	100.0

115. For which of the following purposes does the farm use the local veterinarian?

1) Diagnosis and treatment of sick animals
2) Preventive treatments such as vaccinations and deworming
3) Preventive consultation
4) Treatment consultation
5) Other management consultation e.g. feeding, housing, ventilation

Use of Vet	N	Mean	S.D.	Median	Range
No. of Categories	36	3.1	0.9	3	1 - 5

Categories	Yes freq (%)	No freq (%)
Diagnosis and treatment	36(100.0)	0 (0.0)
Preventive treatments	5 (13.9)	31 (86.1)
Preventive consultation	32 (88.9)	4 (11.1)
Treatment consultation	28 (77.8)	8 (22.2)
Other management consult	10 (27.8)	26 (72.2)

VIII. Feeding Groups

116. During the overwintering period, are females sorted into groups that will receive different levels of feed?

0) No - go to question 118
1) Yes

117. How are the females sorted? (Record total number of responses).

1) by age
2) by condition
3) by calving status
4) other, explain _____

Feeding Groups	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Not sorted	14	38.9	14	38.9
Sorted	22	61.1	36	100.0

Categories	N	Mean	S.D.	Median	Range
# of Groups	22	1.7	0.7	2	1 - 3

Categories	Yes freq (%)	No freq (%)
Age	19 (52.8)	17 (47.2)
Condition	13 (36.1)	23 (63.9)
Calving Status	3 (8.3)	33 (91.7)
Other	2 (5.6)	34 (94.4)

IX. Purchases into Herd

118. During the average year, how many cows or heifers are usually purchased into the herd from other sources?

119. During the average year, how many calves are usually purchased into the herd herd from other sources?

Purchases	N	Mean	S.D.	Median	Range
Cows, Heifers	36	1.8	1.8	2	0 - 5
Calves	36	1.4	2.8	2	0 - 15

X. Knowledge of Treatment and Prevention of Calf Diarrhea

120. In your opinion, what is the best treatment or treatments for new-born calves that are moderately sick with scours? By moderately sick, I mean a calf with fairly liquid diarrhea that is not nursing, and is not as bright and active as it should be.

121. What are some of the things you do to try to prevent scours from occurring in your herd?

Neonatal Calf Diarrhea Knowledge	N	Mean	S.D.	Median	Range
Treatment (scored out of 6)	36	2.4	1.4	2.3	0.5 - 5.5
Prevention (scored out of 10)	36	1.7	1.1	2.0	0 - 4

122. Which of the following best describes your herd?

1) mostly British breeds such as Hereford, Angus, Shorthorn
2) mostly dairy crosses
3) mostly exotic or exotic crosses, such as Simmental, Charolais, Limousin

Predominant Breed in Herd	Frequency	Percent	Cumulative Frequency	Cumulative Percent
British breed	26	72.2	26	72.2
Exotic breeds	10	27.8	36	100.0

XI. Attitude Towards Borrowing

123. In your opinion, what is the highest interest rate that most farmers could reasonably afford to pay on borrowed money?

Highest Interest Rate	N	Mean	S.D.	Median	Range
	36	10.1	2.6	10	5 - 15

124. If there was a worthwhile project you wanted to do on your farm but you had to borrow money to do it, which of the following would most closely represent your response?

1) Given a reasonable rate of interest, I would have few reservations about borrowing the money.
2) I don't want to borrow any more until my present debt load is reduced.
3) I don't like to borrow money, I would not go ahead until I could pay for it.
4) Other _____

Attitude Towards Borrowing	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Few reservations	22	61.1	22	61.1
Debt Too High	8	22.2	30	83.3
Don't Like Debt	5	13.9	35	97.2
Other	1	2.8	36	100.0

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