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Herd Management Software For The Registered Simmental Cattle Breeder: A Solution Written In Omnis 3 Plus

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HERD MANAGEMENT SOFTWARE
FOR THE REGISTERED
SIMMENTAL CATTLE BREEDER:
A SOLUTION WRITTEN IN OMNIS 3 PLUS™

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INTRODUCTION

My education in accounting, work experience with Apple Macintosh computers, and a lifelong involvement in the now economically depressed cattle industry are all combined in this thesis project. I became convinced that the Macintosh could make a significant contribution to more efficient record keeping for cattlemen when I had the opportunity at a former job to train people to use one. These office workers, just like many ranchers, had little or no computer experience. However, within an hour they were familiar with the basics and were able to work productively. I was convinced that the Macintosh is the perfect computer for the cattle industry which has long been plagued by record keeping problems. When I researched software options, I could find no herd-management programs written for the Macintosh. After learning this, I became interested in designing such software myself. The opportunity to do just that arose in late winter of 1986. This project and limited market research for the product are described in detail on the following pages.

Explanation of Problem

Taylor Simmental Ranch

Don and Pat Taylor own and manage Taylor's Simmental Ranch near Helmville, Montana. They run approximately four hundred mother cows, about two hundred of which are registered Simmental cattle. They raise calves which become sires, replacement heifers for themselves and others,
and feedlot animals. The commercial and smaller registered calves are sold by the pound each fall and go directly into the feedlot. The remaining calves, all of which are eligible for registration, are kept over the winter.

Those registered bull calves which remain after the first culling are put on home test. This means they are fed high concentration rations under feedlot conditions and weighed periodically to measure their progress. The purpose is twofold. First, the bulls need to be big and healthy enough to begin servicing cows at about fifteen months old. Also, the feedlot performance of the sire is a strong predictor of the performance of his calves. Since most of these bulls will be sold to commercial cattlemen, the feedlot performance of a potential sire is a strong marketing tool. Each year these bulls are culled heavily based on their performance under these feedlot conditions and later based on fertility tests and scrotal circumference (which is directly correlated to fertility). Those bulls which remain after culling are sold on a private treaty basis. The majority are purchased by commercial cattlemen who expect the relatively large Simmental bulls to increase the weaning weights of their calf crop.

Unlike the bull calves, the registered heifers are not put on test. The heifers are separated and fed sufficient feed to grow and mature enough to be bred in the spring of their yearling year, but not enough to become as fat as the bulls. It is undesirable to over-feed heifers; excess fat will lessen a cow's reproductive efficiency. After several months of watching these heifers, the Taylors choose the replacement heifers that will join their registered herd as producing cows. Heifers are selected for size as determined by weights and measurements, pedigree, conformation, percentage of Simmental blood, and several other factors.
Every calf wintered on the Taylor ranch is weighed at least at birth and weaning, and is measured and weighed again at approximately one year of age. These measurements, of which there are eight, are used separately and in ratios to indicate the size, balance and proportion of the animal's body. Ratios of these measurements are used in the analysis of these numbers. For example, the ratio of the girth to the height will become smaller as the animal gets too tall for its heart girth and, therefore, its body size. An animal conformed like that would require too much feed for the amount of edible meat it would produce because it would have too much useless bone in its legs. The Taylors monitor these ratios carefully to note trends and to aid their selective breeding decisions.

Causes of Problems

The American Simmental Association (ASA), the national registry for Simmental cattle, provides exceptional computerized services for its members. However, with a herd the size of the Taylors', the large amounts of paperwork from ASA can become hard to organize and the data is impossible to resort for specific analysis. Because of these limitations and Mrs. Taylor's busy schedule (she drives 70 miles to work four days a week), the Taylors decided a computer was the only way to get the most out of the information they had available. Among the stores Mrs. Taylor shopped at was Emery Computers of Helena, where she talked to the Senior Marketing Representative, Mr. Paul Paulsen. After asking Mrs. Taylor about her needs and experience with computers, he decided her complex and specific situation and lack of experience indicated that she would need to hire a consultant. He called me.
Determination of Software Needs

When I talked to Mrs. Taylor, I needed her answers to questions that would allow me to make the right software recommendations. First I needed to know what she wanted a computer to do for her. She wasn't exactly sure what a computer was capable of, but she wanted all her extensive herd records filed and mathematical calculations automated. She also mentioned financial record keeping as something she wanted to computerize. And she wanted graphics capabilities. From this information, I determined that the Taylors needed an integrated spreadsheet and a programmable, relational database. Both these programs would have to be very powerful in order to handle the large amount of complex data they wanted to process. Both these types of software are available for the two operating systems I was considering: MS-DOS and Macintosh.

Operating Systems

There are two questions I ask someone who needs to choose which operating system he would be the most comfortable with. First I ask if they are familiar with MS-DOS; then I ask if they need to transfer data to another computer. I asked Mrs. Taylor if either of the Taylors had experience with MS-DOS; if they had been familiar with that operating system I would have been inclined in that direction. However, neither of the Taylors had any prior experience with either type of computer; they would have to learn completely from the beginning and they had little time to devote to learning. Next I asked Mrs. Taylor if she thought they would ever need to or want to link their computer to another computer. She told me they did not need this option. However, she expressed a desire to link to the head office of the ASA
someday because she could save time sending registration applications and other required data to ASA.

Her answers to these questions left me with a split decision. The Taylors' lack of computer experience and the shorter learning time required by the Macintosh made me lean strongly toward that operating system because it is easier to learn and requires almost no memorization. All Macintosh programs use the same menu-driven interface. However, when data compatibility is an issue, the prominence of the MS-DOS system generally makes that system the only choice. Research into the ASA's computer system and data transfer operations was needed. Fortunately, ASA's head office is in Bozeman, Montana, so this was not difficult.

When I talked to the staff at ASA, they assured me that data could be read by their computer if it was on an IBM formatted disk or through a modem in ASCII. Since they are willing to give me the file specifications, which are the directions for how the data is to be organized when it enters the receiving computer, the type of operating system used by the rancher is not a problem. The only relevant consideration was that the herd management software be capable of writing and reading ASCII files. This posed no significant difficulty.

Software Options

Because of the modem option for transferring data to ASA, I felt more comfortable recommending Macintosh software for the Taylors. The significantly shorter learning time required by the Macintosh was the overriding factor in this decision. The next step was to pick out the specific software packages. There is only one powerful integrated spreadsheet for the Macintosh, and that is Microsoft, Inc's Excel™. However, it is an
excellent choice. The program is fast, powerful, easy to use, and it has exceptional graphics capabilities. Choosing the database program was more difficult.

There are two high quality databases I could choose from: Double Helix and Omnis 3 Plus™. Both are programmable and relational. The former is icon-based, easy to use, relational, and fairly powerful. It is also a top reports generator, which was important for our purposes, and has limited graphics capabilities. Omnis 3 Plus™, on the other hand, is more difficult to learn, requires at least some programming for many applications, and does not support graphics internally. However, both Excel™ and Omnis 3 Plus™ support SYLK files, which means each can read files created by the other. Since the cattle herd data can be transferred from the database to a program with exceptional graphics, graphics in the database program was an expendable concern. Since Omnis 3 Plus™ has many features Helix does not, is exceptionally powerful, and runs much faster, Omnis 3 Plus™ was the final choice.

The final package purchased by Taylors included:

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple Macintosh Plus</td>
<td>Microsoft Excel™</td>
</tr>
<tr>
<td>20 Megabyte hard drive</td>
<td>Omnis 3 Plus™</td>
</tr>
<tr>
<td>Imagewriter II printer</td>
<td></td>
</tr>
</tbody>
</table>

**Contract**

Our arrangement stated that I would write the herd management program in Omnis 3 Plus™ for a flat fee. Because this fee would not sufficiently compensate me for the hundreds of hours I have and will put into
writing this program, I retained ownership and marketing rights to the program.

**Specific Needs**

The next step was to determine, out of the Taylors' unending list of "things this computer should do," which features had to be included in the original beta test version of the herd management program. In other words, what were the bare necessities? After talking to the Taylors at length, I decided that five major areas should be addressed. They need some facility to handle information about bulls on test, a cow's lifetime production, comparison factors for sires, and measurement ratios. In addition, I convinced Taylors that occasionally it would be advantageous to be able to pull up only an individual's statistics. My next step was to determine what programming problems I would run into in the process of providing the solutions to these situations.

**Implementation Obstacles--Calculations**

There are four particularly time-consuming (and error-prone) calculations my program would need to automate: adjusted weights, weight per day of age (WDA), average daily gain (ADG) and indices. Indices are a mathematical method of trait comparison within a herd, while adjusted weights, ADGs, and WDAs are valuable for in-herd and general comparisons. A calf's index for a particular weight or measurement is the percent the calf is, for this weight or measurement, of the average of his contemporaries (usually herd mates of the same gender). For example, if the average weight of Taylors' yearling bulls is 1,000 pounds, a bull which
weighed 1,100 pounds would have an unadjusted yearling weight index of 110.

Adjusted Weights

Both 205-Day and 365-Day adjusted weights are commonly used by cattlemen to compare calves raised under different conditions. Although all conditions cannot be factored out, these formulas eliminate two important sources of difference: the age of the dam at birth of the calf and the age of the calf when weaned. A young cow will give birth to a smaller calf, produce less milk, and wean a smaller calf than will an older cow, all other things being equal. Obviously a calf that is eight months old when weaned has an advantage over a calf that is only six months old if actual weaning weights are used as the comparison factor. The 205-Day Adjusted Weight and the 365-Day Adjusted Weight adjust the calf's weight backward or forward to the weight the calf would have been, based on its current weight, on the 205th or 365th day of its life. Then a factor is added to the calf's weight to compensate those calves born to either very young or very old cows. The adjustment factors vary from breed to breed. The exact formula and the table of adjustment factors from the ASA Bylaws are in Appendix A.

Average Daily Gain and Weight per Day of Age

The two remaining calculations, ADG and WDA, are both partial measurements of feed conversion efficiency. ADG measures the number of pounds an animal gains per day while on feed. This is an important factor for feedlot operators and cattlemen who retain ownership in their commercial calves at the feedlot. The WDA is calculated by dividing the weight by the days of age. It is especially important as a trend. Cattle should have a high
WDA to a point in age, and then this measurement should begin to decline. When an animal has passed slaughter age and reached reproductive age, maximum economic utility dictates that its energy no longer be used to produce more red meat but rather to produce offspring.

**Description of Program**

The purpose behind this program can be summed up in one word: efficiency. My goal was to create a program that would be as easy as possible to use, yet provide the rancher with an effective way to organize and analyze his complex herd records. I decided the most logical flow for this program would be to follow as closely as possible in the data entry process the development of a calf from conception until it leaves the herd. This approach should blend the use of the computer into everyday life on the ranch as painlessly as possible.

In a programmable database like Omnis 3 Plus™, a basic framework for a database is provided along with a method to modify this framework into a stand alone computer program. This method is generally some form of a programming language; it is called "sequences" in Omnis. These sequences allow the programmer to modify screens, create menus, and specify screen buttons as well as the more traditional programming functions like calculations and logical functions. Rather than explain all the details of my program's source code, a listing of the code is provided in Appendix B.

Because Omnis 3 Plus is a programmable database, the application for herd management is a separate turnkey application. When the user double clicks on the icon entitled "SimmentalSystems," the program begins running. Four menus, (File, Edit, Input Records, and Reports) appear on the menu
bar. The first two are standard Macintosh menus; the last two are specific to this program. The several options under the Input Records menu correspond to occasions when information is gathered about cattle. Each option will display a different data entry layout. Breeding Season, Calving Season, Weaning Weights, On Test, Yearling Weights, and Measurements are these options. In addition, an option called Other Editing is included. This layout displays all the information known about one animal on one screen. The other menu options lead to layouts which are more attractive and allow the user to input only certain information. For example, one layout is used during calving season and only prompts the user to enter data learned at that time of year, such as birth weight and sex. "Sequences" are attached to these layouts; that is a term used in Omnis 3 Plus™ for its programming code. These programs use the information which was recently added to the animal's record to perform the various calculations discussed earlier. For example, when the date weighed and the weight are entered at weaning time, the operator can specify to the computer that it should calculate the 205-Day Adjusted Weight from this information. A message box will appear on the screen to tell the operator what that calf's 205-Day Adjusted Weight is. What follows is a step-by-step description of the process of entering data and printing reports. Each option of the two menus which functions in the beta test version is discussed. Some options under the Reports menu are future plans and are not currently functional.

Input Records Menu

The options under the Input Records menu allow the user to select the type of data he has ready to enter. Each of these options is discussed in turn.
Breeding Season

When the option "Breeding Season" is chosen, a screen appears which indicates that the user should choose either "Artificial" or "Pasture" from the new menu. Each option takes the user to a different screen. The two entry screens are similar; the only difference is the terms "date turned out" and "date AI'd." When the option "Pasture" is taken, the following screen appears. The cursor is automatically ready to create a new record and is flashing in the Bull's ID space. When the Bull's ID is entered, his name automatically appears and the cursor moves to the Cow's ID space. Then the date the cow was artificially inseminated or the date the bull was turned out, depending on the case, are typed into the respective blanks. When the user clicks on the OK button or hits the return key, the computer automatically creates a record for this unborn calf. The program calculates the date the record is created and an expected birth date for the calf. These calculations take place invisible to the user, since none of them are of any interest to a rancher at this point. When all matings are entered for the year, this phase of data entry is completed.
Calving Season

When a calf is born the record which was created at conception must be edited. The first step is to find the calf's record. At this point it does not have a unique identifier, like an ID number or tattoo. In order to find the calf's record the Find button is clicked, the cow's number is typed in, and the return key is pressed. This will find one of the cow's calves' records. If it is not the correct offspring (this can be determined by the date of birth) then clicking the Next button will locate the record of another calf out of this cow. Continue clicking on the Next button until the newborn's record is located. Pressing the Edit button will then allow the user to enter the new information such as the calf's ear tag number (ID), birth weight and gender. The date of
birth appears on the screen. This was calculated during breeding season for two purposes. As mentioned before, it provides an easy method of identifying the correct record among the dam's offspring. In addition, it provides the rancher with an automatic comparison between the date the cow should have calved and actually did calve. For instance, if several cows were artificially inseminated to the same bull and his calves are consistently born later than the average gestation indicated they should be, the user would be alerted to this each time a calf was born.

![Calving Season Information Screen](image)

Figure II. Calving Season Information Screen.

When all the newly acquired information is entered correctly, the return key is pressed and the Calc Now button is clicked. Pressing the return
key updates the files with the new information. Clicking the Calc Now button calculates the correct age of dam adjustment factor for the calf, based on the ASA age of dam adjustment factors for the dam's date of birth, the date the calf was born, and the calf's sex. This factor, which is a number between zero and 81.2, will be used later to calculate adjusted weights. The values of the adjustment factors vary from breed to breed. The following message box appears on the screen after the Calc Now button is clicked.

![Adjustment Factor is: 66.70](image)

Figure III. Age of Dam Adjustment Factor Message Box.

**Weaning Weights**

After the adjustment factor is determined and the calf's weaning weight is taken the fall after its birth, the 205-day adjusted weight can be calculated. The menu option Weaning Weights takes the user to the screen which appears below. Clicking the Find button, typing the calf's number, and pressing return, will cause the correct record to appear. Clicking the Edit button will allow this record to be amended. The date the calf is weighed, the actual weaning weight, and the horn status are typed and the return key is pressed to update the files with the new information.
After these additions and changes are made, clicking the Calc Now button tells the computer to calculate the 205-day adjusted weight. It does so using the standard formula from the ASA bylaws, which can be found in Appendix A. After the calculation is complete, a message box like the one below appears and tells the user what the calf’s 205-Day Weight is.

CALF # B1010’s 205 DAY WEIGHT IS: 580.35

Figure V. 205-Day Adjusted Weight Message Box.
Test Information

Usually the next step in a bull calf's life is to be put in the feedlot for performance testing. All the various dates and weights are entered on the same screen, which is accessed by selecting the On Test option. The following screen appears.

![On Test Information Screen]

Figure VI. On Test Information Screen

Again the calf’s record is found by clicking Find, typing the ID number, and pressing the return key. The Edit button is clicked when the user wishes to make changes in the record. The date the cattle are started on full feed and the initial weight are entered in the first rectangle. At this point no calculations are needed, so the user merely enters the new data by pressing
the return key. When the test weights are taken, they are entered, along with the respective dates. After each weight session's data is entered for this calf, the return key is pressed and the appropriate button is clicked. For example, after 56-day weights are entered for this animal, the Calc 56 button is clicked. Then the ADG and WDA for this test period are calculated. A message box appears and informs the user immediately what this calf's ADG and WDA are. This appears below.

![56-DAY ADG IS: 3.60 56-DAY WDA IS: 2.68](image)

Figure VII. On Test Message Box.

**Yearling Information and Measurements**

 often yearling weights and measurements are taken at the same time. To facilitate data entry in these cases, all of this information is entered on the same screen, which appears when the Yearling Info option is selected from the menu. If the weights and measurements are taken on different dates, this screen can be accessed more than once; the dates for weights and measurements are entered in different spaces for this reason.
The calf's record is found using the method described for the other entry layouts. Then the yearling weight and the date that it was taken are entered. If that is all the information gathered about that calf so far, the return key can be pressed at this stage. However, if the measurements are available also, the user can continue entering that data as well. An error message will appear if the operator tries to enter a value in the field for testicle circumference if the animal is a heifer. After all information is correctly typed, the user enters the updates by pressing the return key. The Calc Now button is then clicked to calculate the 365-day adjusted weight. It is calculated using the standard ASA formula which can be found in Appendix A. Again a message box informs the user of the result of the new calculation.
Other Editing

The Other Editing option brings the user to a screen with the complete history of one animal on one screen. It serves two purposes: it facilitates programming because it shows the results of any calculations that do not require user intervention, and it allows the user to change any information he may want to at any time, including information such as prices or status in the herd (sold, dead, still in herd, etc) which is not currently available on other screens.

Reports Menu

The options under the reports menu allow the user to select from several printed reports. Each of these options is discussed in turn.

On Test Report

A listing of the weights, calculations, and indices of the bulls on test would provide the Taylors with a valuable advertising tool to combat the flood of advertising potential customers receive from bull sale managers during late winter and early spring. In addition, running such a report would
be an easy way to detect poor feedlot performance by any bulls (this would enable the Taylors to cull them earlier, thereby saving feed).

The reports I designed to handle test information will facilitate both advertising and culling. When the user chooses the On Test option, the last two menus are replaced on the menu bar with a new menu called Test Dates. The option under the new menu allow the user to specify which weight date's (56, 84, 112, Final) information the report should use. The following data is listed for each bull: sire, dam, date calved, gestation (only for those calves which are the product of artificial insemination), birth weight, 205-day adjusted weight and its index, the most recent test weight taken, the ADG and its index, and the WDA and its index. The bulls' records can be sorted on any of these factors, except gestation length. This is an example of the report:

<table>
<thead>
<tr>
<th>Calf ID</th>
<th>Sire</th>
<th>Dam</th>
<th>DoB</th>
<th>Gest. Days</th>
<th>Birth WT</th>
<th>205-Day Adj. WT</th>
<th>56-Day Ind</th>
<th>A.D.G. Ind</th>
<th>W.D.A. Ind</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1012</td>
<td>A0001</td>
<td>A0012</td>
<td>3/10/86</td>
<td>98</td>
<td>573</td>
<td>96</td>
<td>970</td>
<td>4.74</td>
<td>125</td>
</tr>
<tr>
<td>HX011</td>
<td>XXXXX</td>
<td>C1011</td>
<td>3/31/86</td>
<td>74</td>
<td>630</td>
<td>106</td>
<td>890</td>
<td>3.86</td>
<td>102</td>
</tr>
<tr>
<td>H1011</td>
<td>A0001</td>
<td>A0011</td>
<td>3/9/86</td>
<td>96</td>
<td>550</td>
<td>93</td>
<td>890</td>
<td>4.04</td>
<td>106</td>
</tr>
<tr>
<td>HX010</td>
<td>XXXXX</td>
<td>C1010</td>
<td>3/16/86</td>
<td>100</td>
<td>625</td>
<td>105</td>
<td>855</td>
<td>2.54</td>
<td>67</td>
</tr>
</tbody>
</table>

Figure X. On Test Report
Cows Option-Cows Menu-Production Card Option

The cow-production record report will be very useful for culling cows, choosing replacement heifers, and advertising. Each of the cow's calves is listed by sex in chronological order of birth date. The following information is given for each calf: ID number, sire, sex, birth weight, 205-day adjusted weight, ADG and WDA for bull calves, 365-day adjusted weight, and, perhaps the most important point, the price if the calf was sold privately. This is what the report looks like.

Taylor Simmental Ranch  
Helmville, Montana  
MAR 25 87

<table>
<thead>
<tr>
<th>Cow's ID</th>
<th>Calf's ID</th>
<th>Sire</th>
<th>Sex</th>
<th>Birth</th>
<th>205-Day</th>
<th>A.D.G</th>
<th>365-Day</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0010</td>
<td>B1010</td>
<td>A0001</td>
<td>B</td>
<td>96</td>
<td>551</td>
<td>2.90</td>
<td>986</td>
<td>1000</td>
</tr>
<tr>
<td></td>
<td>H1010</td>
<td>A0001</td>
<td>B</td>
<td>100</td>
<td>617</td>
<td>0.00</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gender Averages:</td>
<td></td>
<td></td>
<td>98</td>
<td>584</td>
<td>2.90</td>
<td>943</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C1010</td>
<td>A0001</td>
<td>H</td>
<td>98</td>
<td>580</td>
<td>3.73</td>
<td>1154</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Gender Averages:</td>
<td></td>
<td></td>
<td>98</td>
<td>580</td>
<td>3.73</td>
<td>1154</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overall Averages:</td>
<td></td>
<td></td>
<td>98</td>
<td>583</td>
<td>2.21</td>
<td>1013</td>
<td></td>
</tr>
</tbody>
</table>

Figure XI. Cow Card Report

Bulls Option

Under the reports menu, the option Bulls will produce a report which is useful in evaluating and comparing bulls' performances as sires. The report lists these data for each bull: number of calves, average birth weight, average 205-Day weight, average 365-Day weight, average ADG,. Here is an example.
Individual Option

Bull-buying season is one of the most important times to have good records. Bull buyers need to know a great deal of information and don't want to spend much time finding it. I designed a special report for these circumstances because so much of the income of a registered cattle operation comes from bull sales. This report gives all the information known to date about this animal’s individual statistics, but it does not rank or compare this bull to the others. A ranch needs to sell both its best bull and its worst bull. However, it is not necessary to impress upon a potential buyer of the latter that he is a poor judge of bulls. This is the report.
ID Number: B1010  Date of Birth: APR 2 80  ASA Number: 25982
Name: B1010  Gestation: 292  Color: RWF  Horn Status: Horned

Weights:     Indices:     Measurements:     Ratios:
Birth Weights: 96  Index:     Girth: 73  Girth/Top: 1.06  
Rump Length: 20  Girth/Height: 1.46  
205-Day Adj: 785  Index:     Topline: 69  Girth/Rump W: 3.48  
2/3 Topline: 49  Girth/Rump L: 3.65  
ADG on Feed: 2.90  Index:     Rump Width: 21  Girth/Shoulder: 3.84  
Shoulder: 19  Ht/Rump L: 2.50  
WDA: 2.64  Index:     Rump Height: 50  Ht/Rump W: 2.38  
Thurl: 7  Ht/Thurl: 7.14  
365-Day Adj: 1145  Index:     Testicles: 33  

Figure XIII. Individual Report

Measurement Ratios Report

Most of the Taylors' selective breeding is done by comparing measurement ratios. For this reason they need a listing of all the measurement ratios for comparison purposes. Each of the ratios the Taylors requested is listed together with the sire and dam of the individual. This report appears as follows:

TAYLOR'S SIMMENTAL RANCH
HELMVILLE, MONTANA
MAR 25 87

<table>
<thead>
<tr>
<th>CALF</th>
<th>Sire</th>
<th>Girth</th>
<th>Girth</th>
<th>Girth</th>
<th>Girth</th>
<th>Ht</th>
<th>Ht</th>
<th>Ht</th>
<th>365</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ID</td>
<td>Dam</td>
<td>Top</td>
<td>Height</td>
<td>Rump W</td>
<td>Rump L</td>
<td>Shoulder</td>
<td>Rump L</td>
<td>Rump W</td>
</tr>
<tr>
<td>HX012</td>
<td>XXXX</td>
<td>B1012</td>
<td>1.08</td>
<td>1.36</td>
<td>3.89</td>
<td>2.67</td>
<td>1.37</td>
<td>1.02</td>
<td>3.21</td>
</tr>
<tr>
<td>HX010</td>
<td>XXXX</td>
<td>C1010</td>
<td>1.31</td>
<td>1.47</td>
<td>3.25</td>
<td>2.97</td>
<td>1.51</td>
<td>1.00</td>
<td>3.21</td>
</tr>
</tbody>
</table>

Figure XIX. Measurement Comparison Report.
Market Research Section

Since I had retained ownership on this program, I decided it might be interesting to do some limited market research to decide if I have developed a marketable product or not. This was not intended to be full-scale, statistically correct research. I merely wanted to discuss record keeping and computers with some Simmental breeders to learn about my potential market. The actual survey questions are in Appendix C. Questions one through six were asked of everyone who agreed to answer the survey. The first three questions were asked to determine how detailed the respondent's record keeping system is. Question number two was eventually thrown out because people found it too difficult to answer. The first four respondents indicated that they could not accurately estimate the amount of time they spent with their record keeping because it varied, was often done along with other work such as income taxes, or was done frequently and for short durations (like recording a new calf's birth, which takes only five minutes, but it may be done 300 times a year). The answer to question number six determined which of the remaining questions were asked of the respondent. If he answered yes, then I asked questions ten through thirteen, if he answered no I asked question twenty. Question ten asked what brand of computer he owned, question eleven inquired whether or not he hired a consultant, and the third asked the price range for his computer. The last question in this section asked about the experience of the rancher with computers prior to his purchasing one. If the respondent answered no to question number six, then I asked them question number twenty. This question separated out the people who would never be open to computerization, no matter what the advantages.
The remaining respondents were asked questions twenty one through twenty six. Twenty one asked if he had a brand preference. From this question I wanted to learn if a bias against Macintoshes existed. My next question asked for the two most important factors out of a list of five. Price, availability of service, availability of specialized agricultural software, familiarity with brand of computer, and ease of use were my five choices. Question twenty three listed four types of tasks which are often computerized and asked the respondent which he would require in his system. The four tasks were: herd records, financial information, mailing lists, advertising design. For question 24 I asked if he would consider hiring a consultant if he purchased a computer. Next I asked for the price range the respondent would consider spending. Since my software requires a Macintosh Plus and a 20 meg hard drive, people who could not or would not spend at least $5,000 are not part of my target market. The last question in this section asked about the person's experience with computers. This market may be primarily made of inexperienced users.

I asked everyone questions thirty and thirty one, unless he answered no to number twenty (i.e., that he would never consider buying a computer) These questions inquired if the person knew about the Apple Macintosh and whether he would be interested in comprehensive herd management software for the Macintosh.

My population for the sample was the list of Montana ASA members which Mrs. Taylor gave me. These names were entered into an Omnis 3 Plus™ database which holds names and addresses. The list contained 172 names after duplicate names and the MSU Bobcat Booster Club (yes, it is on the membership list) were eliminated. I decided I wanted a random sample of 5%, or seven usable responses. Because I did not have telephone numbers
and I did not know whether or not the people listed were still in the Simmental business, I started with the first thirty usable numbers from a random number table found in the back of a statistics textbook. The first thirty numbers under 172 yielded twenty-six usable names after rejecting duplicate numbers and other eliminating factors. I was unable to get phone numbers for six names. I began calling until I had the seven good responses. By good response I do not mean a response I found favorable but complete surveys. For example, one elderly gentleman answered questions until it became apparent that he had no idea what he was talking about. It turned out that his son had been a rancher but had gone broke, sold all the cattle, and moved to Kansas. The gentleman I was talking to had not been involved with the cattle and knew nothing about them. I didn't ask him any further questions nor was he among my seven "good" responses.

Although I tried to take a random sample, I suspect two factors might make my sample biased. Most of the telephone numbers I was unable to find were in smaller towns in the far western part of Montana. It is also possible that I unintentionally biased the results when I choose which people to call from the twenty options. Despite the lack of statistical correctness, this research was interesting and educational. Without detailing every response or analyzing every possible combination of data, the following information sums up some basic information and two particular points I found interesting or surprising.

**Basic Information**

Of my seven respondents, one did not own a computer and would not buy one, one did own a Commodore 64, and the other five did not own one but would consider the idea. One of these was planning a purchase in the near
future. The one man who was not interested in buying a computer said he did not have time to learn to run one as well as the consultants he could hire. Only one of the respondents owns more than one hundred and fifty head of purebred cows.

**Actual vs Adjusted Weights**

From the answers to number three I wanted to learn, among other things, whether ranchers differentiated between adjusted weights and actual weights. I would have anticipated that adjusted weights would be far more important in the selection process than would actual weights. However, only one man felt the 205-day adjusted weight was more important than the actual weaning weight and the 365-day adjusted weight more valuable than the actual yearling weight. One woman did not calculate adjusted weights at all, despite the fact that this service is offered by ASA. One man actually ranked adjusted weights as significantly less important than the actual weights. This trend surprised me because selecting for actual rather than adjusted weights will give the advantage to the oldest calves that were born of middle-aged cows rather than the calves with superior genetics.

**Familiarity and Interest in Macintosh Computers**

Since my software only runs on a Macintosh, I was particularly interested in the responses to my last two questions. I was surprised to learn how many ranchers had seen or heard of the Apple Macintosh. Four of the six had seen or heard of them. Although three of these four said they were not interested in agricultural software for the Macintosh, one mentioned a lack of service in her town (which is not really the case there) and one mentioned that the Macintosh software would not link to the ASA computer.
Later versions of my software will solve this problem. That left me with three people who would be interested in a herd management software package for the Macintosh, a more hopeful result than I had expected. The following graph illustrates the breakdown of answers for the last two questions.

![Interest in Macintosh Software by Familiarity with Computer](image)

Figure XX. Familiarity and Interest in Macintosh Computer

**Market Research Conclusions**

In general, I learned a great deal from the market research aspect of this project. For one thing, making survey telephone calls takes a great deal of time and is generally unpleasant. I will definitely think twice before I decide to conduct telephone surveys. Also, I had expected to encounter more opposition to the idea of computers in the cattle industry. I was encouraged to discover that many people were interested in computerizing and actually
had a little experience with the machines. Another important point was that people were biased toward IBM-compatible machines. I had expected this since the herd management software in existence and the ASA computer are both this type. Although I was slightly encouraged by the results in Figure XX above, which showed half my respondents were interested in Macintosh software, the bias which exists toward IBM computers indicates to me that caution is in order. My final conclusion is that I will have a marketable product when the feature for data transfers to ASA is completed; however, I am not going to be able to retire off the proceeds from this software.

Conclusions and Remarks

Taken together, writing this program and doing the market research have definitely been the biggest challenge of my life. Since the Taylors are real people with a very large real investment, this project has been much more demanding than classroom assignments and the responsibility has, on occasion, been frightening. However, knowing that this software will make a difference in a ranch's productivity has made the completion of even this first version worth the effort. Now I'm ready to work on the first updated version!
APPENDIX A

AMERICAN SIMMENTAL ASSOCIATION
AGE OF DAM ADJUSTMENT FACTORS
AND
ADJUSTED WEIGHT FORMULAS
Age of Dam Adjustment Factor Table from American Simmental Association Bylaws:

<table>
<thead>
<tr>
<th>Age of Dam in Years</th>
<th>Bull Calf</th>
<th>Heifer Calf</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 2</td>
<td>81.2</td>
<td>60.2</td>
</tr>
<tr>
<td>2 - 2.5</td>
<td>66.7</td>
<td>48.4</td>
</tr>
<tr>
<td>2.5 - 3</td>
<td>52.6</td>
<td>37.8</td>
</tr>
<tr>
<td>3 - 3.5</td>
<td>36.4</td>
<td>26.0</td>
</tr>
<tr>
<td>3.5 - 4</td>
<td>24.9</td>
<td>17.8</td>
</tr>
<tr>
<td>4 - 4.5</td>
<td>13.6</td>
<td>10.3</td>
</tr>
<tr>
<td>4.5 - 5</td>
<td>6.4</td>
<td>5.3</td>
</tr>
<tr>
<td>5 - 9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9 - 10</td>
<td>2.4</td>
<td>3.4</td>
</tr>
<tr>
<td>10 - 11</td>
<td>6.1</td>
<td>7.9</td>
</tr>
<tr>
<td>&gt; 11</td>
<td>11.3</td>
<td>13.6</td>
</tr>
</tbody>
</table>

205-Day Adjusted Weight Formula:

\[
205\text{-Day Adjusted Weight} = \left(\text{Weaning WT - Birth WT}\right) \times 205 + ADF
\]

(date weighed - date calved)

365-Day Adjusted Weight Formula:

\[
365\text{-Day Adjusted Weight} = \left(\text{Yearling WT - Birth WT}\right) \times 365 + ADF
\]

(date weighed - date calved)
APPENDIX B

"SimmentalSystems" SOURCE CODE
2 Artificial/A
---
Goto screen 3

Repeat
Prepare for Insert
Enter data []
If Flag False
  Quit all sequences
End If
Calculate CDOB as CDATAID+270
Calculate CDATCRT as #D
Update files
Calculate #P as 3
Calculate #S1 as CSIREID
Calculate #3 as CSQUEC (0 dps)
Find on CIDNUM [#S1]
Calculate #P as 4
Calculate #3 as CSQUEC (0 dps)
Calculate #P as 3
Find on CSQUEC [#3]
Prepare for Edit
Calculate #P as 4
Calculate CSTRESQ as #3
Update files
Calculate #P as 5
Calculate #S2 as CDAMID
Find on CIDNUM [#S2]
Calculate #3 as CSQUEC (0 dps)
Calculate #P as 3
Find on CSQUEC [#3]
Prepare for Edit
Calculate #P as 5
Calculate CDAMSQ as #3
Update files

Until Flag False

3 Pasture/P
---
Goto screen 2

Repeat
Prepare for Insert
Enter data []
If Flag False
  Quit all sequences
End If
Calculate CDOB as CDATAID+270
Calculate CDATCRT as #D
Calculate CDATAID as
Update files
Calculate #P as 3
Calculate #S1 as CSIREID
Calculate #3 as CSQUEC (0 dps)
Find on CIDNUM [#S1]
Calculate #P as 4
Calculate #3 as CSQUEC (0 dps)
Calculate #P as 3
SELECTED SEQUENCES FOR EBREEDN AS AT MAR 30 87

Calculate #P as 5
Calculate #S2 as CDAMID
Find on CIDNUM [#S2]
Calculate #3 as CSQUEC (0 dps)
Calculate #P as 3
Find on CSQUEC [#3]
Prepare for Edit
Calculate #P as 5
Calculate CDAMSQ as #3
Update files
Until Flag False

No errors found
SELECTED SEQUENCES FOR ECALVIN AS OF MAR 30 87

30 Find Button
---------------
Find (prompted) []

31 Next Button
---------------
Next on CDAMID

32 Previous Button
---------------
Previous on CDAMID

33 Edit Button
---------------
Prepare for Edit Enter data Update files []

34 FINISHED BUTTON
---------------
Prepare for Edit
Calculate #P as 3
Calculate #10 as CDOB
Calculate #32 as CIDNUM
Find on CIDNUM [CDAMID]
Calculate #P as 3
Calculate #9 as CDOB
Calculate #1 as (#10-#9)/365  (2 dps)
OK message [The dam was ;#1; years old at calf's birth.]
Calculate #P as 3
Find on CIDNUM with exact match [#S2]
IF CSEX='B'
Prepare for Edit
IF #1<2
  Calculate CDAMADJ as 81.2
ELSE IF (#1>=2) & (#1<2.5)
  Calculate CDAMADJ as 66.7
ELSE IF (#1>=2.5) & (#1<3)
  Calculate CDAMADJ as 52.6
ELSE IF (#1>=3) & (#1<3.5)
  Calculate CDAMADJ as 36.4
ELSE IF (#1>=3.5) & (#1<4)
  Calculate CDAMADJ as 24.9
ELSE IF (#1>=4) & (#1<4.5)
  Calculate CDAMADJ as 13.6
ELSE IF (#1>=4.5) & (#1<5)
  Calculate CDAMADJ as 6.4
ELSE IF (#1>=5) & (#1<9)
  Calculate CDAMADJ as 0
ELSE IF (#1>=9) & (#1<10)
  Calculate CDAMADJ as 2.4
ELSE IF (#1>=10) & (#1<11)
  Calculate CDAMADJ as 6.1
ELSE IF (#1>=11)
  Calculate CDAMADJ as 11.3
End If
SELECTED SEQUENCES FOR ECALVIN AS AT MAR 30 87

Calculate CDAMADJ as 60.2
Else If (#1>=2)&(#1<2.5)
    Calculate CDAMADJ as 48.4
Else If (#1>=2.5)&(#1<3)
    Calculate CDAMADJ as 37.8
Else If (#1>=3)&(#1<3.5)
    Calculate CDAMADJ as 26
Else If (#1>=3.5)&(#1<4)
    Calculate CDAMADJ as 17.8
Else If (#1>=4)&(#1<4.5)
    Calculate CDAMADJ as 10.3
Else If (#1>=4.5)&(#1<5)
    Calculate CDAMADJ as 5.3
Else If (#1>=5)&(#1<9)
    Calculate CDAMADJ as 0
Else If (#1>=9)&(#1<10)
    Calculate CDAMADJ as 3.4
Else If (#1>=10)&(#1<11)
    Calculate CDAMADJ as 7.9
Else If (#1>=11)
    Calculate CDAMADJ as 13.6
End If
Update files
OK message [Adjustment Factor is: CDAMADJ;]
Else
    OK message [Calf's sex is incorrectly defined. Must be 'H' or 'B'.]
End If

No errors found
SELECTED SEQUENCES FOR EWANIN AS AT MAR 30 87

25 Find Button
--------------
Find (prompted) []

26 Next Button
--------------
Next on CIDNUM

27 Previous Button
------------------
Previous on CIDNUM

28 Edit Button
---------------
Prepare for Edit  Enter data  Update files []

30 205-DAY ADJ WEIGHT
----------------------
Prepare for Edit
Calculate C205WT as (CWNWT-CBWT)/(CDATWN-CDOB)*205+CDAMADJ+CBWT
OK message  Small window [COLF # ;CIDNUM;'S 205 DAY WEIGHT IS: ;C205WT;]
Calculate #P as 5
Calculate #1 as #1+C205WT (2 dps)
OK message  Small window [TOTAL IS: ;#1;]
Update files

31 Finish Session Button
------------------------
YES/NO message  Default to YES  [Add to existing totals?]
If Flag True
  Prepare for Edit
  Find on YEAR  [DTY(CDOB)]
  Calculate T205WTS as T205WTS+#1
  Update files
  OK message  [TOTAL IS NOW ;T205WTS; YEAR IS NOW ;YEAR;]
Else If Flag False
  Prepare for Insert
  Calculate YEAR as DTY(CDOB)
  Calculate T205WTS as #1
  Update files
  OK message  [TOTAL IS NOW ;T205WTS; YEAR IS NOW ;YEAR;]
End If

No errors found
30 Calc 56 Button
-----------------
Prepare for Edit
Calculate C56ADG as (C56WT-CSTWT)/(CDAT56-CDATST)
Calculate C56WDA as C56WT/(CDAT56-CDOB)
OK message Small window [56-DAY ADG IS: ;C56ADG; 56-DAY WDA IS: ;C56WDA;]
Update files

31 Calc 84 Button
-----------------
Prepare for Edit
Calculate C84ADG as (C84WT-CSTWT)/(CDAT84-CDATST)
Calculate C84WDA as C84WT/(CDAT84-CDOB)
OK message Small window [84-DAY ADG IS: ;C84ADG; 84-DAY WDA IS: ;C84WDA;]
Update files

32 Calc 112 Button
------------------
Prepare for Edit
Calculate C112ADG as (C112WT-CSTWT)/(CDAT112-CDATST)
Calculate C112WDA as C112WT/(CDAT112-CDOB)
OK message Small window [112-DAY ADG IS: ;C112ADG; 112-DAY WDA IS: ;C112WDA;]
Update files

33 Calc Final Button
---------------------
Prepare for Edit
Calculate CFINADG as (CFINLWT-CSTWT)/(CDATFIN-CDATST)
Calculate CFINWDA as CFINLWT/(CDATFIN-CDOB)
OK message Small window [FINAL ADG IS: ;CFINADG; FINAL WDA IS: ;CFINWDA;]
Update files

34 Next Button
--------------
Next on CIDNUM

35 Find Button
--------------
Find (prompted) []

36 Edit Button
--------------
Prepare for Edit Enter data Update files []
Calculate #ER as 4

37 Quit Button
--------------
Calculate #S1 as 'QUIT'
Quit sequence

No errors found
SELECTED SEQUENCES FOR EYEARLN AS AT MAR 30 87

25 Find Button
-------------
Find (prompted) []

26 Next Button
-------------
Next on CIDNUM

27 Previous Button
-------------
Previous on CIDNUM

28 Edit Button
-------------
Prepare for Edit Enter data Update files []

29 Calc Weights Button
-----------------------
OK message Small window [GOT TO CALC SQUEC]
Prepare for Edit
Calculate C365WT as (CYRWT-CBWT)/(CDATYR-CDOB)*365+CDAMADJ+CBWT
OK message Small window [CALF # ;CIDNUM;'S 365 DAY ADJUSTED WEIGHT IS: ;C365WT;]
Calculate #P as 5
Calculate #1 as #1+C365WT (2 dps)
OK message Small window [TOTAL IS: ;#1;]
Update files

30 365-DAY ADJ WEIGHT
-----------------------
OK message Small window [GOT TO CALC SQUEC]
Prepare for Edit
Calculate C365WT as (CYRWT-CBWT)/(CDATYR-CDOB)*365+CDAMADJ+CBWT
OK message Small window [CALF # ;CIDNUM;'S 365 DAY ADJUSTED WEIGHT IS: ;C365WT;]
Calculate #P as 5
Calculate #1 as #1+C365WT (2 dps)
OK message Small window [TOTAL IS: ;#1;]
Update files

31 Finish Session Button
-------------------------
Prepare for Edit
Calculate T365WTS as T365WTS+#1
Update files
OK message [TOTAL IS NOW ;T365WTS;]

No errors found
APPENDIX C

MARKET RESEARCH SURVEY
1. Which of the following types of information are part of your record keeping process?

Do you take:

- Actual Birth Weights
- Actual Weaning Weights
- Actual Yearling Weights

Do you calculate:

- 205-Day Adj. Weights
- 365-Day Adj. Weights
- A.D.G. on Feed
- W.D.A.

Birth Weight Index or Ratio
- Weaning Weight Index or Ratio
- Yearling Weight Index or Ratio
- 205-Day Weight Index or Ratio
- 365-Day Weight Index or Ratio

Do you record:
- Estimated breeding values

2. Approximately how many hours do you spend during each season maintaining these records (including time spent calculating and recording)?

<table>
<thead>
<tr>
<th>Season</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>_____</td>
</tr>
<tr>
<td>Summer</td>
<td>_____</td>
</tr>
<tr>
<td>Fall</td>
<td>_____</td>
</tr>
<tr>
<td>Winter</td>
<td>_____</td>
</tr>
</tbody>
</table>

3. Which of the following criteria are involved in your selection program? Please rank from one (1) to five (5) the relative importance of these factors in your selection process. A rank of five would indicate a quality crucial to your selection decision; a rank of one (1) would indicate a factor which is not involved in your selection process.

- Actual Birth Weight
- Actual Weaning Weight
- 205 Adj. Weight
- Actual Yearling Weight
- 365 Adj. Weight
- A.D.G.
- W.D.A.
- Maternal traits of dam
- Est. Breeding Values

- BWT Index
- WWT Index
- 205 Index
- YWT Index
- 365 Index
4. What is your age range?
   - under 30 years _______
   - 31-45 years _______
   - over 45 years _______

5. Approximately how many purebred cattle do you run?
   - Zero _______
   - under 150 _______
   - over 150 _______

6. Do you own a computer?
   - yes _______
   - no _______
Answered Yes to Owning a Computer

10. What brand of computer do you own?

11. Did you hire a consultant when you decided to purchase a computer?
   
yes  
no

12. Into what price range did your system fall?
   
   Less than $2,000
   $2,000-$6,000
   Over $6,000

13. Before you purchased your computer, did you have any experience with computers?
   
yes  
no
Answered No to Owning a Computer

20. Have you ever considered buying a computer for your operation, or would you consider one if it was cost-effective and you could be assured that you could learn to run it?

yes
no
If yes to question 20, then continue. If no to question 20, thank them and hang up quickly.

21. If you were to buy a computer, do you have a brand preference?

IBM
Apple Macintosh
Other brand
if 'other' please specify__________________________
Undecided, or no preference

22. Of the following factors, which would be the most important factor in your decision process if you were to buy a computer? Which would be the second?

Price
Availability of service
Availability of specialized agricultural software
Familiarity with brand of computer
Ease of use

23. What type of tasks would you require from a computer?

Herd records
Financial information
Mailing lists
Advertising design

24. Would you consider hiring a consultant if you decided to purchase a computer?

yes
no
25. Into what price range would your entire system have to fall in order for it to be profitable for you to purchase a computer? Please give the maximum.

- Less than $2,000
- $2,000-$6,000
- Over $6,000

26. Do you have any experience with computers?

- yes
- no
Ask everyone these (unless they answered no to #20)

31. Have you ever seen or heard about the Apple Macintosh Computers's easy-to-use features?
   
   yes
   no

32. Would you be interested in comprehensive record-keeping software for the purebred cattleman if it was available on the Apple Macintosh?

   yes
   no
   if 'no' why not______________________________