Commodity Costs and Returns Estimation Handbook

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CHAPTER 13

STRUCTURE AND CONTENT OF COST AND RETURN REPORTS

Producers and users of cost and return (CAR) estimates need a reporting format that enhances the ability to correctly interpret, verify, modify, update, and use the information. Preceding sections of this document have recognized that aspect of sharing CAR by providing recommendations for a wide range of documentation. This section summarizes recommended characteristics of the CAR format and provides examples. The base format includes a carefully labeled, single-page summary of the CAR and essential documentation in accompanying tables and footnotes and/or computer files. Additional suggestions for data verification, editing, updating, and sharing CAR build on these report structure recommendations.

Most CAR estimates are produced with special computer programs or spreadsheets. It is unlikely that a single program will deliver exactly the formats and supporting data recommended in this section and also meet the particular preferences of users. In recommending formats, it is assumed that CAR producers are likely to work with a variety of computer tools suited to their own situations. Specific recommendations and examples provided in this section can be adapted easily to local situations, while still maintaining the essential characteristics emphasized here.

CAR IDENTIFICATION, DOCUMENTATION, AND DESCRIPTION

Table 13.1 provides a reminder list for most of the procedural and documentary recommendations made in the various sections of this report. Details of the recommendations can be obtained from the applicable chapter or section.

The first two parts of Table 13.1 concern information needed to identify the individual CAR. A combination of the title, footnotes, and identification system (e.g., n digit code/number) needs to indicate clearly the commodity or commodities included, the applicable geographic area, a contact person or agency, the background farm situation for the CAR, and the management level assumed. Given the importance the Task Force has noted for making the distinction, a P or H should be attached to the numerical code or title to distinguish between projected and historical CARs.

Part 3 of Table 13.1 covers concepts and calculation procedures used in an individual CAR, or more likely, a whole set of CARs produced by an agency or institution. The unit of analysis, acre (hectare) definition, and production period need to be indicated on the CAR format unless the conventions used are well known. Items identified by a star (*) might most conveniently be explained in a User's Manual applicable to all of an agency's CAR estimates. The manual could be based on recommendations in this report but tailored to the specific agency situation (Texas A&M Extension Economists, for example). A fully computerized system available to both CAR builders and users could include the information either as notes or integrated tables providing data entity attributes as described later. Because a user cannot properly interpret the CAR without the starred information, every effort is needed to assure that a manual, CAR notes, or direct computer assistance is available.

Unlike part 3, parts 4 and 5 of Table 13.1 involve items unique to individual CAR estimates. In part 4, the production/marketing system is identified, and production conditions, resources, and practices are specified. If the production/marketing system is unusual, perhaps projecting a new production technology, the documentation may require special detail in explaining data estimation methods.

Part 5, Table 13.1, calls for explanations of the individual revenue and cost items. The suggestions here go beyond the units, price, quantity, and total values suggested for the single-page CAR summary formats discussed in the next subsection. Additional supporting tables and a set of footnotes or a data attribute system are also needed. The complete format with tables and footnotes is illustrated and discussed in following pages.

FORMATS FOR CAR SUMMARIES AND SUPPORTING TABLES AND FOOTNOTES

Table 13.1 indicates the scope of information needed in the overall CAR report. This section discusses and illustrates ways of providing the information. A summary CAR format, a table listing CAR items to be included in crop and livestock estimates, and supporting tables and footnotes that fulfill the specifications in Table 13.1 are suggested and discussed.

CAR Summaries

Two CAR summaries are recommended (Tables 13.2 and 13.3). Table 13.2 is a simple, one-page CAR summary with little detail, a limited list of aggregated input items, and an estimate of residual returns over included costs, properly labeled. Table 13.3 provides item units, prices, and quantities, in addition to the total values. Items are more disaggregated but the format is still one readable page. Clearly, the Table 13.2 format is most suited for a user who wants CAR values without much detail. In some cases, the Table 13.2 format may be most appropriate for composite budgets (either historical or projected) for which unit, quantity, and price data are not easily interpretable. Table 13.3 R presents the same material as is Table 13.3 but uses real values for all CARs including operating interest. The final CAR estimates are the same as when using the nominal approach in Table 13.3 since the end of the production period is the base for computing real and nominal values. Appendix 13A contains supporting tables used to produce these estimates along with a number of alternative estimates for the same enterprise using different assumptions.

Both formats have input items divided into two categories defined as follows:

1. Operating costs (costs of expendable inputs consumed during the production period).
2. Allocated overhead (costs of using capital assets that provide services over multiple production periods along with general overhead).

The first category involves input commitments for which quantities, prices, and timing can be specified a priori using knowledge of the production process being followed and expected economic conditions. The amount of the outlay and nominal interest to the end of the production period are routinely calculable and chargeable as outlined in other parts of this report. The amount of the outlay for the item is quantity used times price (e.g., current market, opportunity, use, or salvage value as discussed in other sections). In the

past, "direct costs," "operating costs," "variable costs," and other names have been used in CAR formats to identify the first category of costs. ***The Task Force recommends that the term OPERATING COSTS be used as the descriptive name for these inputs.***

The second category of inputs involves own and full-time hired labor, owned machinery, equipment, buildings, livestock capital costs, and land costs that need to be calculated and allocated to individual enterprises that use them. Cash expenses for property taxes and insurance along with capital recovery (depreciation and interest) must be allocated. Other sections of the manuscript describe how these expenses/economic costs are calculated. They are allocated in the CAR estimate on a per acre or per head basis depending on use associated with the production process (e.g., based on performance rates for machinery and labor) and other estimating procedures (e.g., operator surveys and panels, expert knowledge, judgement, and logic).

Whole-farm overhead costs for items listed in Table 13.4 also need to be estimated. The recommendation is that a separate CAR table showing aggregate whole-farm overhead expenses be developed using the format presented in Chapter 9. A line is included in the allocated costs section of the CAR enterprise format so that an allocation can be made to individual enterprises, if desired. Table 13.4 suggests that individual whole-farm overhead items should be estimated separately and aggregated to the total for the CAR whole-farm overhead item. Then, the total is allocated to enterprises. An alternative is exemplified by Schedule 14.8 for the Midwest dairy farm example or Schedule 15.8 for the cotton-almond example, which allocate individual overhead cost items to enterprises. This procedure is preferred if individual items are clearly and predominantly used by certain enterprises.

The second category of input items has been called variously "Fixed Costs," "Ownership Costs," and "Economic Costs" in CAR estimates over past years. Although those names convey very useful economic and accounting concepts, the mix of items involves costs that do not meet the fixed, ownership, or economic cost definitions in every case. ***The Task Force recommends that the category heading ALLOCATED OVERHEAD be used for this group of expenses***. All of the costs in the second category are, in fact, "allocations" to the enterprise unit based on amount of use by the activity, or by other rules. They are "overhead" in the sense that they are identifiable in total at the firm level but arbitrary rules are usually used to allocate them to individual enterprises. This characteristic certainly differentiates them from items in the first input category.

Full-time hired labor and unpaid labor with farm ownership claims could possibly be assigned directly under expendables rather than being treated as allocated overhead. However, such labor will most likely require some allocation decisions by enterprise, suggesting it is probably appropriate to list it under allocated overhead. Similarly, land rent could be listed under either category, but fits more logically under allocated overhead.

CAR Items and Item Groups

Tables 13.2 and 13.3 provide an illustration of items and item groups for a dairy budget. Crop examples are presented in Chapters 14 and 15. The more detailed CAR in Table 13.3 needs to be one readable page. The one-page constraint may involve a tradeoff with detail in identifying item costs. For example, it is convenient to have fuel and lube separated from repair costs and (cash) costs for machinery,

and to have insurance and taxes separated from capital recovery, but more lines would be needed. Supporting CAR information and footnotes can provide that detail, so the one-page limit priority can be met.

Tables 13.5 and 13.6 provide checklists of input items commonly included in crop and livestock CAR estimates. As indicated earlier, some sets of inputs should be disaggregated in the more detailed CAR in Table 13.3, compared to the summary CAR in Table 13.2.

Supporting Tables

Cost and return reporting formats developed over time have included several of the kinds of information recommended in Table 13.1 and they should be continued. The following supporting tables are familiar to most who work with crop and livestock CAR estimates and are a useful way to provide the supplementary information.

- A monthly calendar of tasks, operations, and inputs as illustrated in Schedule 14.5 or 15.5 should be included. This detail is essential for understanding the particular production system (activity) depicted by the CAR. The calendar makes items and values less abstract and supports user evaluation of the system's relevance. It is even useful to have a very general version of this information for a composite, historical budget.

- A supporting table should provide details of cost items that may be masked by aggregations across tasks, machines, and cost items in the one-page summary CAR. Schedule 14.5 in the Midwest farm example or Schedule 15.5 in the cotton-almond example provide illustrations of what is needed. It might be feasible to combine the monthly calendar and the input cost information, including operating and ownership costs by operation and individual chemical applications, and so forth.

- A list and description of machinery and equipment used in developing the CAR estimate along with data required for the cost calculations (e.g., purchase price, years of life, use per year, and applicable engineering cost equation coefficients) should be attached. It may be convenient to assign machine codes in this table for use in identifying machinery and equipment items throughout the CAR format. The machinery and equipment information might support a large set of CARs from a given producing agency. For example, all CARs applicable to a particular farm type and geographic area might be covered by one machinery and equipment set table. Examples of equipment and machinery lists are provided in Schedules 14.6, 14.7, 15.6 and 15.7.

- Tables summarizing input and product price assumptions for sets of CAR are recommended. An alternate approach is through notes or data attribute information discussed in the next subsection. Price sources and data treatment (e.g., methods of handling price variability) should also be described. It is useful to have the comparisons of prices across commodities and inputs in one table. If users understand the initial, carefully considered prices used in CAR, they are less likely to substitute inferior price assumptions. Or, they have a better basis for adjusting prices for their own situation.

The footnotes to Table 13.3 and Table 13A.8 provide a clear summary of the price assumptions.

Footnotes

A series of footnotes or computerized data attributes to provide information for Table 13.1 items that cannot be presented fully in the single-page summary and supporting tables is recommended. Footnotes should be referenced to items in the one-page, detailed CAR. The footnote documentation is the core of Task Force intent to increase user understanding, allow for replication (verification) and validation of the CAR values, supply data references and information about actual and possible other assumptions, increase flexibility in CAR use, and generally afford improved CAR quality control.

Examples of footnote/data attribute information (and references as appropriate) are provided by the notes attached to Table 13.3 and Table 13.3R. The notes may perform any or all of the following tasks.

- Describe type, size, managerial level, and other assumptions concerning the whole farm that are (at least implicitly) in the background for the CAR.

- Provide current, specialized information about the particular enterprise. For example, details of a government farm program affecting price and acreage of the commodity could be explained. These details could be kept up to date and used to update the CAR using the underlying computer system. Thus the user would know how government program effects on the enterprise were handled.

- Present price and yield data series supporting the values used in the CAR, with source references. If this series were operational, it would replace the price assumptions table suggested earlier.

- Provide information to assist the user to modify the CAR for other planning situations such as a different irrigation or feed/pasture system, custom rather than own harvesting equipment, a different quality of soil or farm location, a different size of farm unit, or an alternative level of a critical variable input. The resulting flexibility afforded for using each CAR could cut down on the number of CARs provided by an agency.

- Contain additional detail on chemicals (analysis, generic names, etc.), fertilizer mixes, seeding and reseeding costs, miscellaneous supplies included for crops and livestock, vet and med costs, various complicated cost calculations, and so forth.

- Present sensitivity analysis for variables in the CAR. The most common sensitivity analysis provided for CAR is a simple matrix of residual returns for arbitrary ranges of yields and prices about the base levels in the CAR. Sensitivity of returns to changes in other key variables might also be presented. As noted in an earlier section, relationships (e.g., meaningful correlation) among the variables should not be ignored in choosing the ranges for sensitivity analysis.

DATA VERIFICATION, EDITING, UPDATING, AND SHARING

The CAR format with accompanying documentation is designed to present data clearly and provide detail needed for thoughtful use. It anticipates a subsequent process of data verification, editing, updating, and sharing by CAR users. This process has varied levels of complexity depending upon the intended use of the CAR information, the methods used to collect, tabulate, and analyze the data, and the desirability and need for sharing with others.

No single CAR meets the needs of all users, necessitating the need for flexibility and adaptability. Hallam discusses three broad classes of users: economic optimizers (or managers), economic analysts, and policy evaluators. The optimizers include firm-level agricultural producers, consultants who provide assistance to decision makers, and researchers evaluating alternative technologies. Economic analysts use CAR to test hypotheses and make predictions of economic responses. This includes supply and demand analysis and work on the structure of agriculture and the organization of firms. Those evaluating policy typically aggregate firm-level data that begins with individual enterprise CARs (Hallam: 373). As discussed in Chapters 1 and 2, different methods may be appropriate for these different uses. In addition, different formats for presenting and sharing the data may be useful. The best way to share historical data based on surveys may differ from the best way to share data that is used to create projected CAR estimates. Given that CAR may be developed for one particular purpose, the procedures recommended in this chapter on report format and handling data may assist users in modifying estimates for use in another purpose, while maintaining the recommended CAR properties.

Partly because CAR producers as well as users have varied objectives, published CARs may have important differences. For example, conducting a major survey of producers of a particular commodity to determine CARs for making policy decisions involves a different process than using a local farmer panel to determine CARs for farm-level planning. In the case of the survey, major efforts will be devoted to conducting the survey, computer coding and verifying the data, developing appropriate statistical techniques to summarize the data, and developing reports that can be used by the policy maker. The use of the farmer panel is usually less structured and the results obtained are only a "starting point." Numerous adjustments must be made when doing planning for an individual producer. The recommended CAR estimation methods, format, and documentation are designed to give the prospective user of diverse CARs a well defined starting place to verify, edit, update, and share various CARs.

Because of the diversity identified above, it is highly unlikely that a single method for data verification, editing, updating, and sharing can be utilized. Nevertheless, through standardized concepts and procedures, significant progress can be made in those activities. To that end, the terms EDITING, VERIFICATION, MODELBASE, FORECAST, AND UPDATING are defined here and in the glossary of this report.

Editing is the process of changing one or more coefficients used in a specific CAR budget.

Verification is the process of confirming that the data used in the calculations were, in fact, the data the user intended to use.

Modelbase is the set of equations and the specified calculation procedures that are used to manipulate/use a database, for example, a CAR modelbase.

Forecast is the projection of CAR for some future period based on expected input-output coefficients and a set of prices. The procedures recommended by the Task Force will primarily be used for planning or analysis of expected response. The resulting CAR estimate can therefore be defined as a forecast of expected CARs based on documented input-output relationships and prices.

Updating is the process of changing the data used in making the CAR estimate. As new data becomes available, users will want to replace the obsolete data. "Updating," as used in this report, refers to the data rather than the calculation procedures and specified input-output relationships.

In addition, a procedure is outlined in Appendix 13B to make CAR data and documentation available in electronic form. This computerized approach would provide consistency, simplicity, convenience, and flexibility in editing, verifying, and updating CAR data.

In order to meet the objective of sharing CAR data, a database of available CAR estimates is needed. An inventory of both CAR data and methods could be obtained through a sharing of information by those who conduct CAR studies. The database of the shared CAR data should be computer coded and the data file accessible and able to be downloaded using compatible software and data formats.

Data sharing is complicated by problems concerning software and data compatibility. Not all software packages have identical data requirements or use the same data formats. No recommendation is made here about which specific software packages or formats should be used; however, the unequivocal requirement is that data files contain not only data values of interest but also documentation about the data. Data documentation includes variable names, labels, and alphabetic characters or numeric values in a specified format. Format documentation includes physical characteristics and field specifications or locations of the data in the file. Because the format determines how easily data can be shared, this information is very important to potential data users. Software packages are available to translate data stored in one format to another format. General data documentation might include information, restrictions, or assumptions about the data that would assist the user in interpretation and use. The terms DATA FILE, SOFTWARE, AND FORMAT are defined here and in the glossary of this report.

Data file is the complete collection of variables, data values, and so forth that are needed to use the data meaningfully.

Software is one program or a collection of programs (package) designed for a specific purpose. For example, LOTUS 123 is a spreadsheet software package. Data created by software packages generally hold compressed data and formatting codes that control how they will be displayed on a screen or printed.

Format is a set of directions that describes a field or location and the contents of that field to help the computer to read and write data values.

Recommended Methods for Data Sharing

The use of the INTERNET is recommended for the exchange of data and information related to CAR budgets in electronic form. The INTERNET is a worldwide collection of interconnected computer networks that link academic institutions, the research community in the government and private sectors, general businesses, and individual consumers.

The INTERNET enables exchange of data in the most efficient manner through electronic mail, the World Wide Web, file transfer, or remote login. Electronic mail may be the most versatile of these four, because it most readily translates information between different communication protocols in the various networks. This may also be applicable in transferring data from a WINDOWS to a UNIX computer. However, encoding and decoding packages such as ABE (Ascii Binary Encodes) might be needed to move binary files by electronic mail. Pages on the World Wide Web may be used to provide access to specific data files. An individual accessing a particular homepage could be given instructions on downloading a data file or could simply download some types of files by clicking on an icon. The File Transfer Protocol (FTP) moves files from one computer to another. Access to the files is subject to the standard computer security protection, e.g., in UNIX installations, the user has to be authorized for read-access to the files to be transferred. The user will remain barred from modifying or deleting files on the host computer. The INTERNET remote login program (TELNET) allows a user to work on a computer that is located hundreds of miles away, but it requires that the user be registered on the host computer. TELNET may also be used to transfer files.

The optimal way to provide information regarding the availability of specific CAR for use by others is a problem that must be addressed. One possible solution is to set up a central registry of available CARs, with continuous updating. The datafile ENTRPRSE discussed in Appendix 13B could serve as the central registry. This approach relies on the willingness of each researcher to add new developments to the registry; it also relies on a volunteer to take custody of such a central registry. This option would not require the complete transfer of the budget information to the registry, rather, only the provision of access information (or links). The transfer of all completed CARs into some central file would be an alternative; this alternative would require a custodian of the massive resulting file structure. In light of the cooperative nature of the effort, the first alternative is preferable.

TABLE 13.1 Recommended Items for Individual CAR Identification, Documentation, and Description[1]

1. Identification of the CAR

   a. CAR name (usually refers to a commodity), and code if appropriate.
   b. Historic or projected.
   c. Preparer, contact person, agency, phone, e-mail address, etc.
   d.* Software used to generate CAR.
   e. Date CAR estimate prepared.

2. Assumptions concerning the setting for the CAR

   a. Identification of the country, county, state, province, or other subarea to which the CAR is applicable.
   b. Description of the individual or composite farm situation that provides the background for the CAR estimate, including the farm size, type, and business organization.
   c.* Specification of the management level assumed.

3. Concepts and procedures followed in CAR estimation

   a. Unit of analysis (acre, head, farm, etc.).
   b. Planted or harvested acre.
   c. Starting and ending dates of production period.
   d.* Time point for discounting values (e.g., harvest time).
   e.* Interest and discount rates used (e.g., real v.s. nominal).
   f.* Handling costs and returns from government programs.
   g.* Method of handling variability in estimates (trends, cycles, seasonality, and random variation).
   h.* Handling, storage, and processing CARs when applicable to a given CAR.
   i.* Method used to measure and cost pasture.
   j.* Opportunity and market costing methods utilized.
   k.* Land costing method.
   l.* Labor costing method.
   m.* Method used to allocate overhead costs.
   n.* For international CAR comparisons, inflation and exchange rates assumed, policy distortions among the subject countries, excluded or unaccounted costs among the estimates, etc.
   o.* Standardized machinery and equipment costing procedures, perhaps incorporated in the computer program used.
   p.* Method used to calculate interest charges on operating capital.

TABLE 13.1 (continued)

4. The production/marketing system assumed

   a. A description of the product(s) and services produced and an indication of the marketing plan (timing/location of sale, market type, pricing approach) assumed.
   b. Specification of the technical production conditions and practices such as soil type and class, irrigation (indicate system), organic practices, formal rotations, row spacing, preceding and following crops, machinery and equipment set assumed, machine use per year, feeding plan, animal replacement practices, animal grades/varieties used, and chemical/cultural approach.
   c. Explanation of the data estimation methods for nontraditional or new technology included in CAR.

5. Explanation of individual revenue and cost items

   a. Yield and product price bases and sources. Explanation of how the yields used relate to yield data cited and how prices used relate to yields and product qualities used.
   b. Levels of expendable inputs and prices. Examples include the nature of inputs used (e.g., active material in fertilizer and chemicals by generic and brand names), seeding and reseeding rates and times, assumptions regarding death and shrink losses, feed consumed, routine medication and veterinary medical treatments, pasture calculations, miscellaneous supplies, breeding fees, etc.
   c. Methods used for estimating the costs of multiple year production activities (e.g., providing replacement cows, re-establishing alfalfa, orchards, etc.).
   d. A review of data sources.

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[1]Items identified by *, and perhaps some others that are consistently handled across agency CAR, can best be handled in a CAR manual and/or computer HELP command.

TABLE 13.2 A Sample One-page CAR Summary for a Dairy Budget
1992 Projected Costs and Returns for Milk Production Per Cow, Brief
(Rearing of replacement heifers not included)
Ben & Bev Dairyman Farm, Upper Midwest, USA (See Chapter 14 for a complete description of the farm)
Prepared by John Q. Taskforce, Dept. of Ag. Econ., Anonymous State University, March 1992

Item	Dollars
Gross Value of Production:	
Milk	$2,652.04
Cull Cows	0.00
Bull Calves	51.00
Heifer Calves	61.20
Interest on Receipts to December	113.44
Total	2,877.68
Operating Costs	
Replacement Heifer	0.00
Corn	278.47
Protein, Vitamins, & Minerals	190.29
Alfalfa Hay	172.09
Alfalfa Haylage	174.59
Corn Silage	64.96
Marketing	103.33
Breeding	46.80
Veterinary & Medicine	64.52
Supplies	156.00
Fuel, Oil, and Utilities	26.58
Repairs	302.15
Bedding	
Interest On Operating Inputs To December	65.09
Total Operating Costs	1,644.87
Allocated Overhead	
Hired Labor	258.30
Opportunity Cost Of Unpaid Labor	243.45
Opportunity Interest Of Labor	20.67
Capital Recovery Of Livestock Investment	247.96
Capital Recovery Of Machinery & Equipment Investment	86.82
Capital Recovery Of Bldg Investment	74.04
Taxes & Insurance	11.23
General Farm Overhead	99.46
Total Allocated Overhead	1041.93
Total Costs Listed	2,686.80
Value Of Production Less Total Operating Costs	1,232.81
Value Of Production Less Total Costs Listed	190.88

Table 13.3 A Sample Detailed CAR Summary for a Dairy Budget
1992 Projected Costs and Returns for Milk Production Per Cow, Detailed
(Uses capital recovery to account for cost of replacement heifers)
Ben & Bev Dairyman Farm, Upper Midwest, USA (See Chapter 14 for a complete description of the farm)
Prepared by John Q. Taskforce, Department of Agricultural Economics, Anonymous State University, March 1992

	Item	Units	Quantity	Price	Value
	Gross Value Of Production				
1	Milk (a)	cwt	216.00	12.28	2,652.04
2	Cull Cows (b)	cwt	4.68	45.56	0.00
3	Bull Calves (c)	hd	0.42	122.78	51.00
4	Heifer Calves (c)	hd	0.42	147.34	61.20
5	Interest On Receipts to December (d)			0.092	113.44
6	Total (e)				2,877.68
	Operating Costs				
7	Replacement Heifer (f)	hd	0.40	1031.36	0.00
8	Corn (g)	bu	135.00	2.06	278.47
9	Protein, Vit., & Min. (g)	cwt	12.72	14.96	190.29
10	Alfalfa Hay (g)	ton	2.19	78.58	172.09
11	Alfalfa Haylage (g)	ton	2.37	73.67	174.59
12	Corn Silage (g)	ton	3.96	16.40	64.96
13	Marketing (milk) (h)	cwt	216.00	0.48	103.33
14	Breeding (i)	cow	1.00	46.80	46.80
15	Veterinary & Medicine (i)	cow	1.00	64.52	64.52
16	Supplies (i)	cow	1.00	156.00	156.00
17	Fuel, Oil, & Utilities (j)				26.58
18	Repairs (k)				302.15
19	Bedding				
20	Interest On Oper. Costs To Dec. (d)			0.092	65.09
21	Total Operating Costs (e)				1,644.87
	Allocated Overhead				
22	Hired Labor (l)				258.30
23	Opportunity Cost Of Unpaid Labor(l)				243.45
24	Opportunity Interest on Labor				20.67
25	Capital Recovery Of Livestock Investment (m)				247.96
26	Capital Recovery Of Mach & Eq Investment (n)				86.82
27	Capital Recovery of Bldg Investment (o)				74.04
28	Taxes & Insurance (p)				11.23
29	General Farm Overhead (q)				99.46
30	Total Allocated Overhead (e)				1,041.93
31	Total Costs Listed (e)				2,686.80
32	Value Of Prod. Less Total Oper. Costs (e)				1,232.81
33	Value Of Prod. Less Total Costs Listed (e)				190.88

TABLE 13.3: 1992 Projected Costs and Returns for Milk Production Per Cow, Detailed Notes
(Table 13A.1 contains cost and revenue data by month for the dairy enterprise.)

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[a] Quantity sold is the total for the year; sales each month are 18 cwt. Price per cwt for milk is based on a non-seasonally adjusted real average price at the end of the year of $12.50. This was adjusted using the seasonal index below to account for typical seasonality in milk prices and then adjusted to a nominal basis assuming a 4% annual rate of inflation. The nominal at the end of the year is $12.50, because this is the base period. The average nominal price for the year is projected to be $12.278. Nominal interest on this revenue from the month of sale to December 31 is recorded on line 5. It is assumed that revenue from milk is received at the end of the month. Because quantities per month are constant, the average nominal price for the year multiplied by the total quantity gives the actual total revenue (expenditure).

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average
Seasonal Index	103.0	101.8	100.0	98.4	96.8	95.7	96.4	97.7	100.3	102.7	103.8	103.3	100.00
1992 Real (seas. adj.)	12.875	12.725	12.500	12.300	12.100	11.963	12.050	12.213	12.538	12.838	12.975	12.913	12.500
1992 Nominal	12.420	12.316	12.138	11.983	11.826	11.730	11.855	12.054	12.415	12.754	12.933	12.913	12.278

[b] Dairy cows are assumed to be replaced every 2.5 years giving a replacement rate of .40. It is assumed that 1% of the cows die each year (2.5% over the 30-month period) and thus are not available to be sold. This gives an effective cull rate of .39 [0.40 - 0.01 or (0.975)(0.40)]. The average weight of the .39 cows culled per year is 1,200 pounds. This gives per cow culled sales of 468 pounds [(.39)(1,200)]. Price per cwt for cull cows is based on a nonseasonally adjusted real average price at the end of the year of $46.40. The seasonally adjusted price is $42.8736 which is both a real and nominal value for December 31. This was adjusted to a nominal basis assuming a 4% annual rate of inflation with the end of December being the base point in time. The average nominal price over the 12 months is $45.56. Nominal prices for each month are reported here and in Table 13A.8.

Seasonally Adjusted Nominal Prices	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average
Cull Cows	42.97	46.30	47.53	47.15	47.16	46.18	45.88	46.35	46.18	45.08	43.06	42.87	45.56
Bull Calves	120.59	120.98	121.38	121.77	122.17	122.57	122.97	123.38	123.78	124.19	124.59	125.00	122.78
Heifer Calves	144.70	145.18	145.65	146.13	146.61	147.09	147.57	148.05	148.54	149.02	149.51	150.00	147.34

Because the estimate in Table 13.3 uses the capital recovery method to value investment in the breeding herd, no income from cull sales is included in the estimates. The value of the cull animal is included as a negative cost in computing the cost of a breeding herd replacement in line 25 of Table 13.3.

[c] The calving interval is 13 months, producing 0.92 (12/13) calves per year. With a livability of 90%, this results in 0.4154 [(12/13)(0.9)(0.5)] bull calves and 0.4154 heifer calves per year.

The prices for calves reflect the market in the area for 3-day-old calves and is assumed to have a constant real value during the year. The real and nominal values are projected to be $125 for bull

TABLE 13.3 Detailed Notes (continued)

calves and $150 for heifer calves on December 31, 1992. Nominal prices for each month are contained in Table 13A.8 and in the Table in footnote [b]. The average nominal values are $122.78 and $147.34. As with the cull cows, the calf sales are assumed to be equally spaced during the year.

[d] All receipts and expenses are assumed to occur on the last day of the month. Interest is compounded at the monthly rate of $.00736 \left[(1.092)^{\frac{1}{12}} - 1\right]$, (equivalent to an annual rate of .092) until the last day of December. For example, the interest income on milk receipts on January 31 of 223.556 is $18.7841 $[(223.556)(1.092)^{11/12} - 223.556]$. We do this for each month and for each revenue category and sum them.

[e] Individual values may not sum to totals due to rounding.

[f] Dairy cows are assumed to be replaced every 2.5 years giving a replacement rate of .40. The cull rate of .39 allows for some death loss over the life of the cow. A real price of $1,050 per replacement as of December 1992 is assumed. This gives a nominal price at the beginning of January 1992 of $1,009.6155 [(1,050)/(1.04)]. This is adjusted each month to reflect 4% inflation during the year. Thus the price at the end of January is $1,012.92 $[(1,009.6155)(1.04)^{1/12}]$. The nominal prices per month are reported in Table 13A.8. with a nominal average during the year of $1,031.36. Because this estimate uses the capital recovery method for valuing the investment in the herd, no replacement cost is included on line 7 of the report. The value of the replacement is included in computing the cost of a breeding herd replacement on line 25 of Table 13.3.

[g] Annual feed consumption is 135 bushels of corn, 1,272 pounds of a protein/vitamin/mineral premix, 2.19 tons of alfalfa, 2.37 tons of alfalfa haylage, and 3.96 tons of corn silage. These annual consumption amounts are based on historical data for the Dairyman operation and information on ration formulation available from the Minnesota Extension Service. This gives per day amounts as follows: corn (20.712 lbs), vitamin mineral premix (3.485 lbs), alfalfa hay (12 lbs), alfalfa haylage (12.9863 lbs), and corn silage (21.6986 lbs). The prices in Table 13.3 are the nominal averages for the year and reflect net market prices the farm would receive. The prices are not seasonally adjusted. The monthly prices are as follows.

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Nominal Average	Real Average
Corn	2.03	2.03	2.04	2.05	2.05	2.06	2.07	2.07	2.08	2.09	2.09	2.10	2.06	2.10
Premix	14.69	14.74	14.79	14.84	14.89	14.93	14.98	15.03	15.08	15.13	15.18	15.23	14.96	15.23
Alfalfa Hay	77.17	77.43	77.68	77.94	78.19	78.45	78.70	78.96	79.22	79.48	79.74	80.00	78.58	80.00
Alfalfa Haylage	72.35	72.59	72.83	73.06	73.30	73.54	73.78	74.03	74.27	74.51	74.76	75.00	73.67	75.00
Corn Silage	16.11	16.16	16.22	16.27	16.32	16.38	16.43	16.48	16.54	16.59	16.65	16.70	16.40	16.70

TABLE 13.3 Detailed Notes (continued)

[h] Based on the expenditures by the farm through marketing 216 cwt of milk in 1991 for \$99.36. This is equivalent to an average of \$0.46 per cwt. This is adjusted forward to a nominal yearly average price for 1992 of \$0.4784, giving a projected annual nominal cost of \$103.3344. To account for monthly expenditures and operating interest we need to allocate these annual amounts over the months. Since Ben markets the same amount of milk each month this is most easily done by assuming that real expenditures are constant. We can find a constant real price per month using the monthly inflation rate and the fact that the nominal monthly expenditures must add up to total nominal expenditures where sales per month are 18 cwt. This gives $\sum_{j=1}^{12} p_j^n\,(18) = \sum_{j=1}^{12} p^r(1+\pi_m)^{j-12}(18) = (.46)(1.04)(216) = (.4784)\ (216) = 103.3344$. We solve this expression for p^r to get the constant real price per cwt. Letting EXP_{-1} be total nominal expenditures last year and assuming the end of December of the current year is the base for computing real values we obtain

$$\sum_{j=1}^{12} p^r(1+\pi_m)^{(j-12)}(18) = (1+\pi)\ EXP_{-1}$$

$$\Rightarrow p^r = \frac{(1+\pi)\ EXP_{-1}}{(18)\sum_{j=1}^{12}(1+\pi_m)^{(j-12)}} = \frac{(1+\pi)\ EXP_{-1}}{(1+\pi_m)(18)\sum_{j=1}^{12}(1+\pi_m)^{(j-12-1)}}$$

$$= \frac{(1+\pi)\ EXP_{-1}}{(1+\pi_m)(18)\ US_0(\pi_m, 12)}\ .$$

The last equality comes from equation 2B.7. Writing the expression this way allows the use of canned annuity procedures for computing p^r because the last expression is just the annuity having a present value of $(1+\pi)EXP_{-1}$ divided by $(1+\pi_m)(18)$. Monthly real expenditures are $(18)p^r$ while monthly nominal expenditures in the j^{th} month are $p^r(1+\pi_m)^{j-12}(18)$. For this example we obtain

$$p^r = \frac{(1+\pi)\ EXP_{-1}}{(1+\pi_m)(18)\ US_0(\pi_m, 12)}$$

$$= \frac{(1.04)(99.36)}{(1.0032737)(18)\ (11.748502)}$$

$$= \frac{103.3344}{212.165335}$$

$$= .4870.$$

This is the real price (also equal to the nominal price on December 31st) that can be adjusted for inflation to create a nominal price for each month of the year. The simple average of these constructed nominal prices will be the projected nominal average for the year (\$0.4784). An alternative would be to assume that nominal prices are equal each month and are equal to \$0.4784. This would give constant nominal expenditures per month of \$8.6112 as compared to the rising pattern in Table 13A.1.

TABLE 13.3 Detailed Notes (continued)

[i] Based on total nominal expenditures as recorded in farm records for these livestock inputs in 1991 on a per cow basis. Total expenditures are adjusted forward assuming a 4% inflation rate. Ben did not have data on monthly allocations but felt that they were approximately equal each month for the dairy operation. We therefore assumed that the real expenditures per month are equal for 1992. This means that expenditures rise at the monthly rate of inflation from the end of January to the end of December. Specifically, we solve for a constant real monthly amount (a) such that

$$a(1+\pi)^{-\frac{11}{12}} + a(1+\pi)^{-\frac{10}{12}} + \cdots + a(1+\pi)^{-\frac{0}{12}} = a\sum_{j=1}^{12}(1+\pi)^{\frac{(j-12)}{12}} = (1+\pi)\,EXP_{-1}$$

where EXP_{-1} is total nominal expenditures last year and the end of December of the current year is the base for computing real values. Breeding expenditures for 1991 were \$45.00. Inflation adjusted expenditures are then \$46.80. We can use the standard present value functions to find the real payment (a) by noting that it is given by

$$a = \frac{(1+\pi)\,EXP_{-1}}{\sum_{j=1}^{12}(1+\pi)^{\frac{(j-12)}{12}}} = \frac{(1+\pi)\,EXP_{-1}}{\sum_{j=1}^{12}(1+\pi_m)^{(j-12)}} = \frac{(1+\pi)\,EXP_{-1}}{(1+\pi_m)\sum_{j=1}^{12}(1+\pi_m)^{(j-12-1)}} = \frac{(1+\pi)\,EXP_{-1}}{(1+\pi_m)\,US_0(\pi_m,12)}$$

where π_m is the monthly inflation rate computed from 2.12. The last expression is obtained using equation 2B.7 and is just the annuity having a present value of $(1+\pi)\,EXP_{-1}$ divided by $(1+\pi_m)$ and is discussed further in equation 5.14 on allocating repair costs. It is easy to compute using standard functions such as PMT in Excel. For example, the real breeding cost is given by

$$a^r_{breeding} = \frac{(1+\pi)\,EXP_{-1}}{(1+\pi_m)\,US_0(\pi_m,12)}$$

$$= \frac{(1.04)(45)}{(1.0032737)\,(11.748502)}$$

$$= \frac{46.8}{11.78696}$$

$$= 3.97048.$$

This is the real (and also nominal) payment in December, the nominal payment in November is \$3.9575 $[(3.9705)(1.04)^{\frac{-1}{12}}]$, the nominal payment for January is \$3.8303, and so forth. Veterinary and medicine in 1991 were \$62.04, while supplies were \$150, giving 1992 total nominal expenses

TABLE 13.3 Detailed Notes (continued)

of $64.52 and $156. The December monthly payments are $5.47 and $13.23 in both real and nominal terms. The nominal payments for earlier months follow the pattern in Tables 13A.1 and 13A.8.

[j] Data in Schedule 14.8 indicate $2,275 [(3,500)(.65)] of expense for 89 cows, or $25.56 per cow for fuel, oil, and utilities. It is assumed that these are spaced equally throughout the year for the purpose of computing operating interest. Like the items in footnote [i], this expenditure is adjusted for inflation and then allocated across months such that real expenditures per month are equal. The real expenditure per month is $2.2554. Monthly nominal expenditures are summarized in Table 13.A.1. Average nominal expenditure is $26.58 [(25.56)(1.04)].

[k] Annual Repairs for Buildings and Equipment for Dairy Cows

All repair costs are computed using list prices, which are assumed to be 10% higher than the market value. Repair costs per year are calculated using equation 5.8 $\left(C_{rm\,t} = (RF1)(P_t)\left(\frac{h_t}{1{,}000}\right)^{RF2}\right)$

assuming a list price for the manure equipment of $40,780 at the beginning of the year, a useful life of 12 years, and an assumed annual use of 200 hours. The computation is as follows where the inflation rate is assumed to be 4%.

$C_{rm12}(\text{manure}) = (0.63)((40{,}780)(1.04))\left(\frac{2{,}400}{1{,}000}\right)^{1.3} = 83{,}386.496$ for the total of 2,400 hours of use,

which gives a cost per hour of (83,386.496/2,400) = $34.744.

For feed equipment the repair cost is computed as

$C_{rm15}(\text{feed}) = (0.15)((27{,}331)(1.04))\left(\frac{1{,}995}{1{,}000}\right)^{1.6} = 12{,}873.266$ for the total of 1,995 hours of use,

which gives a cost per hour of (12,873.266/1,995) = $6.4527.

For milking equipment the repair cost is

$C_{rm15}(\text{milk}) = (0.007)((30{,}442)(1.04))\left(\frac{16{,}500}{1{,}000}\right)^{2} = 60{,}335.435$ for the total 16,500 hours of use,

which gives a cost per hour of (60,335.435/16,500) = $3.6566.

Costs for the other items are computed using the previous year's expenditures adjusted for inflation (4%).

TABLE 13.3 Detailed Notes (continued)

		Annual Expense	Percent for Cows	Repairs for Cows
Manure Equipment (Schedule 14.7)	($34.744/hr x 200 hr)	$6,948.87	80	$5,559.10
Feed Handling Equipment (Schedule 14.7)	($6.4528/hr x 133 hr)	858.22	80	686.57
Milking Equipment (Schedule 14.7)	($3.6567/hr x 1100 hr)	4,022.36	100	4,022.36
Repairs to Dairy Building (Schedule 14.6, footnote d)	($10,524 in 1991)	10,944.96	100	10,944.96
Buildings & Improvements (Schedule 14.8)	($7,165 in 1991)	7,451.60	65	4,843.54
Machinery & Equipment (Schedule 14.8)	($1,235 in 1991)	1,284.40	65	834.86
				26,891.40
		Estimated repairs per cow (89)		$302.15

Ben does not have any data on the allocation of repair expenditures over the year. After discussion with him, it was decided to assume that the total real repair expense was spaced equally throughout the year for the purpose of computing operating interest. As suggested in Chapter 5, because the repair costs are in nominal (also real) values at the end of the year and expenditures will be at an earlier point in time, it is appropriate to deflate these before computing nominal interest. The procedure suggested in [i] and [j] is followed to find a constant real payment, which is then adjusted for inflation. The computations are contained in Table 13A.1 and are repeated here.

Real Prices	Real Cost Per Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average Cost	Current Cost
Cow Repairs (Real)	25.6343	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	**302.1505**
Replacement Repairs (Real)	2.7974	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	**32.9727**
Cow Repairs (Nominal)		24.73	24.81	24.89	24.97	25.05	25.14	25.22	25.30	25.38	25.47	25.55	25.63	25.18	**302.1505**
Replacement Repairs (Nominal)		2.70	2.71	2.72	2.73	2.73	2.74	2.75	2.76	2.77	2.78	2.79	2.80	2.75	**32.9727**

[l] Livestock labor is based on labor use in 1991 (Schedule 14.4) and an interview in which Ben allocated the labor between the cows and the young stock. The data is as follows.

Worker	Total Livestock Hours	Total Cows Hours	Total Young Stock Hours	Per Cow Hours	Wage $/hour 1991	Wage $/hour 1992	Per Cow Cost
Operator	2,437	2,193	244	24.640	$9.50	$9.880	$243.45
Son	330	0	330	0.00	$5.43	$5.645	$0.00
Hired Worker 1	2,173	1,956	217	21.978	$9.47	$9.845	$216.38
Hired Worker 2	734	661	73	7.427	$5.43	$5.645	$41.92
Total Hired							$258.30

TABLE 13.3 Detailed Notes (continued)

The implicit 1991 wage rates for hired workers are computed from the data in Schedule 14.4. The son's labor is priced the same as Hired Worker 2. The operator has an opportunity wage of $9.50. Unfortunately no data on the monthly breakdown of labor use by month was available. Therefore it was assumed that labor use for the dairy operation was the same each month. Whereas this would be obviously incorrect for most crop operations, it is probably reasonable for the dairy operation. The implicit cost per hour for 1992 was computed by multiplying the 1991 wage rates by 1.04 to account for inflation. It is assumed that labor quantities in 1991 and 1992 are the same. The labor expenditures (such as hours) are assumed to be equally spaced over the year so that each worker (including the unpaid ones) is paid a monthly salary. These expenditures are allocated in a manner similar to items in footnotes [h], [i], and [j] where a constant real payment over the months is assumed. The actual monthly expenditures in real and nominal terms are as follows.

Expenditure	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**	**Total**
Month #	1	2	3	4	5	6	7	8	9	10	11	12		
Family Labor Real	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65	20.65		243.448
Family Labor Nominal	19.92	19.99	20.06	20.12	20.19	20.25	20.32	20.39	20.45	20.52	20.59	20.65	20.29	243.448
Hired Labor Real	21.91	21.91	21.91	21.91	21.91	21.91	21.91	21.91	21.91	21.91	21.91	21.91		258.300
Hired Labor Nominal	21.14	21.21	21.28	21.35	21.42	21.49	21.56	21.63	21.70	21.77	21.84	21.91	21.53	258.300
Opportunity Interest	3.45	3.14	2.82	2.51	2.19	1.88	1.56	1.25	0.94	0.62	0.31	0.00		20.672

The nominal average expenditure multiplied by 12 will give the nominal expenditure for the year. Opportunity interest at a nominal rate is charged since most employees are paid monthly and the family makes monthly withdrawals.

[m] Capital recovery is based on the difference between the real market value of a bred heifer, $1,050, (assumed purchased at the beginning of the current year) and the real sale value of a 1,170 pound cull cow at $46.40 per cwt., or $542.88 received three years later. The 1,170 pounds represents 2.5% less than 1,200 pounds to account for death loss. This sale value is discounted back to the present at a real interest rate of 5% and then subtracted from the purchase price of the heifer to obtain a net present cost of the breeding animal. This is then converted to a real 30-month annuity following the procedures outlined in Chapter 2. This real annuity is adjusted back to each month of the year to account for inflation during the year. Specifically,

$$a^{r}(monthly) = \$20.2042 = \frac{\left(1{,}050 - \frac{542.88}{(1.05)^{30/12}}\right)}{\left(\frac{1 - \frac{1}{(1.05)^{30/12}}}{(1.05)^{1/12}-1}\right)} = \frac{(1{,}050 - 480.5412)}{(28.18516)}.$$

Since the base for real values is the end of year 1 we can create a nominal payment stream beginning at the end of January using the following relation

TABLE 13.3 Detailed Notes (continued)

$$a_j^n(monthly) = (1+\pi)^{\frac{j-12}{12}} \; a^r(monthly).$$

The nominal payment stream is as follows.

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Nominal Annuity	19.491	19.555	19.619	19.683	19.747	19.812	19.877	19.942	20.007	20.073	20.138	20.204
Adjusted to Dec 31	21.128	21.043	20.957	20.872	20.787	20.703	20.619	20.535	20.452	20.369	20.287	20.204
Partial Sum	21.128	42.171	63.128	84.000	104.788	125.491	146.110	166.646	187.098	207.467	227.753	247.958

If this monthly nominal annuity is used to compute the cost of the breeding animal then nominal interest at an annual rate of 9.2% should be charged. Alternatively, one can compute a real annuity with one payment at the end of the year. Because the cow is held 2.5 years we can compute a fractional annuity as follows.

$$a^r(annual) = \frac{\left(1{,}050 - \frac{542.88}{(1.05)^{2.5}}\right)}{\left(\frac{1 - \frac{1}{(1.05)^{2.5}}}{(.05)}\right)} = \frac{(1{,}050 - 480.5412)}{(2.296597)} = \$247.9576.$$

The fractional payment made at the end of 30 months is computed using equation 2B.26 and is given by

$$\begin{aligned} a^r(fractional) &= a\left(\frac{(1+r)^{frac(n)} - 1}{r}\right) \\ &= a\left(\frac{(1.05)^{.5} - 1}{.05}\right) \\ &= (247.9576)\ (0.49390) = 122.466. \end{aligned}$$

[n] Capital recovery is based on the difference between the beginning value of the various pieces of equipment and their real salvage value at the end of their useful life. This salvage value is discounted back to the present at a real interest rate of 5% and then subtracted from the initial value to obtain a net present cost of the equipment. This is then converted to a real annual annuity following the procedures outlined in Chapter 2 and equation 6.7. The manure equipment has a useful life of 12 years and values as in Schedule 14.7.

TABLE 13.3 Detailed Notes (continued)

$$CSC_{manure} = \frac{\left(PP - \frac{SV}{(1+r)^n}\right)}{\left(\frac{1-(1+r)^{-n}}{r}\right)} = \frac{\left(37{,}073 - \frac{5{,}272}{(1.05)^{12}}\right)}{\left(\frac{1-(1.05)^{-12}}{.05}\right)} = 3{,}851.56.$$

Because this is beginning-of-year value it is multiplied by (1.04) to obtain a year-end value of $4,005.62 [(3,851.56)(1.04)].

The feed handling equipment has a useful life of 15 years and values as in Schedule 14.7.

$$CSC_{feed} = \frac{\left(24{,}846 - \frac{2{,}624}{(1.05)^{15}}\right)}{\left(\frac{1-(1.05)^{-15}}{.05}\right)} = 2{,}272.12.$$

Because this is beginning-of-year value it is multiplied by (1.04) to obtain a year-end value of $2,363.00 [(2,272.12)(1.04)].

The milking equipment has a useful life of 15 years and values as in Schedule 14.7.

$$CSC_{milking} = \frac{\left(27{,}675 - \frac{2{,}922}{(1.05)^{15}}\right)}{\left(\frac{1-(1.05)^{-15}}{.05}\right)} = 2{,}530.83.$$

Because this is beginning-of-year value it is multiplied by (1.04) to obtain a year-end value of $2,632.06 [(2,272.12)(1.04)]

The following table summarizes the results.

		Cows	
	Livestock	Percent	Annual
Manure Equipment	$4,005.62	80	$3,204.50
Feed Handling Equipment	2,363.00	80	1,890.40
Milking Equipment	2,632.06	100	2,632.06
Annual Total	$10,909.36		$7,720.96
Capital Recovery/Cow			$86.82

TABLE 13.3 Detailed Notes (continued)

[o] The buildings for livestock have an estimated market value of $87,000 (Schedule 14.6). The opportunity cost of this capital is valued at a 5% real rate and a 9.2% nominal rate. The estimated life of each item is given in Schedule 14.6. Equation 6.7 is used to compute capital recovery. Eighty percent of the opportunity cost is allocated to the dairy cows. The data and computations are presented in the following table.

	Manure Pit	Harvestor 1	Heifer Barn	Harvestor 2	Dairy Barn	Stave Silo 1	Stave Silo 2	Old Barn	Hay Shed	Total
	Value	Value	Value							
Vo	2,000.00	8,000.00	5,000.00	20,000.00	40,000.00	5,000.00	1,000.00	3,000.00	3,000.00	87,000.00
Vn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
n	10	20	20	20	15	20	10	10	20	
Real interest rate	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	0.0500	
Inflation rate	0.0400	0.0400	0.0400	0.0400	0.0400	0.0400	0.0400	0.0400	0.0400	
Nominal interest rate	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	
$V_n/((1+r)^n)$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
$V_0-(V_n/((1+r)^n))$	2,000.00	8,000.00	5,000.00	20,000.00	40,000.00	5,000.00	1,000.00	3,000.00	3,000.00	87,000.00
USO(n,r)	7.72173493	12.462210	12.4622103	12.462210	10.379658	12.462210	7.72173493	7.721735	12.46221	95.856
Real annuity	259.0091	641.9407	401.2129	1,604.8517	3,853.6915	401.2129	129.5046	388.5137	240.7278	7,920.665
Inflation adjusted annuity	269.3695	667.6183	417.2615	1,669.0458	4,007.8392	417.2615	134.6848	404.0543	250.3569	8,237.492
% for cows	80	80	80	80	80	80	80	80	80	
Annuity for cows	215.4956	534.0947	333.8092	1,335.2367	3,206.2713	333.8092	107.7478	323.2434	200.2855	6,589.993

Total Annual Cost	6,589.993
Number of Cows	89
Cost per Cow	74.0449

TABLE 13.3 Detailed Notes (continued)

[p] Taxes and insurance are calculated from the data in Schedule 14.8. Approximately 12% of the real estate tax and 65% of the farm insurance is allocated to the dairy cows. These expenses are adjusted forward for inflation so that 1992 values are 4% higher. Real estate taxes for this dairy herd are [(0.12)(3,244)(1.04)] or $404.85. Insurance is [(0.65)(880)(1.04)] or $594.88. The costs per cow (assuming 89 cows in the herd) are $4.55 and $6.68, respectively, for a total of $11.23.

[q] General farm overhead includes the dairy cows' share (65%) of overhead expenses (Schedule 14.8) adjusted for inflation. The total overhead is $13,094 (1,194+3,500+7,165+1,235). Multiplying by 0.65, adjusting for inflation, and dividing by the number of cows gives a total of $\left[\frac{(13{,}094)(0.65)(1.04)}{89}\right] = \$99.46$ per cow.

Table 13.3R A Sample Detailed CAR Summary for a Dairy Budget (Real values)
Real 1992 Projected Costs and Returns for Milk Production Per Cow, Detailed
(Uses Capital Recovery to Account for Cost of Replacement Heifers)
Ben & Bev Dairyman Farm, Upper Midwest, USA (See Chapter 14 for a complete description of the farm)
Prepared by John Q. Taskforce, Department of Agricultural Economics, Anonymous State University, March 1992

	Item	Units	Quantity	Price	Value
	Gross Value Of Production				
1	Milk(a)	cwt	216.00	12.50	2,699.78
2	Cull Cows (b)	cwt	4.68	46.40	0.00
3	Bull Calves (c)	hd	0.42	125.00	51.92
4	Heifer Calves (c)	hd	0.42	150.00	62.31
5	Interest On Receipts to December(d)			0.050	63.68
6	Total (e)				2,877.68
	Operating Costs				
7	Replacement Heifer (f)	hd	0.40	1050.00	0.00
8	Corn (g)	bu	135.00	2.10	283.50
9	Protein, Vit. & Min. (g)	cwt	12.72	15.23	193.73
10	Alfalfa Hay (g)	ton	2.19	80.00	175.20
11	Alfalfa Haylage (g)	ton	2.37	75.00	177.75
12	Corn Silage (g)	ton	3.96	16.70	66.13
13	Marketing (milk) (h)	cwt	216.00	0.49	105.20
14	Breeding (i)	cow	1.00	47.65	47.65
15	Veterinary & Medicine (i)	cow	1.00	65.69	65.69
16	Supplies (i)	cow	1.00	158.82	158.82
17	Fuel, Oil & Utilities (j)				27.06
18	Repairs (k)				307.61
19	Bedding				
20	Interest On Oper. Costs To Dec.(d)			0.050	36.53
21	Total Operating Costs (e)				1,644.87
	Allocated Overhead				
22	Hired Labor (l)				262.97
23	Opportunity Cost Of Unpaid Labor(l)				247.85
24	Opportunity Interest on Labor				11.60
25	Capital Recovery Of Livestock Investment(m)				247.96
26	Capital Recovery Of Mach & Eq Investment(n)				86.82
27	Capital Recovery of Bldg Investment (o)				74.04
28	Taxes & Insurance (p)				11.23
29	General Farm Overhead (q)				99.46
30	Total Allocated Overhead (e)				1,041.93
31	Total Costs Listed (e)				2,686.80
32	Value Of Prod. Less Total Oper. Costs (e)				1,232.81
33	Value Of Prod. Less Total Costs Listed (e)				190.88

TABLE 13.3R Real 1992 Projected Costs and Returns for Milk Production Per Cow, Detailed Notes
(Table 13A.1R contains cost and revenue data by month for the dairy enterprise.)

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[a] Quantity sold is the total for the year; sales each month are 18 cwt. Price per cwt for milk is based on a non-seasonally adjusted real average price at the end of the year of $12.50. This was adjusted using the seasonal index below to account for typical seasonality in milk prices. Real interest on this revenue from the month of sale to December 31 is recorded on line 5. It is assumed that revenue from milk is received at the end of the month. Because quantities per month are constant, the average real price for the year multiplied by the total quantity gives the actual total revenue (expenditure).

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average
Seasonal Index	103.0	101.8	100.0	98.4	96.8	95.7	96.4	97.7	100.3	102.7	103.8	103.3	100.00
1992 Real (seas. adj.)	12.875	12.725	12.500	12.300	12.100	11.963	12.050	12.213	12.538	12.838	12.975	12.913	12.500
1992 Nominal	12.420	12.316	12.138	11.983	11.826	11.730	11.855	12.054	12.415	12.754	12.933	12.913	12.278

[b] Dairy cows are assumed to be replaced every 2.5 years giving a replacement rate of .40. It is assumed that 1% of the cows die each year (2.5% over the 30 month period) and thus are not available to be sold. This gives an effective cull rate of .39 [0.40 - 0.01 or (0.975)(0.40)]. The average weight of the .39 cows culled per year is 1,200 pounds. This gives per cow culled sales of 468 pounds [(.39)(1,200)]. Price per cwt for cull cows is based on a non-seasonally adjusted real average price at the end of the year of $46.40. The seasonally adjusted price is $42.8736 which is both a real and nominal value for December 31.

Because the estimate in Table 13.3R uses the capital recovery method to value investment in the breeding herd, no income from cull sales is included in the estimates. The value of the cull animal is included as a negative cost in computing the cost of a breeding herd replacement in line 25 of Table 13.3R.

[c] See note [c] in Table 13.3. The prices for calves reflect the market in the area for 3-day-old calves and is assumed to have a constant real value during the year. This is projected to be $125 for bull calves and $150 for heifer calves on December 31, 1992. As with the cull cows, the calf sales are assumed to be equally spaced during the year.

[d] All receipts and expenses are assumed to occur on the last day of the month. Interest is compounded at the monthly rate of .0040741 $[(1.050)^{\frac{1}{12}} - 1]$, (equivalent to an annual rate of .05) until the last day of December.

[e] Individual values may not sum to totals due to rounding.

[f] Dairy cows are assumed to be replaced every 2.5 years giving a replacement rate of .40. The cull rate of .39 allows for some death loss over the life of the cow. A real price of $1,050 per replacement

TABLE 13.3R Detailed Notes (continued)

as of December 1992 is assumed. Because this estimate uses the capital recovery method for valuing the investment in the herd, no replacement cost is included on line 7 of the report. The value of the replacement is included in computing the cost of a breeding herd replacement on line 25 of Table 13.3R.

[g] See note [g] in Table 13.3. The prices in Table 13.3R are the real prices for the year and reflect net market prices the farm would receive. The prices are not seasonally adjusted.

[h] See note [h] in Table 13.3. The real average price for the year is .4870 which rounds to .49 in Table 13.3R.

[i] See note [i] in Table 13.3. The computed real payment is per month $3.97048. Multiplied by 12 months gives an annual payment of $47.65 for breeding. Veterinary and medicine in 1991 were $62.04, while supplies were $150, giving 1992 total nominal expenses of $64.52 and $156. The real monthly payments are $5.474 and $13.235, giving annual expenditures of $65.69 and $158.82 respectively.

[j] See note [j] in Table 13.3. The real expenditure per month is $2.2554 giving an annual total of $27.06.

[k] See note [k] in Table 13.3. The real monthly cost of $25.634 leads to an annual cost of $307.61.

[l] See note [l] in Table 13.3. The labor costs are charged interest at a real rate.

[m] See note [l] in Table 13.3. The capital costs are in real terms at the end of the year.

[n] See note [n] in Table 13.3. The capital costs are in real terms at the end of the year.

[o] See note [o] in Table 13.3. The building costs are in real terms at the end of the year.

[p] See note [p] in Table 13.3. Taxes and Insurance are in real terms at the end of the year.

[q] See note [q] in Table 13.3. General Farm Overhead is in real terms at the end of the year.

TABLE 13.4 Whole-Farm Overhead Cost Items

Overhead Item	Whole Farm	Enterprise 1	Enterprise 2	Enterprise n
Accounting/legal fees				
Advertising				
Computer & related office equipment (annualized costs)				
Education costs within year				
Farm office (maintenance, insurance, capital recovery, etc.)				
Farm organization dues/meetings				
Farm shop (portions could be included in repair cost estimates)				
General use vehicles (whole-farm share)				
Maintenance of general farm facilities—roads, boundary fences, water system, etc.				
Property/casualty insurance				
Publications				
Umbrella liability insurance				
Utilities/phone				
TOTAL	Total Farm	Tot. Ent. 1	Tot. Ent. 2	Tot. Ent. n

Notes:
(1) Each line in this worksheet is allocated separately.
(2) The total for each enterprise is transferred as a single line item input into the respective enterprises.

TABLE 13.5 Expense Items Check List for Crop CAR Estimates[1]

Seed, seed stock, plants, seedlings, etc.
Fertilizer consumed (by blend or by total N, P, K, etc.)
Chemicals (by type; application costs must be separable)
-- Herbicide
-- Insecticide
-- Fungicide
-- Growth regulators
-- Harvest aids
Custom services (by type)
Machinery
-- Fuel and lube
-- Repairs
Irrigation
-- Water (consider system efficiency)
-- Water district charges, taxes, and other expenses
-- Fuel and lube
-- Repairs
Utilities (enterprise specific)
Labor (see Chapter 8 for labor recommendations)
Miscellaneous crop-specific supplies
Crop insurance (offset with indemnity payment if applicable)
Costs of accessing market
Checkoff/assessment (involuntary)
Shipping/transportation
Storage/processing (if reflected in product sales)
Interest on operating capital
Land rent (see Chapter 7 on land costs)
Crop establishment costs (see Chapter 10 multiyear enterprise section)
Capital recovery on durable machinery and equipment (See Chapter 6)
Allocated farm overhead
Tax and insurance on machinery and equipment for the enterprise

[1]Consult various sections of the Report for recommendations on calculating costs for different items.

TABLE 13.6 Expense Items Check List for Livestock CAR Estimates[1]

Feed, minerals, and feed additives (by type)
Forage (by type)
Animal health/performance
-- Vet services and medicines
-- Pest control/chemicals
-- Expendable health equipment and supplies
Breeding costs
-- Bull, boar, ram, stallion fee (or maintenance cost)
-- AI charge including semen
-- Estrus synchronization
-- Pregnancy checking
Machinery and equipment, including buildings
-- Fuel/lube or utilities specific to the enterprise
-- Repairs
Labor
Grazing fees, land rental, pasture maintenance
Livestock-specific supplies
Marketing costs (e.g., commissions, feed, bedding)
Hauling/transportation (if not reflected in prices used)
Checkoffs/assessments (involuntary)
Livestock purchased for resale
Interest on operating capital
Access to market
Capital recovery for machinery/equipment/buildings
Taxes and insurance on machinery/equipment/buildings
Allocated farm overhead

[1] Consult Report sections for recommendations concerning calculating costs for different items.

APPENDIX 13A

SUPPLEMENTARY DATA TABLES FOR CHAPTER 13

This appendix contains data tables that support the CAR estimates in Tables 13.2 and 13.3. It also contains alternate estimates of milk production using the market value, historic cost, and current cost methods of accounting for the cost of replacement livestock as compared to the capital recovery method used in Table 13.3. Table 13A.1 contains monthly price, quantity, return, and cost data for the dairy enterprise discussed in Chapter 13. Table 13A.2 contains a CAR estimate using the market value methods for valuing replacement animals while Tables 13A.3A and 13A.3B illustrate the historic cost method of valuing replacement animals. The current value method is used in Table 13A.4. Table 13A.5A presents estimates of the cost of raising a dairy heifer from birth to one year of age in current dollars while Table 13A.5B shows estimates of the cost of raising a dairy heifer from one year of age to freshening. Tables 13A.6A and 13A.6B are the detailed monthly tables that support Tables 13A.5A and 13A.5B. Table 13A.7 gives the current combined costs of raising one heifer from birth to age one year and from one year to freshening. Whereas Tables 13A.5AB and 13A.6AB consider these costs of assuming the birth of a one heifer in January with freshening at two years of age in a subsequent January, Table 13A.7 assumes that heifer births and growth occur continuously over time so 1/12 of a heifer is born each month, is weaned each month, is bred each month, and so forth. Thus, whereas the data in Tables 13A.5AB and 13A.6AB estimate costs based on a seasonal pattern of expenses consistent with the growth pattern of a heifer, Table 13A.7 assumes equal expenditures in each and every month. Table 13A.8 is a listing of monthly and annual average prices used in the estimation.

Table 13A.1 Income & Expenses Per Month For 1992 Projected Costs & Returns For Milk Production Per Cow														
ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
		1	2	3	4	5	6	7	8	9	10	11	12	
Quantity Sold														
Milk	cwt	18	18	18	18	18	18	18	18	18	18	18	18	216
Cull Cows	cwt	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	4.68
Bull Calves	HD	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.4153846
Heifer Calves	HD	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.4153846
Sale Price														
Milk	$/cwt	12.42	12.32	12.14	11.98	11.83	11.73	11.85	12.05	12.42	12.75	12.93	12.91	12.277969
Cull Cows	$/cwt	42.97	46.30	47.53	47.15	47.16	46.18	45.88	46.35	46.18	45.08	43.06	42.87	45.55924
Bull Calves	$/HD	120.59	120.98	121.38	121.77	122.17	122.57	122.97	123.38	123.78	124.19	124.59	125.00	122.78087
Heifer Calves	$/HD	144.70	145.18	145.65	146.13	146.61	147.09	147.57	148.05	148.54	149.02	149.51	150.00	147.33704
Value Of Production														
Milk	$	223.566	221.6848	218.4779	215.6861	212.8736	211.1435	213.3842	216.9698	223.473	229.5694	232.7879	232.425	2652.0413
Cull Cows	$	16.75868	18.05705	18.53788	18.38702	18.39415	18.01076	17.89169	18.07529	18.00903	17.58258	16.7924	16.7207	213.21724
Bull Calves	$	4.174123	4.187788	4.201498	4.215253	4.229052	4.242897	4.256787	4.270723	4.284704	4.298731	4.312804	4.326923	51.001285
Heifer Calves	$	5.008948	5.025346	5.041798	5.058303	5.074863	5.091477	5.108145	5.124867	5.141645	5.158477	5.175365	5.192308	61.201542
Total Revenue		249.5078	248.9549	246.2591	243.3466	240.5716	238.4887	240.6409	244.4407	250.9084	256.6092	259.0685	258.6649	2977.4614
Annual Nominal Int Rate	Decimal	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	
Monthly Compound Int Rate	Decimal	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	
Valuation Month(Dec=12, etc)	Integer	12	12	12	12	12	12	12	12	12	12	12	12	
Valuation Month-Current Month	Integer	11	10	9	8	7	6	5	4	3	2	1	0	
Compound Int To Valuation Month (Milk)	$	18.78409	16.86997	14.90793	13.03378	11.21427	9.498933	7.970303	6.459522	4.971507	3.392253	1.713599	0	108.81616
Compound Int To Valuation Month (Culls)	$	1.40807	1.374122	1.26494	1.111117	0.969011	0.810269	0.668288	0.538129	0.400639	0.259811	0.123612	0	8.928008
Compound Int To Valuation Month (Bulls)	$	0.350711	0.318686	0.286691	0.254725	0.222788	0.19088	0.158999	0.127146	0.09532	0.063521	0.031747	0	2.1012143
Compound Int To Valuation Month (Heifers)	$	0.420853	0.382423	0.344029	0.30567	0.267346	0.229056	0.190799	0.152575	0.114384	0.076225	0.038097	0	2.5214571
Compound Int To Valuation Month (Total)	$	20.96372	18.9452	16.80359	14.70529	12.67341	10.72914	8.988389	7.277373	5.58185	3.791809	1.907055	0	122.36684

Table 13A.1: Income & Expenses Per Month For 1992 Projected Costs & Returns For Milk Production Per Cow (cont)														
ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
Quantity Purchased														
Replacement Heifer	HD	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.4
Corn	Bu	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	135
Protein, Vit. & Min	cwt	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	12.72
Alfalfa Hay	ton	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	2.19
Alfalfa Haylage	ton	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	2.37
Corn Silage	ton	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	3.96
Marketing	cwt	18	18	18	18	18	18	18	18	18	18	18	18	216
Purchase Price														
Replacement Heifer	$/HD	1012.92	1016.24	1019.56	1022.90	1026.25	1029.61	1032.98	1036.36	1039.75	1043.16	1046.57	1050.00	1031.3593
Corn	$/Bu	2.03	2.03	2.04	2.05	2.05	2.06	2.07	2.07	2.08	2.09	2.09	2.10	2.063
Protein, Vit. & Min	$/cwt	14.69	14.74	14.79	14.84	14.89	14.93	14.98	15.03	15.08	15.13	15.18	15.23	14.960
Alfalfa Hay	$/Ton	77.17	77.43	77.68	77.94	78.19	78.45	78.70	78.96	79.22	79.48	79.74	80.00	78.580
Alfalfa Haylage	$/Ton	72.35	72.59	72.83	73.06	73.30	73.54	73.78	74.03	74.27	74.51	74.76	75.00	73.669
Corn Silage	$/Ton	16.11	16.16	16.22	16.27	16.32	16.38	16.43	16.48	16.54	16.59	16.65	16.70	16.404
Marketing	$/cwt	0.47	0.47	0.47	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.49	0.49	0.478
Operating Costs														
Replacement Heifer	$	33.76402	33.87455	33.98545	34.09671	34.20833	34.32032	34.43268	34.5454	34.6585	34.77196	34.88579	35	412.54372
Corn	$	22.79071	22.86532	22.94018	23.01528	23.09063	23.16622	23.24206	23.31815	23.39448	23.47107	23.54791	23.625	278.46701
Protein, Vit. & Min	$	15.5737	15.62469	15.67584	15.72716	15.77864	15.8303	15.88212	15.93412	15.98628	16.03862	16.09112	16.1438	190.28638
Alfalfa Hay	$	14.08442	14.13053	14.17679	14.2232	14.26976	14.31648	14.36335	14.41037	14.45754	14.50487	14.55236	14.6	172.08967
Alfalfa Haylage	$	14.28942	14.3362	14.38313	14.43022	14.47746	14.52485	14.5724	14.62011	14.66797	14.71599	14.76417	14.8125	174.5944
Corn Silage	$	5.316386	5.333791	5.351252	5.368771	5.386347	5.40398	5.421671	5.43942	5.457228	5.475093	5.493017	5.511	64.957956
Marketing	$	8.457248	8.484935	8.512713	8.540581	8.568541	8.596592	8.624735	8.65297	8.681298	8.709718	8.738231	8.766838	103.3344
Breeding	$	3.830276	3.842815	3.855395	3.868017	3.88068	3.893384	3.90613	3.918918	3.931747	3.944619	3.957532	3.970488	46.8
Veterinary & Medicine	$	5.280673	5.297961	5.315305	5.332706	5.350164	5.367679	5.385251	5.402881	5.420569	5.438314	5.456118	5.47398	64.5216
Supplies	$	12.76759	12.80938	12.85132	12.89339	12.9356	12.97795	13.02043	13.06306	13.10582	13.14873	13.19177	13.23496	156
Fuel & Oil	$	2.17575	2.182872	2.190019	2.197188	2.204381	2.211598	2.218838	2.226102	2.233389	2.240701	2.248036	2.255396	26.58427
Bedding	$													
Repairs (nominal $)	$	24.7291	24.8100	24.8912	24.9727	25.0545	25.1365	25.2188	25.3013	25.3842	25.4673	25.5507	25.6343	302.15052
Total (exclude dairy heifer)	$	129.2952	129.7185	130.1432	130.5692	130.9967	131.4255	131.8558	132.2874	132.7205	133.155	133.5909	134.0283	1579.7862
Total Operating Costs	$	163.0592	163.5931	164.1286	164.6659	165.205	165.7458	166.2885	166.8328	167.379	167.927	168.4767	169.0283	1992.3299
Annual Nominal Int Rate	Decimal	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	
Monthly Compound Nominal Int Rate	Decimal	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	
Valuation Month(Dec=12, etc)	Integer	12	12	12	12	12	12	12	12	12	12	12	12	
Valuation Month-Current Month	Integer	11	10	9	8	7	6	5	4	3	2	1	0	
Compound Int To Valuation Month (no heifers	$	10.86342	9.871439	8.880375	7.890219	6.900958	5.912576	4.925061	3.938399	2.952575	1.967577	0.98339	0	65.085995
Compound Int To Valuation Month (inc heifers	$	13.70029	12.44926	11.19939	9.950663	8.703067	7.45658	6.211187	4.966868	3.723608	2.481388	1.240191	0	82.082483
Allocated Overhead														
Hired Labor	$	21.14	21.21	21.28	21.35	21.42	21.49	21.56	21.63	21.70	21.77	21.84	21.91	258.300
Opportunity Cost Of Unpaid Labor	$	19.92	19.99	20.06	20.12	20.19	20.25	20.32	20.39	20.45	20.52	20.59	20.65	243.448
Compound Int (Labor) To Valuation Month	$	3.45	3.14	2.82	2.51	2.19	1.88	1.56	1.25	0.94	0.62	0.31	0.00	20.672
Capital Recovery Of Livestock Inv		21.12833	21.0426	20.95722	20.87218	20.78749	20.70315	20.61914	20.53548	20.45215	20.36917	20.28652	20.2042	247.95763
Capital Recovery Of Machinery Inv														86.82
Capital Recovery of Bldg Inv														74.0449
Taxes & Insurance														11.23
General Farm Overhead														99.46
Total Allocated Overhead														1041.931
Total Costs (Cap Recovery)														3099.347
Total Costs (Market Value)														#VALUE!

Table 13A.2 A Sample Detailed CAR Summary for a Dairy Budget
1992 Projected Costs and Returns for Milk Production Per Cow, Detailed
(Market value method used to account for cost of replacement heifers)
Ben & Bev Dairyman Farm, Upper Midwest, USA (See Chapter 14 for a complete description of the farm)
Prepared by John Q. Taskforce, Department of Agricultural Economics, Anonymous State University, March 1992

	Item	Units	Quantity	Price	Value
	Gross Value Of Production				
1	Milk (a)	cwt	216.00	12.28	2,652.04
2	Cull Cows (b)	cwt	4.68	45.56	213.22
3	Bull Calves (c)	hd	0.42	122.78	51.00
4	Heifer Calves (c)	hd	0.42	147.34	61.20
5	Interest On Receipts to December (d)			0.092	122.37
6	Total (e)				3,099.83
	Operating Costs				
7	Replacement Heifer (f)	hd	0.40	1031.36	412.54
8	Corn (g)	bu	135.00	2.06	278.47
9	Protein, Vit., & Min. (g)	cwt	12.72	14.96	190.29
10	Alfalfa Hay (g)	ton	2.19	78.58	172.09
11	Alfalfa Haylage (g)	ton	2.37	73.67	174.59
12	Corn Silage (g)	ton	3.96	16.40	64.96
13	Marketing (milk) (h)	cwt	216.00	0.48	103.33
14	Breeding (i)	cow	1.00	46.80	46.80
15	Veterinary & Medicine (i)	cow	1.00	64.52	64.52
16	Supplies (i)	cow	1.00	156.00	156.00
17	Fuel, Oil, & Utilities (j)				26.58
18	Repairs (k)				302.15
19	Bedding				
20	Interest On Oper. Costs To Dec. (d)			0.092	82.08
21	Total Operating Costs (e)				2,074.41
	Allocated Overhead				
22	Hired Labor (l)				258.30
23	Opportunity Cost Of Unpaid Labor(l)				243.45
24	Opportunity Interest on Labor				20.67
25	Opportunity Interest On Livestock Investment (m)				44.89
26	Capital Recovery of Bldg Investment (n)				86.82
27	Opportunity Cost Of Bldg Investment (o)				74.04
28	Taxes & Insurance (p)				11.23
29	General Farm Overhead (q)				99.46
30	Total Allocated Overhead (e)				838.87
31	Total Costs Listed (e)				2,913.28
32	Value Of Prod. Less Total Oper. Costs (e)				1,025.42
33	Value Of Prod. Less Total Costs Listed (e)				186.55

TABLE 13A.2 1992 Projected Costs and Returns for Milk Production Per Cow (Market Value Method), Detailed Notes

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[a] See notes for Table 13.3.

[b] The average weight of the .39 cows culled per year is 1,200 pounds. This gives per cow culled sales of 468 pounds [(.39)(1,200)]. Price per cwt for cull cows is based on a nonseasonally adjusted real average price at the end of the year of $46.40. This was adjusted using the seasonal index below to account for typical seasonality in cattle prices and then adjusted to a nominal basis assuming a 4% annual rate of inflation. The nominal price at the end of December (the base period) is $46.40 while the average nominal price over the 12 months of the year is $45.56. This gives revenue of $213.22 [(4.68)(45.46)]. Nominal interest on this revenue from the month of sale to December 31 is recorded on line 5 of the Table. It is assumed that revenue from cull cow sales is received at the end of the month with an equal quantity sold per month.

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average
Seasonal Index	96.00	103.10	105.50	104.30	104.00	101.50	100.50	101.20	100.50	97.80	93.10	92.40	99.992
1992 Real (seas. adj.)	44.544	47.838	48.952	48.395	48.256	47.096	46.632	46.956	46.632	45.379	43.198	42.873	46.396
1992 Nominal	42.971	46.300	47.533	47.146	47.164	46.181	45.876	46.346	46.177	45.083	43.057	42.873	45.559

[c] See notes for Table 13.3.

[d] See notes for Table 13.3. Interest on revenue in Table 13A.2 is larger than in Table 13.3 due to the inclusion of cull cow sales as revenue. Interest on operating expenses is also larger due to the inclusion of the heifer purchase as an operating expense.

[e] Individual values may not add to totals due to rounding.

[f] Dairy cows are assumed to be replaced every 2.5 years giving a replacement rate of .40. The cull rate of .39 allows for 1% death loss each year and 2.5% death loss over 2.5 years. A real price for replacement heifers of $1,050 as of December 1992 is assumed. This gives a nominal price at the beginning of January 1992 of $1,009.6155. This is adjusted to reflect 4% inflation during the year with a nominal average for the 12 months of $1,031.359. The annual payment is then $412.54 [(.40)(1,031.36)].

[g] See notes for Table 13.3.

[h] See notes for Table 13.3.

[i] See notes for Table 13.3.

[j] See notes for Table 13.3.

[k] See notes for Table 13.3.

TABLE 13A.2 Detailed Notes (continued)

[l] See notes for Table 13.3.

[m] Because we are using the market value method, there is no capital recovery and cost is based on the opportunity interest associated with the investment in the cow since cull sales and heifer purchases are accounted for in other sections of the estimate. The traditional method of computing opportunity interest based on equations 6.5 and 6.6 (also equations 10.3 and 10.4) is used to obtain a value for investment. Specifically, we compute real opportunity interest on an average year-end value of V_0 given by $\left(\frac{V_0 + V_n + D}{2} \right)$ where D is straight-line depreciation computed as $D = \frac{V_0 - V_n}{n}$ and

V_0 = Value of the cow at the beginning of the first year in real terms
V_n = Real value of the cow at the end of her useful life (period n)
n = useful life in years.

This value is multiplied by the real interest rate (r) to obtain opportunity interest cost (OC) as

$$OC = \left(\frac{V_0 + V_n + D}{2} \right) (r).$$

Because the herd has a rolling inventory of cows, some older and some younger, this "average" value is used as an approximation of the value of the representative cow at the beginning of the year. The real value of a heifer is \$1,050. The real value of a cull animal (assuming 1% death loss per year or 2.5 % over 2.5 years) is obtained by multiplying the net sales weight [(12 cwt)(.975)] by the market price for cull cows (\$46.40 per cwt) to obtain \$542.88. The assumed productive life of the cow is 30 months (2.5 years) so D is given by $D = \frac{1{,}050 - 542.88}{2.5} = \$202.848$. We compute an average inventory value in real terms as Average $V_0^r = \left(\frac{1{,}050 + 542.88 + 202.848}{2} \right) = \$897.864$.

Opportunity interest is computed directly then as [(897.864)(0.05)] = \$44.8932. We can also convert this average value to beginning-of-year nominal terms by dividing it by $(1 + \pi)$ to obtain \$863.33 $[(897.864)(1.04)^{-1}]$. Opportunity interest is computed as [(863.33)(0.05)] = \$43.1665. Adjusting this to end of the year prices will give \$44.8932 [(43.1665)(1.04)].

[n]-[q] See notes for Table 13.3.

Table 13A.3A A Sample Detailed CAR Summary for a Dairy Budget
1992 Projected Costs and Returns for Milk Production Per Cow, Detailed
(Historic Cost Method used to Account for Cost of Replacement Heifers)
Ben & Bev Dairyman Farm, Upper Midwest, USA (See Chapter 14 for a complete description of the farm)
Prepared by John Q. Taskforce, Department of Agricultural Economics, Anonymous State University, March 1992

	Item	Units	Quantity	Price	Value
	Gross Value Of Production				
1	Milk (a)	cwt	216.00	12.28	2,652.04
2	Cull Cows (b)	cwt	4.68	45.56	213.22
3	Bull Calves (c)	hd	0.42	122.78	51.00
4	Heifer Calves (c)	hd	0.42	147.34	61.20
5	Interest On Receipts to December (d)			0.092	122.37
6	Total (e)				3,099.83
	Operating Costs				
7	Replacement Heifer (f)	hd	0.40	1140.10	456.04
8	Corn (g)	bu	135.00	2.06	278.47
9	Protein, Vit., & Min. (g)	cwt	12.72	14.96	190.29
10	Alfalfa Hay (g)	ton	2.19	78.58	172.09
11	Alfalfa Haylage (g)	ton	2.37	73.67	174.59
12	Corn Silage (g)	ton	3.96	16.40	64.96
13	Marketing (milk) (h)	cwt	216.00	0.48	103.33
14	Breeding (i)	cow	1.00	46.80	46.80
15	Veterinary & Medicine (i)	cow	1.00	64.52	64.52
16	Supplies (i)	cow	1.00	156.00	156.00
17	Fuel, Oil, & Utilities (j)				26.58
18	Repairs (k)				302.15
19	Bedding				
20	Interest On Oper. Costs To Dec. (d)			0.092	83.87
21	Total Operating Costs (e)				2,119.70
	Allocated Overhead				
22	Hired Labor (l)				258.30
23	Opportunity Cost Of Unpaid Labor(l)				243.45
24	Opportunity Interest on Labor				20.67
25	Opportunity Interest On Livestock Investment (m)				48.77
26	Capital Recovery of Bldg Investment (n)				86.82
27	Opportunity Cost Of Bldg Investment (o)				74.04
28	Taxes & Insurance (p)				11.23
29	General Farm Overhead (q)				99.46
30	Total Allocated Overhead (e)				842.74
31	Total Costs Listed (e)				2,962.44
32	Value Of Prod. Less Total Oper. Costs (e)				980.13
33	Value Of Prod. Less Total Costs Listed (e)				137.38

TABLE 13A.3A 1992 Projected Costs and Returns for Milk Production Per Cow (Historic Value Method), Detailed Notes

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[a] See notes for Table 13.3.

[b] See notes for Table 13A.2.

[c] See notes for Table 13.3.

[d] See notes for Table 13A.2.

[e] Individual values may not add to totals due to rounding.

[f] Dairy cows are assumed to be replaced every 2.5 years giving a replacement rate of .40. The cull rate of .39 allows for 1% death loss each year and 2.5% death loss over 2.5 years. A real price for replacement heifers is estimated based on the cost of raising a heifer in the herd. These are summarized in Table 13A.5AB. Table 13A.5A gives the costs of raising a heifer from birth to one year of age assuming 1992 prices for all inputs including the heifer calf valued at $150 as of December 1992. The estimates in Table 13A.5A assume the heifer calf is born on January 1, 1991. Table 13A.5B gives the cost of raising the same calf from age 1 year to the point of freshening (2 years) also assuming 1992 prices. We follow the convention that inflation outside the current period is 0%. To have a heifer ready to enter the herd on January 1, 1991, the calf must be born on January 1, 1989. Given this time line, the first year costs will accrue interest from the end of 1990 to the beginning of 1991 at a 5% real rate. The second year costs will already be in end-of-second-year dollars. The first year cost in end-of-1992 dollars is $577.67. The second year cost from Table 13A.5B is $554.16. This gives a total cost in end-of-1992 dollars of $1,160.7135 [(577.67)(1.05) + $554.16]. This gives a beginning-of-year (January 1) value of $1,116.07 [(1,160.71)/(1.04)]. The average nominal price over the year is $1,140.10 as compared to $1,031.36 in the case of a purchased replacement. The annual payment is then $456.04 [(.40)(1,140.10)].

[g] - [l] See notes for Table 13.3.

[m] Because we are using the historic cost method, there is no capital recovery and cost is based on the opportunity interest associated with the investment in the cow since cull sales and heifer purchases are accounted for in other sections of the estimate. The traditional method of computing opportunity interest based on equations 6.5 and 6.6 (also equations 10.3 and 10.4) is used to obtain a value for investment. Specifically, we compute real opportunity interest on an average year-end value of V_0 as in Table 13A.2. The real value of a heifer in end-of-1992 dollars from footnote f is $1,160.71 [(577.67)(1.05) + $554.16]. The real value of a cull animal (assuming 1% death loss per year or 2.5 % over 2.5 years) is $542.88 as before. The assumed productive life of the cow is 30 months (2.5 years) so D is given by $D = \frac{1,160.71 - 542.88}{2.5} = \$247.132$. We compute an average inventory

TABLE 13A.3A Detailed Notes (continued)

value in real terms as Average $V_0^r = \left(\frac{1{,}160.71 + 542.88 + 247.132}{2} \right) = \$975.361$. Opportunity interest is computed directly then as [(975.361)(0.05)] = $48.768.

[n] - [q] See notes for Table 13.3.

Table 13A.3B Income & Expenses Per Month For Projected 1992 Costs & Returns For Milk Production Per Cow (Historic Cost Method)

ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
		1	2	3	4	5	6	7	8	9	10	11	12	
Quantity Sold														
Milk	cwt	18	18	18	18	18	18	18	18	18	18	18	18	216
Cull Cows	cwt	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	4.68
Bull Calves	HD	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.4153846
Heifer Calves	HD	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.034615	0.4153846
Sale Price														
Milk	$/cwt	12.42	12.32	12.14	11.98	11.83	11.73	11.85	12.05	12.42	12.75	12.93	12.91	12.277969
Cull Cows	$/cwt	42.97	46.30	47.53	47.15	47.16	46.18	45.88	46.35	46.18	45.08	43.06	42.87	45.55924
Bull Calves	$/HD	120.59	120.98	121.38	121.77	122.17	122.57	122.97	123.38	123.78	124.19	124.59	125.00	122.78087
Heifer Calves	$/HD	144.70	145.18	145.65	146.13	146.61	147.09	147.57	148.05	148.54	149.02	149.51	150.00	147.33704
Value Of Production														
Milk	$	223.566	221.6848	218.4779	215.6861	212.8736	211.1435	213.3842	216.9698	223.473	229.5694	232.7879	232.425	2652.0413
Cull Cows	$	16.75868	18.05705	18.53788	18.38702	18.39415	18.01076	17.89169	18.07529	18.00903	17.58258	16.7924	16.7207	213.21724
Bull Calves	$	4.174123	4.187788	4.201498	4.215253	4.229052	4.242897	4.256787	4.270723	4.284704	4.298731	4.312804	4.326923	51.001285
Heifer Calves	$	5.008948	5.025346	5.041798	5.058303	5.074863	5.091477	5.108145	5.124867	5.141645	5.158477	5.175365	5.192308	61.201542
Total Revenue		249.5078	248.9549	246.2591	243.3466	240.5716	238.4887	240.6409	244.4407	250.9084	256.6092	259.0685	258.6649	2977.4614
Annual Nominal Int Rate	Decimal	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	
Monthly Compound Int Rate	Decimal	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	
Valuation Month(Dec=12, etc)	Integer	12	12	12	12	12	12	12	12	12	12	12	12	
Valuation Month-Current Month	Integer	11	10	9	8	7	6	5	4	3	2	1	0	
Compound Int To Valuation Month (Milk)	$	18.78409	16.86997	14.90793	13.03378	11.21427	9.498933	7.970303	6.459522	4.971507	3.392253	1.713599	0	108.81616
Compound Int To Valuation Month (Culls)	$	1.40807	1.374122	1.26494	1.111117	0.969011	0.810269	0.668288	0.538129	0.400639	0.259811	0.123612	0	8.928008
Compound Int To Valuation Month (Bulls)	$	0.350711	0.318686	0.286691	0.254725	0.222788	0.19088	0.158999	0.127146	0.09532	0.063521	0.031747	0	2.1012143
Compound Int To Valuation Month (Heifers)	$	0.420853	0.382423	0.344029	0.30567	0.267346	0.229056	0.190799	0.152575	0.114384	0.076225	0.038097	0	2.5214571
Compound Int To Valuation Month (Total)	$	20.96372	18.9452	16.80359	14.70529	12.67341	10.72914	8.988389	7.277373	5.58185	3.791809	1.907055	0	122.36684

Table 13A.3B Income & Expenses Per Month For Projected 1992 Costs & Returns For Milk Production Per Cow (Historic Cost Method) -- cont														
ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
Quantity Purchased														
Replacement Heifer	HD	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.033333	0.4
Corn	Bu	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	135
Protein, Vit. & Min	cwt	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	12.72
Alfalfa Hay	ton	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	0.1825	2.19
Alfalfa Haylage	ton	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	2.37
Corn Silage	ton	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	3.96
Marketing	cwt	18	18	18	18	18	18	18	18	18	18	18	18	216
Purchase Price														
Replacement Heifer	$/HD	1119.72	1123.39	1127.06	1130.75	1134.46	1138.17	1141.90	1145.63	1149.38	1153.15	1156.92	1160.71	1140.1038
Corn	$/Bu	2.03	2.03	2.04	2.05	2.05	2.06	2.07	2.07	2.08	2.09	2.09	2.10	2.063
Protein, Vit. & Min	$/cwt	14.69	14.74	14.79	14.84	14.89	14.93	14.98	15.03	15.08	15.13	15.18	15.23	14.960
Alfalfa Hay	$/Ton	77.17	77.43	77.68	77.94	78.19	78.45	78.70	78.96	79.22	79.48	79.74	80.00	78.580
Alfalfa Haylage	$/Ton	72.35	72.59	72.83	73.06	73.30	73.54	73.78	74.03	74.27	74.51	74.76	75.00	73.669
Corn Silage	$/Ton	16.11	16.16	16.22	16.27	16.32	16.38	16.43	16.48	16.54	16.59	16.65	16.70	16.404
Marketing	$/cwt	0.47	0.47	0.47	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.49	0.49	0.478
Operating Costs														
Replacement Heifer	$	37.32403	37.44622	37.56881	37.6918	37.81519	37.93899	38.06319	38.1878	38.31282	38.43825	38.56408	38.69033	456.04152
Corn	$	22.79071	22.86532	22.94018	23.01528	23.09063	23.16622	23.24206	23.31815	23.39448	23.47107	23.54791	23.625	278.46701
Protein, Vit. & Min	$	15.5737	15.62469	15.67584	15.72716	15.77864	15.8303	15.88212	15.93412	15.98628	16.03862	16.09112	16.1438	190.28638
Alfalfa Hay	$	14.08442	14.13053	14.17679	14.2232	14.26976	14.31648	14.36335	14.41037	14.45754	14.50487	14.55236	14.6	172.08967
Alfalfa Haylage	$	14.28942	14.3362	14.38313	14.43022	14.47746	14.52485	14.5724	14.62011	14.66797	14.71599	14.76417	14.8125	174.5944
Corn Silage	$	5.316386	5.333791	5.351252	5.368771	5.386347	5.40398	5.421671	5.43942	5.457228	5.475093	5.493017	5.511	64.957956
Marketing	$	8.457248	8.484935	8.512713	8.540581	8.568541	8.596592	8.624735	8.65297	8.681298	8.709718	8.738231	8.766838	103.3344
Breeding	$	3.830276	3.842815	3.855395	3.868017	3.88068	3.893384	3.90613	3.918918	3.931747	3.944619	3.957532	3.970488	46.8
Veterinary & Medicine	$	5.280673	5.297961	5.315305	5.332706	5.350164	5.367679	5.385251	5.402881	5.420569	5.438314	5.456118	5.47398	64.5216
Supplies	$	12.76759	12.80938	12.85132	12.89339	12.9356	12.97795	13.02043	13.06306	13.10582	13.14873	13.19177	13.23496	156
Fuel & Oil	$	2.17575	2.182872	2.190019	2.197188	2.204381	2.211598	2.218838	2.226102	2.233389	2.240701	2.248036	2.255396	26.58427
Bedding	$													
Repairs (nominal $)	$	24.73	24.81	24.89	24.97	25.05	25.14	25.22	25.30	25.38	25.47	25.55	25.63	302.15052
Total (excluding dairy heifer)	$	129.2952	129.7185	130.1432	130.5692	130.9967	131.4255	131.8558	132.2874	132.7205	133.155	133.5909	134.0283	1579.7862
Total Operating Costs	$	166.6193	167.1647	167.712	168.261	168.8119	169.3645	169.919	170.4752	171.0333	171.5932	172.155	172.7186	2035.8277
Annual Nominal Int Rate	Decimal	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	
Monthly Compound Nominal Int Rate	Decimal	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	0.007361	
Valuation Month(Dec=12, etc)	Integer	12	12	12	12	12	12	12	12	12	12	12	12	
Valuation Month-Current Month	Integer	11	10	9	8	7	6	5	4	3	2	1	0	
Compound Int To Valuation Month (no heifers	$	10.86342	9.871439	8.880375	7.890219	6.900958	5.912576	4.925061	3.938399	2.952575	1.967577	0.98339	0	65.085995
Compound Int To Valuation Month (inc heifers	$	13.9994	12.72106	11.4439	10.16791	8.893078	7.619377	6.346793	5.075308	3.804904	2.535563	1.267268	0	83.87456
Allocated Overhead														
Hired Labor	$	21.14	21.21	21.28	21.35	21.42	21.49	21.56	21.63	21.70	21.77	21.84	21.91	258.300
Opportunity Cost Of Unpaid Labor	$	19.92	19.99	20.06	20.12	20.19	20.25	20.32	20.39	20.45	20.52	20.59	20.65	243.448
Compound Int (Labor) To Valuation Month	$	3.45	3.14	2.82	2.51	2.19	1.88	1.56	1.25	0.94	0.62	0.31	0.00	20.672
Capital Recovery Of Livestock Inv														48.768048
Capital Recovery Of Machinery Inv														86.82
Capital Recovery Cost Of Bldg Inv														74.04
Taxes & Insurance														11.23
General Farm Overhead														99.46
Total Allocated Overhead														842.741
Total Cost														3418.485

Table 13A.4A A Sample Detailed CAR Summary for a Dairy Budget
1992 Projected Costs and Returns for Milk Production Per Cow, Detailed
(Use current value method used to account for cost of replacement heifers)
Ben & Bev Dairyman Farm, Upper Midwest, USA (See Chapter 14 for a complete description of the farm)
Prepared by John Q. Taskforce, Department of Agricultural Economics, Anonymous State University, March 1992

	Item	Units	Quantity	Price	Value
	Gross Value Of Production				
1	Milk (a)	cwt	216.00	12.28	2,652.04
2	Cull Cows (b)	cwt	4.68	45.56	213.22
3	Bull Calves (c)	hd	0.42	122.78	51.00
4	Heifer Calves (d)	hd	0.02	147.34	2.27
5	Interest On Receipts to December (e)			0.092	119.94
6	Total (f)				3,038.47
	Operating Costs				
7	Replacement Heifer (g)	hd	0.00	1140.10	0.00
8	Corn (h)	bu	143.40	2.06	295.79
9	Protein, Vit., & Min. (h)	cwt	13.82	14.96	206.74
10	Alfalfa Hay (h)	ton	2.85	78.58	223.89
11	Alfalfa Haylage (h)	ton	3.11	73.67	228.81
12	Corn Silage (h)	ton	5.20	16.40	85.32
13	Milk Replacer (h)	lbs	16.00	0.79	12.66
14	Marketing (milk) (i)	cwt	216.00	0.48	103.33
15	Breeding (j)	cow	1.00	64.98	64.98
16	Veterinary & Medicine (k)	cow	1.00	72.60	72.60
17	Supplies (k)	cow	1.00	161.96	161.96
18	Fuel, Oil, & Utilities (l)				30.27
19	Repairs (m)				328.53
20	Bedding (n)				14.40
21	Interest On Oper. Costs To Dec.(e)			0.092	75.37
22	Total Operating Costs (f)				1,904.65
	Allocated Overhead				
23	Hired Labor (o)				286.94
24	Opportunity Cost Of Unpaid Labor(o)				291.46
25	Opportunity Interest on Labor				23.83
26	Opportunity Interest On Livestock Investment (p)				60.32
27	Capital Recovery Of Mach & Eq Investment (q)				101.13
28	Capital Recovery of Bldg Investment (r)				92.56
29	Taxes & Insurance (s)				14.43
30	General Farm Overhead (t)				113.23
31	Total Allocated Overhead (f)				983.90
32	Total Costs Listed (f)				2,888.54
33	Value Of Prod. Less Total Oper. Costs (f)				1,133.82
34	Value Of Prod. Less Total Costs Listed (f)				149.92

TABLE 13A.4A 1992 Projected Costs and Returns for Milk Production Per Cow (Current Cost Method), Detailed Notes

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[a] See note [a] in Table 13.3.

[b] See note [b] in Table 13A.2.

[c] See note [c] in Table 13.3 for revenue from bull calf sales.

[d] It is assumed that 0.40 heifer calves per year are kept back to be raised for replacements. Given net births of .4154 heifers as discussed in footnote c of Table 13.3, this leaves 0.0154 calves to be sold. Although partial calves make no sense in this individual cow estimate, over a herd of 89 cows this would be 1.37 calves. As discussed in footnote c of Table 13.3 the average nominal price for the year is $147.34 giving revenue of $2.27. As with the cull cows, the calf sales are equally spaced during the year.

[e] See note [d] in Table 13.3. Interest on revenue in this Table is larger than in Table 13.3 due to the inclusion of cull cow sales as revenue. Interest on operating expenses is also larger due to the inclusion of the costs of raising a heifer as an additional operating expense.

[f] Individual values may not add to totals due to rounding.

[g] There is no charge here because the costs of raising the replacement are accounted for in the various expense totals such as feed, supplies, and vet-med.

[h] See note [g] in Table 13.3. In addition to the costs of feeding the cow accounted for in Table 13.3, this also includes the costs of feeding both young heifers (birth to 1 year) and yearling heifers (1 year to freshening) for one year. In particular it includes the cost of 0.40 of each type of heifer. These data are reported in Table 13A.7. For example, quantity of corn consumed from Table 13A.1 is 135 bushels, while the quantity from Table 13A.7 is 21 bushels. This then gives a total of 143.4 [135 + (0.4)(21)]. Note that Table 13A.7 assumes that the heifers are raised in a continuous fashion with expenses spaced equally over the year as opposed to Table 13A.6AB, which assume that each heifer is born on January 1.

[i] See note [h] in Table 13.3.

[j] See note [i] in Table 13.3. In addition to the breeding cost in Table 13.3 this includes the cost of breeding the replacement heifer taken from Table 13A.7. This then gives a cost of $64.98 [46.80 + (0.40)(45.4434)].

[k] See note [i] in Table 13.3 for vet-med and supplies. In addition to the costs in Table 13.3 this includes the cost of vet-med and supplies taken from Table 13A.7. This then gives a cost of $72.60 [64.52 + (0.40)(20.20)] for vet-med and $161.96 [156.00 + (0.40)(14.89)] for supplies.

TABLE 13A.4A Detailed Notes (continued)

[l] See note [j] in Table 13.3. In addition to the costs in Table 13.3 this includes the cost of fuel, oil, and utilities taken from Table 13A.7. This then gives a cost of \$30.27 [26.58 + (0.40)(9.20)] allowing for rounding.

[m] See note [k] in Table 13.3. In addition to the costs in Table 13.3 this includes the repairs taken from Table 13A.7. This then gives a cost of \$328.53 [302.15 + (0.40)(65.95)].

[n] Bedding is only used for raising replacement heifers. The cost is taken from Table 13A.7 and equals \$14.40 [(0.40)(36)].

[o] See note [l] in Table 13.3. In addition to the costs in Table 13.3 this includes the labor costs taken from Table 13A.7. This then gives a cost of \$286.94 [258.30 + (0.40)(71.5875)] for hired labor. A similar computation applies to own labor.

[p] Because we are using the current cost method, there is no capital recovery and cost is based on the opportunity interest associated with the investment in the cow and a yearling heifer since cull sales and heifer purchases are accounted for in other sections of the estimate. The traditional method of computing opportunity interest based on equations 6.5 and 6.6 (also equations 10.3 and 10.4) is used to obtain a value for investment. Specifically, we compute opportunity interest for the cow based on an average value of V_0 as follows

$$OC = \left(\frac{V_0 + V_n + D}{2} \right) (r)$$

where

V_0 = Value of the cow at the beginning of the first year in real terms
V_n = Value of the cow at the end (period n) of her useful life in real terms
D = Straight-line economic depreciation $D = \frac{V_0 - V_n}{n}$

OC = Opportunity interest cost
r = real interest rate
n = useful life in years.

V_0 is computed as in the historic cost method. The average value of the cow is then the same as in Table 13A.3 and is equal to \$975.361. To this value of the cow we must add the value of a yearling heifer. Because we have no market data on this value, we use the cost of raising a heifer from birth to 1 year of age taken from Table 13A.5A, which is \$577.67. This then gives an end-of-year value of \$1,206.429 [975.361 + (0.40)(577.67)]. Opportunity interest is then \$60.3214 [(1,206.429)(.05)].

TABLE 13A.4A Detailed Notes (continued)

[q] See note [n] in Table 13.3. In addition to the costs in Table 13.3 this includes machine and equipment investment taken from Table 13A.7. This then gives a cost of $101.13 [86.82 + (0.40)(35.7788)].

[r] See note [o] in Table 13.3. In addition to the costs in Table 13.3 this includes capital recovery for building investment taken from Table 13A.7. This then gives a cost of $92.56 [74.04 + (0.40)(46.28)] with appropriate rounding.

[s] See note [p] in Table 13.3. In addition to the tax and insurance costs in Table 13.3 this includes taxes and insurance taken from Table 13A.7 for the production of the heifer. This then gives a cost of $14.43 [11.23 + (0.40)(7.99)].

[t] See note [q] in Table 13.3. In addition to the overhead costs of $ 99.46 from Table 13.3, the general overhead costs of heifer production using the current cost method taken from Table 13A.7 are included. This gives a total overhead expense for the current cost method of $113.23 [99.46 + (0.40)(34.4269)].

Table 13A.4B Income & Expenses Per Month For Projected 1992 Costs & Returns For Milk Production Per Cow (Current Cost Method)														
ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
		1	2	3	4	5	6	7	8	9	10	11	12	
Quantity Sold														
Milk	cwt	18	18	18	18	18	18	18	18	18	18	18	18	216
Cull Cows	cwt	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	4.68
Bull Calves	HD	0.03462	0.03462	0.03462	0.03462	0.03462	0.03462	0.03462	0.03462	0.03462	0.03462	0.03462	0.03462	0.4153846
Heifer Calves	HD	0.00128	0.00128	0.00128	0.00128	0.00128	0.00128	0.00128	0.00128	0.00128	0.00128	0.00128	0.00128	0.0153846
Sale Price														
Milk	$/cwt	12.42	12.32	12.14	11.98	11.83	11.73	11.85	12.05	12.42	12.75	12.93	12.91	12.277969
Cull Cows	$/cwt	42.97	46.30	47.53	47.15	47.16	46.18	45.88	46.35	46.18	45.08	43.06	42.87	45.55924
Bull Calves	$/HD	120.59	120.98	121.38	121.77	122.17	122.57	122.97	123.38	123.78	124.19	124.59	125.00	122.78087
Heifer Calves	$/HD	144.70	145.18	145.65	146.13	146.61	147.09	147.57	148.05	148.54	149.02	149.51	150.00	147.33704
Value Of Production														
Milk	$	223.566	221.685	218.478	215.686	212.874	211.144	213.384	216.97	223.473	229.569	232.788	232.425	2652.0413
Cull Cows	$	16.7587	18.0571	18.5379	18.387	18.3942	18.0108	17.8917	18.0753	18.009	17.5826	16.7924	16.7207	213.21724
Bull Calves	$	4.17412	4.18779	4.2015	4.21525	4.22905	4.2429	4.25679	4.27072	4.2847	4.29873	4.3128	4.32692	51.001285
Heifer Calves	$	0.18552	0.18612	0.18673	0.18734	0.18796	0.18857	0.18919	0.18981	0.19043	0.19105	0.19168	0.19231	2.2667238
Total Revenue		244.684	244.116	241.404	238.476	235.685	233.586	235.722	239.506	245.957	251.642	254.085	253.665	2918.5265
Annual Nominal Int Rate	Decimal	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	
Monthly Compound Int Rate	Decimal	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	
Valuation Month(Dec=12, etc)	Integer	12	12	12	12	12	12	12	12	12	12	12	12	
Valuation Month-Current Month	Integer	11	10	9	8	7	6	5	4	3	2	1	0	
Compound Int To Valuation Month (Milk)	$	18.7841	16.87	14.9079	13.0338	11.2143	9.49893	7.9703	6.45952	4.97151	3.39225	1.7136	0	108.81616
Compound Int To Valuation Month (Culls)	$	1.40807	1.37412	1.26494	1.11112	0.96901	0.81027	0.66829	0.53813	0.40064	0.25981	0.12361	0	8.928008
Compound Int To Valuation Month (Bulls)	$	0.35071	0.31869	0.28669	0.25473	0.22279	0.19088	0.159	0.12715	0.09532	0.06352	0.03175	0	2.1012143
Compound Int To Valuation Month (Heifers)	$	0.01559	0.01416	0.01274	0.01132	0.0099	0.00848	0.00707	0.00565	0.00424	0.00282	0.00141	0	0.0933873
Compound Int To Valuation Month (Total)	$	20.5585	18.5769	16.4723	14.4109	12.416	10.5086	8.80466	7.13045	5.4717	3.71841	1.87037	0	119.93877

Table 13A.4B Income & Expenses Per Month For Projected 1992 Costs & Returns For Milk Production Per Cow (Current Cost Method) -- cont														
ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
Quantity Purchased														
Replacement Heifer	HD	0	0	0	0	0	0	0	0	0	0	0	0	0
Corn	Bu	11.95	11.95	11.95	11.95	11.95	11.95	11.95	11.95	11.95	11.95	11.95	11.95	143.4
Protein, Vit. & Min	cwt	1.15167	1.15167	1.15167	1.15167	1.15167	1.15167	1.15167	1.15167	1.15167	1.15167	1.15167	1.15167	13.82
Alfalfa Hay	ton	0.23743	0.23743	0.23743	0.23743	0.23743	0.23743	0.23743	0.23743	0.23743	0.23743	0.23743	0.23743	2.8492
Alfalfa Haylage	ton	0.25883	0.25883	0.25883	0.25883	0.25883	0.25883	0.25883	0.25883	0.25883	0.25883	0.25883	0.25883	3.106
Corn Silage	ton	0.43343	0.43343	0.43343	0.43343	0.43343	0.43343	0.43343	0.43343	0.43343	0.43343	0.43343	0.43343	5.2012
Milk Replacer	lbs	1.33333	1.33333	1.33333	1.33333	1.33333	1.33333	1.33333	1.33333	1.33333	1.33333	1.33333	1.33333	16
Marketing	cwt	18	18	18	18	18	18	18	18	18	18	18	18	216
Purchase Price														
Replacement Heifer	$/HD	1119.72	1123.39	1127.06	1130.75	1134.46	1138.17	1141.90	1145.63	1149.38	1153.15	1156.92	1160.71	1140.1038
Corn	$/Bu	2.03	2.03	2.04	2.05	2.05	2.06	2.07	2.07	2.08	2.09	2.09	2.10	2.063
Protein, Vit. & Min	$/cwt	14.69	14.74	14.79	14.84	14.89	14.93	14.98	15.03	15.08	15.13	15.18	15.23	14.960
Alfalfa Hay	$/Ton	77.17	77.43	77.68	77.94	78.19	78.45	78.70	78.96	79.22	79.48	79.74	80.00	78.580
Alfalfa Haylage	$/Ton	72.35	72.59	72.83	73.06	73.30	73.54	73.78	74.03	74.27	74.51	74.76	75.00	73.669
Corn Silage	$/Ton	16.11	16.16	16.22	16.27	16.32	16.38	16.43	16.48	16.54	16.59	16.65	16.70	16.404
Milk Replacer	$/lbs	0.7885	0.7885	0.7885	0.7885	0.7885	0.7885	0.7885	0.7885	0.7885	0.7885	0.7885	0.8200	0.7911
Marketing	$/cwt	0.47	0.47	0.47	0.47	0.48	0.48	0.48	0.48	0.48	0.48	0.49	0.49	0.478
Operating Cost														
Replacement Heifer	$	0	0	0	0	0	0	0	0	0	0	0	0	0
Corn	$	24.2088	24.2881	24.3676	24.4473	24.5274	24.6077	24.6882	24.7691	24.8501	24.9315	25.0131	25.095	295.79385
Protein, Vit. & Min	$	16.9205	16.9759	17.0315	17.0872	17.1431	17.1993	17.2556	17.3121	17.3687	17.4256	17.4826	17.5399	206.74197
Alfalfa Hay	$	18.3239	18.3839	18.4441	18.5044	18.565	18.6258	18.6868	18.748	18.8093	18.8709	18.9327	18.9947	223.88944
Alfalfa Haylage	$	18.727	18.7883	18.8498	18.9115	18.9734	19.0355	19.0978	19.1604	19.2231	19.286	19.3492	19.4125	228.81443
Corn Silage	$	6.98272	7.00558	7.02852	7.05153	7.07461	7.09777	7.12101	7.14432	7.16771	7.19118	7.21472	7.23834	85.318011
Milk Replacer	$	1.0513	1.0513	1.0513	1.0513	1.0513	1.0513	1.0513	1.0513	1.0513	1.0513	1.0513	1.0933	12.6574
Marketing	$	8.45725	8.48494	8.51271	8.54058	8.56854	8.59659	8.62473	8.65297	8.6813	8.70972	8.73823	8.76684	103.3344
Breeding	$	5.31797	5.33538	5.35285	5.37037	5.38796	5.40559	5.42329	5.44105	5.45886	5.47673	5.49466	5.51265	64.977361
Veterinary & Medicine	$	5.94197	5.96142	5.98094	6.00052	6.02016	6.03987	6.05964	6.07948	6.09938	6.11935	6.13938	6.15948	72.6016
Supplies	$	13.255	13.2984	13.342	13.3857	13.4295	13.4734	13.5175	13.5618	13.6062	13.6507	13.6954	13.7403	161.956
Fuel & Oil	$	2.47701	2.48512	2.49325	2.50141	2.5096	2.51782	2.52606	2.53433	2.54263	2.55095	2.5593	2.56768	30.265169
Bedding	$	1.17855	1.1824	1.18628	1.19016	1.19406	1.19796	1.20189	1.20582	1.20977	1.21373	1.2177	1.22169	14.4
Repairs (nominal $)	$	26.8879	26.976	27.0643	27.1529	27.2418	27.3309	27.4204	27.5102	27.6003	27.6906	27.7813	27.8722	328.52871
Total Operating Costs	$	149.73	150.217	150.705	151.195	151.686	152.18	152.674	153.171	153.669	154.168	154.67	155.215	1829.2784
Annual Nominal Int Rate	Decimal	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092	
Monthly Compound Nominal Int Rate	Decimal	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	0.00736	
Valuation Month(Dec=12, etc)	Integer	12	12	12	12	12	12	12	12	12	12	12	12	
Valuation Month-Current Month	Integer	11	10	9	8	7	6	5	4	3	2	1	0	
Compound Int To Valuation Month	$	12.5804	11.4313	10.2834	9.13662	7.9909	6.84626	5.70267	4.56012	3.4186	2.27808	1.13855	0	75.366903
Allocated Overhead														
Hired Labor	$	23.4838	23.5607	23.6378	23.7152	23.7928	23.8707	23.9489	24.0273	24.1059	24.1849	24.264	24.3435	286.935
Opportunity Cost Of Unpaid Labor	$	23.8545	23.9326	24.0109	24.0896	24.1684	24.2475	24.3269	24.4066	24.4865	24.5666	24.647	24.7277	291.465
Compound Int (Labor) To Valuation Month	$	3.98	3.61	3.25	2.89	2.53	2.16	1.80	1.44	1.08	0.72	0.36	0.00	23.830
Capital Recovery Of Livestock Inv														60.321445
Capital Recovery Of Machinery Inv														101.13138
Capital Recovery of Bldg Inv														92.556086
Taxes & Insurance														14.432863
General Farm Overhead														113.22632
Total Allocated Overhead														983.898
Total Costs														2888.543

Table 13A.5A A Sample Detailed CAR Summary for a Dairy Budget
1992 Projected Costs for Production of a Dairy Heifer (birth to 1 year of age)

Ben & Bev Dairyman Farm, Upper Midwest, USA (See Chapter 14 for a complete description of the farm)
Prepared by John Q. Taskforce, Department of Agricultural Economics, Anonymous State University, March 1992

	Item	Units	Quantity	Price (a)	Value (b)
	Operating Costs				
1	Purchase of heifer calf (c)	hd	1.00	144.23	144.23
2	Corn (d)	bu	17.00	2.06	35.14
3	Protein, Vit., & Min. (d)	cwt	2.00	14.96	29.94
4	Alfalfa Hay (d)	ton	0.39	78.58	30.72
5	Alfalfa Haylage (d)	ton	0.43	73.67	31.92
6	Corn Silage (d)	ton	0.73	16.40	12.11
7	Milk Replacer (d)	lbs	40.00	0.81	31.75
8	Breeding (e)	cow	1.00	0	0.00
9	Veterinary & Medicine (f)	cow	1.00	13.00	13.00
10	Supplies (f)	cow	1.00	2.89	2.89
11	Fuel, Oil, & Utilities (g)				4.60
12	Bedding (h)				24.00
13	Repairs (i)				32.97
14	Interest On Oper. Costs To Dec.(j)			0.092	22.40
15	Total Operating Costs (k)				415.67
	Allocated Overhead				
16	Hired Labor (l)				35.79
17	Opportunity Cost Of Unpaid Labor(l)				60.02
18	Opportunity Interest on Labor				3.95
19	Capital Recovery Of Livestock Investment (m)				0.00
20	Capital Recovery Of Mach & Eq Investment (n)				17.89
21	Capital Recovery of Bldg Investment (o)				23.14
22	Taxes & Insurance (p)				4.00
23	General Farm Overhead (q)				17.21
24	Total Allocated Overhead (k)				162.00
25	Total Costs Listed (k)				577.67

TABLE 13A.5A 1992 Projected Costs for Production of a Dairy Heifer (birth to 1 year of age) Detailed Notes

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[a] The prices reported in this column are the average nominal prices for the year. They are the simple average of the monthly prices.

[b] The product of price and quantity in this table will not generally be equal to cost because the quantities often vary by month. When quantities vary, the average price multiplied by the total quantity will not give total expenditure. The monthly expenditures that sum to the value in this column are given in Table 13A.6A.

[c] We assume that a heifer calf is purchased on January 1. The nominal (and real) cost of the calf on December 31 is $150. The nominal value on January 1 is $144.23 [(150)/(1.04)].

[d] Annual feed consumption is 17 bushels of corn, 200 pounds of a protein/vitamin/mineral premix, 0.39 tons of alfalfa, 0.43 tons of alfalfa haylage, and 0.73 tons of corn silage. These annual consumption amounts are based on historical data for the Dairyman operation and information on ration formulation available from the Minnesota Extension Service. These quantities are not evenly spaced over the year but vary depending on the age of the calf. Actual quantities per month are provided here in Table 13A.6A.

		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
Corn	bu	0.50	1.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	2.00	17.00
Protein, Vit, & Min	cwt	0.15	0.15	0.15	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	2.000
Alfalfa Hay	ton	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.04	0.05	0.05	0.06	0.07	0.388
Alfalfa Haylage	ton	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.05	0.06	0.07	0.08	0.430
Corn Silage	ton	0.01	0.01	0.01	0.03	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.733
Milk Replacer	lbs	12.00	14.00	14.00										40.00

The prices, which are the same as in Table 13.3, are the nominal averages for the year and reflect net market prices the farm would receive. The prices are not seasonally adjusted. The monthly prices are as follows.

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Nominal Average	Real Average
Corn	2.03	2.03	2.04	2.05	2.05	2.06	2.07	2.07	2.08	2.09	2.09	2.10	2.06	2.10
Pre-mix	14.69	14.74	14.79	14.84	14.89	14.93	14.98	15.03	15.08	15.13	15.18	15.23	14.96	15.23
Alfalfa Hay	77.17	77.43	77.68	77.94	78.19	78.45	78.70	78.96	79.22	79.48	79.74	80.00	78.58	80.00
Alfalfa Haylage	72.35	72.59	72.83	73.06	73.30	73.54	73.78	74.03	74.27	74.51	74.76	75.00	73.67	75.00
Corn Silage	16.11	16.16	16.22	16.27	16.32	16.38	16.43	16.48	16.54	16.59	16.65	16.70	16.40	16.70

[e] There is no breeding charge because the animal is less than one year of age.

TABLE 13A.5A Detailed Notes (continued)

[f] Based on total nominal expenditures as recorded in farm records for these livestock inputs in 1991 on a yearling to freshening animal basis. Total expenditures are adjusted forward assuming a 4% inflation rate. The projected 1992 levels are listed in Table 13A.6A and below and are nominal values per month that sum to the nominal total.

Expense for 1992	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Veterinary & Medicine	3.00	3.00	1.00	0.75	0.72	0.71	0.70	0.67	0.65	0.60	0.60	0.60	13.00
Supplies	0.35	0.30	0.28	0.25	0.25	0.24	0.22	0.20	0.20	0.20	0.20	0.20	2.89

[g] Data in Schedule 14.8 indicate $2,275 [(3,500)(.65)] of expense for 89 cows, or $25.56 per cow for fuel, oil, and utilities. It is assumed that these are spaced equally throughout the year for the purpose of computing operating interest. Like the items in footnote [i], this expenditure is adjusted for inflation and then allocated across months such that real expenditures per month are equal. Average nominal expenditure is $26.58 [(25.56)(1.04)].

[h] Bedding expenses are based on 1991 data for Ben's operation and are adjusted forward using a 4% annual inflation rate. Data on a monthly basis are available and differ by month because a young calf uses more bedding. The values in Table 13A.6A are projected nominal 1992 values that sum to the total annual expenditure.

[i] Annual Repairs for Buildings and Equipment for Heifer Calves

Repair costs are computed as in footnote [k] of Table 13.3 using standard repair cost formulas for equipment. Costs for the other items are computed using the previous year's expenditures adjusted for inflation (4%). The percent allocated to replacement animals is based on 1991 data and is summarized in the following table.

		Annual Expense	Percent for Replacements	Repairs for Cows
Manure Equipment (Schedule 14.7)	$34.744/hr x 200 hr =	$6,948.87	20	1,389.77
Feed Hdl. Equipment (Schedule 14.7)	6.4528/hr x 133 hr =	858.22	20	171.64
Milking Equipment (Schedule 14.7)	3.6567/hr x 1100 hr =	4,022.36	0	0.00
Repairs to Dairy Bldg. (Schedule 14.6 footnote d)		10,944.96	0	0.00
Buildings & Improvements (Schedule 14.8)		7,451.60	9	670.64
Machinery & Equipment (Schedule 14.8)		1,284.40	9	115.60
				2,347.66
		Estimated repairs per replacement (71.2)		**32.97**

TABLE 13A.5A Detailed Notes (continued)

The number of replacements is based on Ben's replacement rate of 0.40 and the fact that he has two animals in inventory for every replacement (one calf and one yearling). The number (71.2) is derived by multiplying the number of cows (89) by the replacement rate (0.40) and then doubling it. It was decided to use the decimal (71.2) rather than rounding to the integer 71 because that is the way other fractional amounts were handled.

Ben does not have any data on the allocation of repair expenditures over the year. After discussion with him, it was decided to assume that total real repair expense was spaced equally throughout the year for the purpose of computing operating interest. As suggested in Chapter 5, because the repair costs are in nominal (also real) values at the end of the year and expenditures will be at an earlier point in time, it is appropriate to deflate these before computing nominal interest. The procedure suggested in [i] and [j] of Table 13.3 is followed to find a constant real payment, which is then adjusted for inflation. The computations are contained in Table 13A.6A and repeated here.

Real Prices	Real Cost Per Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Nominal Average Cost	Nominal Total Cost
Cow Repairs (Real)	25.6343	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	25.63	**302.1505**
Replacement Repairs (Real)	2.7974	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	**32.9727**
Cow Repairs (Nominal)		24.73	24.81	24.89	24.97	25.05	25.14	25.22	25.30	25.38	25.47	25.55	25.63	25.18	**302.1505**
Replacement Repairs (Nominal)		2.70	2.71	2.72	2.73	2.73	2.74	2.75	2.76	2.77	2.78	2.79	2.80	2.75	**32.9727**

[j] All receipts and expenses are assumed to occur on the last day of the month. Interest is compounded at the monthly rate of $.00736 \left[(1.092)^{\frac{1}{12}} - 1\right]$, (equivalent to an annual rate of .092) until the last day of December. For example, the interest expense on replacement repairs in August is computed as $(2.76)(1.092)^{4/12} - 2.76 = \$0.082$. These are summed across categories and months to obtain the total.

[k] Individual values may not sum to totals due to rounding.

TABLE 13A.5A Detailed Notes (continued)

[l] Livestock labor is based on labor use in 1991 (Schedule 14.4). We assume 71.2 replacements as with repair expenses. The hours per animal are as follows.

Worker	Total Livestock Hours	Total Cows Hours	Total Young Stock Hours	Per Replacement Hours	Wage $/hour 1991	Wage $/hour 1992	Per Replacement Cost
Operator	2,437	2,193	244	3.427	$9.50	$9.88	$33.86
Son	330	0	330	4.635	$5.43	$5.64	$26.16
Hired Worker 1	2,173	1,956	217	3.048	$9.47	$9.85	$30.01
Hired Worker 2	734	661	73	1.025	$5.43	$5.64	$5.79
Total Hired							$35.79

The costs per hour are computed as in footnote [l] of Table 13.3. It is assumed that labor quantities in 1991 and 1992 are the same. The labor expenditures (such as hours) are assumed to be equally spaced over the year so that each worker (including the unpaid ones) is paid a monthly salary. These expenditures are allocated in a manner similar to items in footnotes [i], [j], and [k] of Table 13.3 where a constant real payment over the months is assumed. The actual monthly expenditures in real and nominal terms are as follows.

Expenditure Month #	Jan 1	Feb 2	Mar 3	Apr 4	May 5	Jun 6	July 7	Aug 8	Sep 9	Oct 10	Nov 11	Dec 12	Average	Total
Hired Labor Nominal	2.93	2.94	2.95	2.96	2.97	2.98	2.99	3.00	3.01	3.02	3.03	3.04	2.9828	35.794
Family Labor Nominal	4.91	4.93	4.94	4.96	4.98	4.99	5.01	5.03	5.04	5.06	5.08	5.09	5.0018	60.022
Opportunity Interest	0.66	0.60	0.54	0.48	0.42	0.36	0.30	0.24	0.18	0.12	0.06	0.00		3.948

The nominal average expenditure multiplied by 12 will give the nominal expenditure for the year. Opportunity interest at a nominal rate is charged because most employees are paid monthly and the family makes monthly withdrawals. For example, the opportunity interest on the January expense is given by $(7.84)(1.092)^{11/12} - 7.84 = .658$.

[m] Because there is no cow involved, there is no capital recovery for her. The cow's implicit cost is accounted for in the cost of the calf in footnote [c].

[n] Capital recovery is based on the difference between the beginning value of the various pieces of equipment and their real salvage value at the end of their useful life. This salvage value is discounted back to the present at a real interest rate of 5% and then subtracted from the initial value to obtain a net present cost of the equipment. This is then converted to a real annual annuity following the procedures outlined in Chapter 2 and equation 6.7. A more complete discussion of the equipment for this example is contained in note [n] of Table 13.3. The following table summarizes the results.

TABLE 13A.5A Detailed Notes (continued)

		Heifers	
	Livestock	Percent	Annual
Manure Equipment	$4,005.62	20	$801.12
Feed Handling Equipment	2,363.00	20	472.60
Milking Equipment	2,632.06	0	0.00
Annual Total	$10,909.36		$1,273.72
Capital Recovery/Replacement (71.2 heifers)			$17.89

[o] The buildings for livestock have an estimated market value of $87,000 (Schedule 14.6). The opportunity cost of this capital is valued at a 5% real rate and a 9.2% nominal rate. The estimated life of each item is given in Schedule 14.6. Equation 6.7 is used to compute capital recovery. Twenty percent of the opportunity cost is allocated to the replacements. The data and computations are presented in footnote [o] of Table 13.3 and summarized here.

	Inflation Adjusted Annuity	Percent for Replacements	Annuity for Replacements
Manure Pit	269.3695	20	53.874
Harvestor 1	667.6183	20	133.524
Heifer Barn	417.2615	20	83.452
Harvestor 2	1,669.0458	20	333.809
Dairy Barn	4,007.8392	20	801.568
Stave Silo 1	417.2615	20	83.452
Stave Silo 2	134.6848	20	26.937
Old Barn	404.0543	20	80.811
Hay Shed	250.3569	20	50.071
Total	8,237.492		1,647.498
Total Annual Cost	1,647.498		
Number of Heifers	71.2		
Cost per Heifer	23.14		

[p] Taxes and insurance are calculated from the data in Schedule 14.8. Approximately 6% of the real estate tax and 9% of the farm insurance is allocated to the replacements. These expenses are adjusted forward for inflation so that 1992 values are 4% higher. Real estate taxes for this replacements are [(0.06)(3,244)(1.04)] or $202.43. Insurance is [(0.09)(880)(1.04)] or $82.37. The costs per heifer (assuming 71.2 heifers in the herd) are $2.84 and $1.16, respectively, for a total of $4.00.

TABLE 13A.5A Detailed Notes (continued)

[q] General farm overhead includes the replacements' share (9%) of office expenses (Schedule 14.8) adjusted for inflation. The total overhead is \$13,094 (1,194+3,500+7,165+1,235). Multiplying by 0.09, adjusting for inflation, and dividing by the number of replacements gives $\left[\frac{(13{,}094)(0.09)(1.04)}{71.2}\right]$ = \$17.21 per heifer.

Table 13A.5B A Sample Detailed CAR Summary for a Dairy Budget
1992 Projected Costs for Production of a Dairy Heifer (1 year of age to freshening)

Ben & Bev Dairyman Farm, Upper Midwest, USA (See Chapter 14 for a complete description of the farm)
Prepared by John Q. Taskforce, Department of Agricultural Economics, Anonymous State University, March 1992

	Item	Units	Quantity	Price (a)	Value (b)
	Operating Costs				
1	Purchase of heifer calf (c)	hd	1.00	0.00	0.00
2	Corn (d)	bu	4.00	2.06	8.25
3	Protein, Vit., & Min. (d)	cwt	0.75	14.96	11.22
4	Alfalfa Hay (d)	ton	1.26	78.58	99.01
5	Alfalfa Haylage (d)	ton	1.41	73.67	103.87
6	Corn Silage (d)	ton	2.37	16.40	38.88
7	Milk Replacer (d)	lbs	0.00	0.81	0.00
8	Breeding (e)	cow	1.00	45.44	45.44
9	Veterinary & Medicine (f)	cow	1.00	7.20	7.20
10	Supplies (f)	cow	1.00	12.00	12.00
11	Fuel, Oil, & Utilities (g)				4.60
12	Bedding (h)				12.00
13	Repairs (i)				32.97
14	Interest On Oper. Costs To Dec.(j)			0.092	16.70
15	Total Operating Costs (k)				392.15
	Allocated Overhead				
16	Hired Labor (l)				35.79
17	Opportunity Cost Of Unpaid Labor(l)				60.02
18	Opportunity Interest on Labor				3.95
19	Capital Recovery Of Livestock Investment (m)				0.00
20	Capital Recovery Of Mach & Eq Investment (n)				17.89
21	Capital Recovery of Bldg Investment (o)				23.14
22	Taxes & Insurance (p)				4.00
23	General Farm Overhead (q)				17.21
24	Total Allocated Overhead (k)				162.00
25	Total Costs Listed (k)				554.16

TABLE 13A.5B 1992 Projected Costs for Production of a Dairy Heifer (1 year of age to freshening) Detailed Notes

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[a] The prices reported in this column are the average nominal prices for the year. They are the simple average of the monthly prices.

[b] The product of price and quantity in this table will not generally be equal to cost because the quantities often vary by month. When quantities vary, the average price multiplied by the total quantity will not give total expenditure. The monthly expenditures that sum to the value in this column are given in Table 13A.6B.

[c] The heifer calf is assumed to come from the herd and no charge is included here.

[d] Annual feed consumption is 4 bushels of corn, 75 pounds of a protein/vitamin/mineral premix, 1.26 tons of alfalfa, 1.41 tons of alfalfa haylage, and 2.37 tons of corn silage. These annual consumption amounts are based on historical data for the Dairyman operation and information on ration formulation available from the Minnesota Extension Service. These quantities are not evenly spaced over the year but vary depending on the age of the calf. Actual quantities per month are presented here and in Table 13A.6B.

		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
Corn	bu	0.330	0.330	0.330	0.330	0.330	0.330	0.330	0.330	0.340	0.340	0.340	0.340	4.000
Protein, Vit, & Min	cwt	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.750
Alfalfa Hay	ton	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	0.105	1.260
Alfalfa Haylage	ton	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	1.410
Corn Silage	ton	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	0.198	2.370

The prices are the same as in Table 13.3 and footnote [d] of Table 13A.5A.

[e] The breeding charge is a nominal value of $45.44 that occurs in March.

[f] Based on total nominal expenditures as recorded in farm records for these livestock inputs in 1991 on a per birth to yearling animal basis. Total expenditures are adjusted forward assuming a 4% inflation rate. The projected 1992 levels are listed in Table 13A.6A and below, and are nominal values per month that sum to the nominal total.

Expense for 1992	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
Veterinary & Medicine	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	7.20
Supplies	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00

[g]-[q] See notes [g]-[q] in Table 13A.5A. These costs are the same for both a calf (birth to 1 year of age) and a yearling.

Table 13A.6A Expenses Per Month For 1992 Projected Costs & Returns For Heifer Production (0-12) months														
ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
		1	2	3	4	5	6	7	8	9	10	11	12	
Quantity Purchased														
Heifer Calf (Jan 1 purchase)	HD	1.0000												1.0000
Corn	bu	0.50	1.00	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	2.00	17.0000
Protein, Vit. & Min	cwt	0.15	0.15	0.15	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	2.0000
Alfalfa Hay	ton	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.04	0.05	0.05	0.06	0.07	0.3880
Alfalfa Haylage	ton	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.05	0.06	0.07	0.08	0.4300
Corn Silage	ton	0.01	0.01	0.01	0.03	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.7330
Milk Replacer	lbs	12.00	14.00	14.00										40.0000
Purchase Price														
Heifer Calf (Jan 1 Purchase)	$/HD	144.2308												144.2308
Corn	$/Bu	2.0258	2.0325	2.0391	2.0458	2.0525	2.0592	2.0660	2.0727	2.0795	2.0863	2.0931	2.1000	2.0627
Protein, Vit. & Min	$/cwt	14.6922	14.7403	14.7885	14.8369	14.8855	14.9342	14.9831	15.0322	15.0814	15.1308	15.1803	15.2300	14.9596
Alfalfa Hay	$/Ton	77.1749	77.4276	77.6810	77.9353	78.1905	78.4465	78.7033	78.9609	79.2194	79.4788	79.7390	80.0000	78.5798
Alfalfa Haylage	$/Ton	72.3515	72.5883	72.8260	73.0644	73.3036	73.5436	73.7843	74.0259	74.2682	74.5113	74.7553	75.0000	73.6685
Corn Silage	$/Ton	16.1103	16.1630	16.2159	16.2690	16.3223	16.3757	16.4293	16.4831	16.5371	16.5912	16.6455	16.7000	16.4035
Milk Replacer	$/lbs	0.7910	0.7936	0.7962	0.7988	0.8015	0.8041	0.8067	0.8093	0.8120	0.8147	0.8173	0.8200	0.8054
Operating Costs														
Replacement Heifer	$	144.2308	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	144.2308
Corn	$	1.0129	2.0325	3.0587	3.0687	3.0788	3.0888	3.0989	3.1091	3.1193	3.1295	3.1397	4.2000	35.1369
Protein, Vit. & Min	$	2.2038	2.2110	2.2183	2.5223	2.5305	2.5388	2.5471	2.5555	2.5638	2.5722	2.7325	2.7414	29.9373
Alfalfa Hay	$	0.4630	0.4646	0.5438	0.7014	1.5638	2.3534	3.1481	3.1584	3.9610	3.9739	4.7843	5.6000	30.7158
Alfalfa Haylage	$	0.4341	0.4355	0.5826	0.7306	1.4661	2.2063	2.9514	3.7013	3.7134	4.4707	5.2329	6.0000	31.9249
Corn Silage	$	0.0967	0.1131	0.1622	0.4881	0.8161	0.9825	1.1501	1.3186	1.4883	1.6591	1.8310	2.0040	12.1098
Milk Replacer	$	9.4925	11.1109	11.1472	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	31.7506
Breeding	$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Veterinary & Medicine	$	3.0000	3.0000	1.0000	0.7500	0.7200	0.7100	0.7000	0.6700	0.6500	0.6000	0.6000	0.6000	13.0000
Supplies	$	0.3500	0.3000	0.2800	0.2500	0.2500	0.2400	0.2200	0.2000	0.2000	0.2000	0.2000	0.2000	2.8900
Fuel & Oil	$	0.3766	0.3778	0.3790	0.3803	0.3815	0.3828	0.3840	0.3853	0.3865	0.3878	0.3891	0.3904	4.6011
Bedding	$	3.0000	3.0000	2.7500	2.5000	2.2500	2.0000	2.0000	1.5000	1.5000	1.5000	1.0000	1.0000	24.0000
Repairs (nominal $)	$	2.6986	2.7074	2.7163	2.7252	2.7341	2.7431	2.7520	2.7611	2.7701	2.7792	2.7883	2.7974	32.9727
Total (excluding dairy heifer)	$	23.1283	25.7528	24.8381	14.1166	15.7909	17.2457	18.9517	19.3593	20.3525	21.2724	22.6977	25.5331	249.0392
Total Operating Costs	$	167.3590	25.7528	24.8381	14.1166	15.7909	17.2457	18.9517	19.3593	20.3525	21.2724	22.6977	25.5331	393.2699
Annual Nominal Int Rate	Decimal	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	
Monthly Compound Nominal Int Rate	Decimal	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	
Valuation Month(Dec=12, etc)	Integer	12	12	12	12	12	12	12	12	12	12	12	12	
Valuation Month-Current Month	Integer	11	10	9	8	7	6	5	4	3	2	1	0	
Compound Int To Valuation Month (no heifers)	$	1.9432	1.9598	1.6948	0.8531	0.8319	0.7759	0.7079	0.5764	0.4528	0.3143	0.1671	0.0000	10.2771
Compound Int To Valuation Month (inc heifers)	$	14.0616	1.9598	1.6948	0.8531	0.8319	0.7759	0.7079	0.5764	0.4528	0.3143	0.1671	0.0000	22.3954
Allocated Overhead														
Hired Labor	$	2.9295	2.9391	2.9487	2.9584	2.9680	2.9778	2.9875	2.9973	3.0071	3.0169	3.0268	3.0367	35.7937
Opportunity Cost Of Unpaid Labor	$	4.9124	4.9285	4.9446	4.9608	4.9770	4.9933	5.0097	5.0261	5.0425	5.0590	5.0756	5.0922	60.0215
Compound Int (Labor) To Valuation Month	$	0.6589	0.5987	0.5386	0.4785	0.4185	0.3586	0.2987	0.2389	0.1791	0.1193	0.0596	0.0000	3.9475
Capital Recovery Of Livestock Inv	$													0.0000
Capital Recovery Of Machinery Inv	$													17.8894
Capital Recovery of Bldg Inv	$													23.1390
Taxes & Insurance	$													3.9999
General Farm Overhead														17.2135
Total Allocated Overhead	$													162.0046
Overall Total Cost	$													577.6699

Table 13A.6B Expenses Per Month For 1992 Projected Costs & Returns For Heifer Production (13-24) months														
ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
		1	2	3	4	5	6	7	8	9	10	11	12	
Quantity Purchased														
Heifer Calf (Jan 1 purchase)	HD	0.0000												1.0000
Corn	bu	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	0.3300	0.3400	0.3400	0.3400	0.3400	4.0000
Protein, Vit. & Min	cwt	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.7500
Alfalfa Hay	ton	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	0.1050	1.2600
Alfalfa Haylage	ton	0.1175	0.1175	0.1175	0.1175	0.1175	0.1175	0.1175	0.1175	0.1175	0.1175	0.1175	0.1175	1.4100
Corn Silage	ton	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	0.1975	2.3700
Milk Replacer	lbs													0.0000
Purchase Price														
Heifer Calf (Jan 1 Purchase)	$/HD	144.2308												144.2308
Corn	$/Bu	2.0258	2.0325	2.0391	2.0458	2.0525	2.0592	2.0660	2.0727	2.0795	2.0863	2.0931	2.1000	2.0627
Protein, Vit. & Min	$/cwt	14.6922	14.7403	14.7885	14.8369	14.8855	14.9342	14.9831	15.0322	15.0814	15.1308	15.1803	15.2300	14.9596
Alfalfa Hay	$/Ton	77.1749	77.4276	77.6810	77.9353	78.1905	78.4465	78.7033	78.9609	79.2194	79.4788	79.7390	80.0000	78.5798
Alfalfa Haylage	$/Ton	72.3515	72.5883	72.8260	73.0644	73.3036	73.5436	73.7843	74.0259	74.2682	74.5113	74.7553	75.0000	73.6685
Corn Silage	$/Ton	16.1103	16.1630	16.2159	16.2690	16.3223	16.3757	16.4293	16.4831	16.5371	16.5912	16.6455	16.7000	16.4035
Milk Replacer	$/lbs	0.7910	0.7936	0.7962	0.7988	0.8015	0.8041	0.8067	0.8093	0.8120	0.8147	0.8173	0.8200	0.8054
Operating Costs														
Replacement Heifer	$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Corn	$	0.6685	0.6707	0.6729	0.6751	0.6773	0.6795	0.6818	0.6840	0.7070	0.7093	0.7117	0.7140	8.2520
Protein, Vit. & Min	$	0.9183	0.9213	0.9243	0.9273	0.9303	0.9334	0.9364	0.9395	0.9426	0.9457	0.9488	0.9519	11.2197
Alfalfa Hay	$	8.1034	8.1299	8.1565	8.1832	8.2100	8.2369	8.2638	8.2909	8.3180	8.3453	8.3726	8.4000	99.0105
Alfalfa Haylage	$	8.5013	8.5291	8.5571	8.5851	8.6132	8.6414	8.6697	8.6980	8.7265	8.7551	8.7837	8.8125	103.8726
Corn Silage	$	3.1818	3.1922	3.2026	3.2131	3.2236	3.2342	3.2448	3.2554	3.2661	3.2768	3.2875	3.2983	38.8764
Milk Replacer	$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Breeding	$	0.0000	0.0000	45.4434	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	45.4434
Veterinary & Medicine	$	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	7.2000
Supplies	$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	12.0000
Fuel & Oil	$	0.3766	0.3778	0.3790	0.3803	0.3815	0.3828	0.3840	0.3853	0.3865	0.3878	0.3891	0.3904	4.6011
Bedding	$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	12.0000
Repairs (nominal $)	$	2.6986	2.7074	2.7163	2.7252	2.7341	2.7431	2.7520	2.7611	2.7701	2.7792	2.7883	2.7974	32.9727
Total (excluding dairy heifer)	$	27.0484	27.1284	72.6521	27.2893	27.3701	27.4512	27.5326	27.6142	27.7169	27.7991	27.8816	25.1670	372.6510
Total Operating Costs	$	27.0484	27.1284	72.6521	27.2893	27.3701	27.4512	27.5326	27.6142	27.7169	27.7991	27.8816	27.9644	375.4484
Annual Nominal Int Rate	Decimal	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	
Monthly Compound Nominal Int Rate	Decimal	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	
Valuation Month(Dec=12, etc)	Integer	12	12	12	12	12	12	12	12	12	12	12	12	
Valuation Month-Current Month	Integer	11	10	9	8	7	6	5	4	3	2	1	0	
Compound Int To Valuation Month (no heifers)	$	2.2726	2.0644	4.9575	1.6491	1.4419	1.2350	1.0284	0.8221	0.6166	0.4108	0.2052	0.0000	16.7036
Compound Int To Valuation Month (inc heifers)	$	2.2726	2.0644	4.9575	1.6491	1.4419	1.2350	1.0284	0.8221	0.6166	0.4108	0.2052	0.0000	16.7036
Allocated Overhead														
Hired Labor	$	2.9295	2.9391	2.9487	2.9584	2.9680	2.9778	2.9875	2.9973	3.0071	3.0169	3.0268	3.0367	35.7937
Opportunity Cost Of Unpaid Labor	$	4.9124	4.9285	4.9446	4.9608	4.9770	4.9933	5.0097	5.0261	5.0425	5.0590	5.0756	5.0922	60.0215
Compound Int (Labor) To Valuation Month	$	0.6589	0.5987	0.5386	0.4785	0.4185	0.3586	0.2987	0.2389	0.1791	0.1193	0.0596	0.0000	3.9475
Capital Recovery Of Livestock Inv	$													0.0000
Capital Recovery Of Machinery Inv	$													17.8894
Capital Recovery of Bldg Inv	$													23.1390
Taxes & Insurance	$													3.9999
General Farm Overhead	$													17.2135
Total Allocated Overhead	$													162.0046
Overall Total Cost	$													554.1565

Table 13A.7 Expenses Per Month For Projected 1992 Costs & Returns For Heifer Production (current value method)

ITEM	UNIT	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
		1.0000	2.0000	3.0000	4.0000	5.0000	6.0000	7.0000	8.0000	9.0000	10.0000	11.0000	12.0000	
Quantity Purchased														
Heifer Calf (Jan 1 purchase)	Bu													
Corn	cwt	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	1.7500	21.0000
Protein, Vit. & Min	ton	0.2292	0.2292	0.2292	0.2292	0.2292	0.2292	0.2292	0.2292	0.2292	0.2292	0.2292	0.2292	2.7500
Alfalfa Hay	ton	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	0.1373	1.6480
Alfalfa Haylage	ton	0.1533	0.1533	0.1533	0.1533	0.1533	0.1533	0.1533	0.1533	0.1533	0.1533	0.1533	0.1533	1.8400
Corn Silage	lbs	0.2586	0.2586	0.2586	0.2586	0.2586	0.2586	0.2586	0.2586	0.2586	0.2586	0.2586	0.2586	3.1030
Milk Replacer	cwt	3.3333	3.3333	3.3333	3.3333	3.3333	3.3333	3.3333	3.3333	3.3333	3.3333	3.3333	3.3333	40.0000
Purchase Price														
Heifer Calf (Jan 1 Purchase)	$/Bu	2.0258	2.0325	2.0391	2.0458	2.0525	2.0592	2.0660	2.0727	2.0795	2.0863	2.0931	2.1000	2.0627
Corn	$/cwt	14.6922	14.7403	14.7885	14.8369	14.8855	14.9342	14.9831	15.0322	15.0814	15.1308	15.1803	15.2300	14.9596
Protein, Vit. & Min	$/Ton	77.1749	77.4276	77.6810	77.9353	78.1905	78.4465	78.7033	78.9609	79.2194	79.4788	79.7390	80.0000	78.5798
Alfalfa Hay	$/Ton	72.3515	72.5883	72.8260	73.0644	73.3036	73.5436	73.7843	74.0259	74.2682	74.5113	74.7553	75.0000	73.6685
Alfalfa Haylage	$/Ton	16.1103	16.1630	16.2159	16.2690	16.3223	16.3757	16.4293	16.4831	16.5371	16.5912	16.6455	16.7000	16.4035
Corn Silage	$/lbs	0.7910	0.7936	0.7962	0.7988	0.8015	0.8041	0.8067	0.8093	0.8120	0.8147	0.8173	0.8200	0.8054
Milk Replacer	$/cwt	0.4698	0.4714	0.4729	0.4745	0.4760	0.4776	0.4792	0.4807	0.4823	0.4839	0.4855	0.4870	0.4784
Operating Costs														
Replacement Heifer	$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Corn	$	25.7113	25.7955	25.8799	25.9646	26.0496	26.1349	26.2205	26.3063	26.3924	26.4788	26.5655	26.6525	314.1520
Protein, Vit. & Min	$	17.6859	17.7438	17.8019	17.8602	17.9187	17.9773	18.0362	18.0952	18.1545	18.2139	18.2735	18.3333	216.0943
Alfalfa Hay	$	9.9363	9.9688	10.0014	10.0342	10.0670	10.1000	10.1330	10.1662	10.1995	10.2329	10.2664	10.3000	121.4057
Alfalfa Haylage	$	2.4702	2.4783	2.4864	2.4946	2.5027	2.5109	2.5192	2.5274	2.5357	2.5440	2.5523	2.5607	30.1825
Corn Silage	$	0.2046	0.2052	0.2059	0.2066	0.2072	0.2079	0.2086	0.2093	0.2100	0.2107	0.2113	0.2120	2.4993
Milk Replacer	$	1.5662	1.5713	1.5764	1.5816	1.5868	1.5920	1.5972	1.6024	1.6076	1.6129	1.6182	1.6235	19.1360
Breeding	$	3.7192	3.7314	3.7436	3.7559	3.7682	3.7805	3.7929	3.8053	3.8178	3.8303	3.8428	3.8554	45.4434
Veterinary & Medicine	$	1.6532	1.6587	1.6641	1.6695	1.6750	1.6805	1.6860	1.6915	1.6970	1.7026	1.7082	1.7138	20.2000
Supplies	$	1.2186	1.2226	1.2266	1.2307	1.2347	1.2387	1.2428	1.2469	1.2509	1.2550	1.2591	1.2633	14.8900
Fuel & Oil	$	0.7531	0.7556	0.7581	0.7606	0.7631	0.7656	0.7681	0.7706	0.7731	0.7756	0.7782	0.7807	9.2022
Bedding	$	2.9464	2.9560	2.9657	2.9754	2.9851	2.9949	3.0047	3.0146	3.0244	3.0343	3.0443	3.0542	36.0000
Repairs (nominal $)	$	5.3972	5.4149	5.4326	5.4504	5.4682	5.4861	5.5041	5.5221	5.5402	5.5583	5.5765	5.5948	65.9455
Total Operating Costs	$	73.2623	73.5021	73.7428	73.9842	74.2264	74.4694	74.7132	74.9578	75.2031	75.4493	75.6963	75.9442	895.1510
Annual Nominal Int Rate	Decimal	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	0.0920	
Monthly Compound Nominal Int Rate	Decimal	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	0.0074	
Valuation Month(Dec=12, etc)	Integer	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	
Valuation Month-Current Month	Integer	11.0000	10.0000	9.0000	8.0000	7.0000	6.0000	5.0000	4.0000	3.0000	2.0000	1.0000	0.0000	
Compound Int To Valuation Month	$	6.1555	5.5934	5.0319	4.4708	3.9103	3.3502	2.7907	2.2316	1.6730	1.1149	0.5572	0.0000	36.8795
Allocated Overhead														
Hired Labor	$	5.8590	5.8782	5.8974	5.9167	5.9361	5.9555	5.9750	5.9946	6.0142	6.0339	6.0536	6.0734	71.5875
Opportunity Cost Of Unpaid Labor	$	9.8247	9.8569	9.8892	9.9216	9.9540	9.9866	10.0193	10.0521	10.0850	10.1180	10.1512	10.1844	120.0431
Compound Int (Labor) To Valuation Month	$	1.3178	1.1974	1.0772	0.9571	0.8371	0.7172	0.5974	0.4777	0.3582	0.2387	0.1193	0.0000	7.8950
Capital Recovery Of Livestock Inv	$													0.0000
Capital Recovery Of Machinery Inv	$													35.7788
Capital recovery of Bldg Inv	$													46.2780
Taxes & Insurance	$													7.9998
General Farm Overhead	$													34.4269
Total Allocated Overhead	$													324.0092
Overall Total Cost	$													1265.1602

TABLE 13A.7 1992 Projected Costs for Production of a Dairy Heifer (current value method) Notes

The estimates in Tables 13A.5AB and 13A.6AB consider the costs of raising one dairy heifer from birth to one year of age (A tables) and from 1 year of age to freshening (B tables). The costs are allocated across months assuming the calf is born at the beginning of the first year and freshens at the end of the second year. Expenses follow a pattern consistent with the growth of the calf over the two-year period.

Current value cost estimates assume that the operation is in a long-run equilibrium and the number of cows, calves, and yearlings does not change. In the Dairyman operation, 89 cows and 71.2 heifers in various stages of growth are always in inventory. Thus, in computing current cost estimates, the expenses for a heifer over both years are added and then divided equally between months with the idea that the same percentage of calves are born and cows culled each month. The data in Table 13A.7 come from adding the item totals in Tables 13.6A and 13.6B and then dividing them equally over the 12 months of the year.

Because the replacement rate for Ben and Bev's operation is 40%, 40% of these costs are used in the current value method in Table 13A.4. In order to make all the calculations as clear as possible for this example estimate, it was assumed that there is no death loss in raising the heifers from birth to freshening. A more appropriate approach would be to divide the cost per heifer by one minus the death percentage over the two years. This was not done, simply to ease the discussion of the numbers in the tables.

Table 13A.8 Prices used in Dairy Farm Example

Real Interest	0.05													
Inflation	0.04													
Nominal Interest	0.092													
Monthly Inflation	0.0032737													
	Real Price	1	2	3	4	5	6	7	8	9	10	11	12	
Real Prices	for Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average
Milk	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000	12.5000
Cull Cows	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000	46.4000
Bull Calves	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000
Heifer Calves	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000
Replacement Heifers (market)	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000
Replacement Heifers (raised)	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710
Corn	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000
Pre-mix	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300
Alfalfa Hay	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000
Alfalfa Haylage	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000
Corn Silage	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000
Marketing	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870
Breeding	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705
Veterinary & Medicine	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740
Supplies	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350
Fuel & Oil (Cows)	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554
Fuel & Oil (Heifers)	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904
Seasonal Price Index		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average
Milk		103.0000	101.8000	100.0000	98.4000	96.8000	95.7000	96.4000	97.7000	100.3000	102.7000	103.8000	103.3000	99.9917
Cull Cows		96.0000	103.1000	105.5000	104.3000	104.0000	101.5000	100.5000	101.2000	100.5000	97.8000	93.1000	92.4000	99.9917
Bull Calves		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Heifer Calves		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Replacement Heifers (market)		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Replacement Heifers (raised)		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Corn		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Pre-mix		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Alfalfa Hay		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Alfalfa Haylage		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Corn Silage		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Marketing		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Breeding		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Veterinary & Medicine		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Supplies		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Fuel & Oil (Cows)		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000
Fuel & Oil (Heifers)		100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000

Table 13A.8 Prices used in Dairy Farm Example

Seasonally Adjusted Real Prices	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average
Milk	12.8750	12.7250	12.5000	12.3000	12.1000	11.9625	12.0500	12.2125	12.5375	12.8375	12.9750	12.9125	12.4990
Cull Cows	44.5440	47.8384	48.9520	48.3952	48.2560	47.0960	46.6320	46.9568	46.6320	45.3792	43.1984	42.8736	46.3961
Bull Calves	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000	125.0000
Heifer Calves	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000	150.0000
Replacement Heifers (market)	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000	1050.000
Replacement Heifers (raised)	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710	1160.710
Corn	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000	2.1000
Pre-mix	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300	15.2300
Alfalfa Hay	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000
Alfalfa Haylage	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000	75.0000
Corn Silage	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000	16.7000
Marketing	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870	0.4870
Breeding	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705	3.9705
Veterinary & Medicine	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740	5.4740
Supplies	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350	13.2350
Fuel & Oil (Cows)	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554	2.2554
Fuel & Oil (Heifers)	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904

Seasonally Adjusted Nominal Prices	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Average
Milk	12.42	12.32	12.14	11.98	11.83	11.73	11.85	12.05	12.42	12.75	12.93	12.91	12.28
Cull Cows	42.97	46.30	47.53	47.15	47.16	46.18	45.88	46.35	46.18	45.08	43.06	42.87	45.56
Bull Calves	120.59	120.98	121.38	121.77	122.17	122.57	122.97	123.38	123.78	124.19	124.59	125.00	122.78
Heifer Calves	144.70	145.18	145.65	146.13	146.61	147.09	147.57	148.05	148.54	149.02	149.51	150.00	147.34
Replacement Heifers (market)	1012.921	1016.237	1019.564	1022.901	1026.250	1029.610	1032.980	1036.362	1039.755	1043.159	1046.574	1050.000	1031.359
Replacement Heifers (raised)	1119.721	1123.387	1127.064	1130.754	1134.456	1138.170	1141.896	1145.634	1149.385	1153.147	1156.922	1160.710	1140.104
Corn	2.03	2.03	2.04	2.05	2.05	2.06	2.07	2.07	2.08	2.09	2.09	2.10	2.06
Pre-mix	14.69	14.74	14.79	14.84	14.89	14.93	14.98	15.03	15.08	15.13	15.18	15.23	14.96
Alfalfa Hay	77.17	77.43	77.68	77.94	78.19	78.45	78.70	78.96	79.22	79.48	79.74	80.00	78.58
Alfalfa Haylage	72.35	72.59	72.83	73.06	73.30	73.54	73.78	74.03	74.27	74.51	74.76	75.00	73.67
Corn Silage	16.11	16.16	16.22	16.27	16.32	16.38	16.43	16.48	16.54	16.59	16.65	16.70	16.40
Marketing	0.4698	0.4714	0.4729	0.4745	0.4760	0.4776	0.4792	0.4807	0.4823	0.4839	0.4855	0.4870	0.4784
Breeding	3.8303	3.8428	3.8554	3.8680	3.8807	3.8934	3.9061	3.9189	3.9317	3.9446	3.9575	3.9705	3.9000
Veterinary & Medicine	5.2807	5.2980	5.3153	5.3327	5.3502	5.3677	5.3853	5.4029	5.4206	5.4383	5.4561	5.4740	5.3768
Supplies	12.7676	12.8094	12.8513	12.8934	12.9356	12.9779	13.0204	13.0631	13.1058	13.1487	13.1918	13.2350	13.0000
Fuel & Oil (Cows)	2.1757	2.1829	2.1900	2.1972	2.2044	2.2116	2.2188	2.2261	2.2334	2.2407	2.2480	2.2554	2.2154
Fuel & Oil (Heifers)	0.3766	0.3778	0.3790	0.3803	0.3815	0.3828	0.3840	0.3853	0.3865	0.3878	0.3891	0.3904	0.3834

APPENDIX 13B

PROCEDURES TO ENHANCE THE DATA MANAGEMENT PROCESS AND DATA SHARING

Greater reliance on computer technology will be needed to achieve editing, verifying, updating, and sharing objectives for CAR, particularly when addressing data management procedures and the need to more freely exchange data. Computer developments will involve the use of standardized procedures that are heavily dependent upon database and modelbase systems. The increased availability and use of object oriented database systems make the proposed CAR recommendations even more promising because data management procedures can be mixed with calculation procedures (Rahn and Harsh).

To achieve some degree of standardization of CAR, a data entity-relationship model should be employed. An entity is an object or concept of interest about which data can be stored. Each entity has a set of attributes that provides information regarding the entity. A relationship is a connection between two entities. This approach is illustrated in Table 13B.1 (and in discussion of CAR footnotes and data attribute ideas in the section of this chapter entitled Formats for CAR Summaries and Supporting Tables and Footnotes).

A code is attached to each of the entities in Table 13B.1. This code is a pointer to additional information regarding the data entity. The additional information can be textual, a calculation process, or another data entity. For example, the cotton CAR has the code B1. This is a pointer to a database entity that provides additional information (e.g., region that the budget relates to, farm characteristics, time period involved, data collection methods used, production technologies employed, and so forth). Likewise, the price for cotton seed has the assigned code P111. This data entity may contain additional details regarding the price's source, last date price was updated, units used to state price, and other attributes related to this price data entity.

The quantity related to cotton seed has the code M314. This is the pointer to the procedure (calculation method) used to determine the seed quantity. The method indicates that the seed quantity has been adjusted to reflect the need to replant in 6 out of 10 years. A procedure (M19) is also used with the herbicide quality. This procedure involves a "representative" herbicide program that results in an expected cost per acre.

The use of database and modelbase procedures has many advantages including maintenance ease, better documentation of data used in the budget, and the ability to exchange data in electronic form. However, to insure that database procedures meet the intended objectives, extensive efforts will be needed in designing the various database structures that comprise the system. Also, efforts will be needed to develop standardized procedures for doing the many calculations (e.g., weighing returns and costs) involved in developing the CAR.

Illustration of Data Management Procedures

To better illustrate the potential and functional characteristics of database and modelbase procedures, and to also indicate that the additional efforts needed to use these approaches are modest, a prototype

example will be utilized. The prototype example is only partially completed because it has been prepared only for illustrative purposes. A finalized design can and should be done by a professional group appointed to further develop the structure for a comprehensive database and modelbase CAR package.

Four files are required to make the database system functional (see Table 13B.2). The first file (ENTRPRSE) (see Table 13B.3) contains documentation details regarding the CAR. It indicates the enterprise on which the analysis was done and other critical information with respect to the development (e.g., location of analysis, date, assumed level of management, technologies employed, etc.). This file will be the basis for an inventory of existing CAR discussed in the text of the report.

To allow for nationwide sharing of data, the structure of this file needs to be carefully designed. If a national level ENTRPRSE database is developed, new records can be added as new CAR studies are completed. Thus, those wanting to know the existence of other CAR studies related to selected enterprises can then query the national database.

All files related to a specific CAR enterprise study would be stored in a unique directory as defined in the "DATA_DIR" column of the "ENTRPRSE" file. Also, a budget can be a virtual budget. This will allow the creation of a new budget by using a weighted confirmation of other budgets (e.g., a wheat and summer fallow rotation).

A second file contains the price data used in the CAR study. This file has details (attributes) with respect to the prices used in the analysis. In addition to the price value, it provides information with respect to source of the price (e.g., a farmer or supplier survey), date of price, price location, and so forth. A master price file might be used because several enterprises might share a common set of price data (e.g., cost of urea fertilizer that is used on several crops) and the individual CAR price file could reference the master price file.

The third file (C_R_TRN) contains the basic data related to the CARs. The suggested database file structure is shown in Table 13B.4. The structure of the data closely parallels a financial transaction such as recorded in records systems. To make the data shareable, it will be necessary to use standardized codes for items considered in the CAR study. A possible coding system for these items is shown in Table 13B.5. Each return or cost requires a separate record in the database file. The keeping of nonaggregated data is strongly suggested. This would involve adding a record for each return or cost. The modelbase will be used to aggregate the data in (C_R_TRN) to a higher level of summarization. The greater the detail contained in this file, the better the data can be shared with others.

The last file (NOTES) is used to store supporting notes regarding the CAR analysis. Each price or quantity specified as part of a record in the CAR basic data file could have a supporting note attached. This file could be part of the database file as memo columns (thus not really a separate file), a separate database file, or a word processing file with the note clearly labeled (e.g., N 284 for Note No. 284, which might be attached to a quantity amount). Notes can be used to indicate how values are calculated (e.g., 6 out of 10 years there is a need to replant and thus the seed amount has been adjusted accordingly).

Storing data in a database certainly leads to a more standardized approach and thus enhances the possibilities for sharing data. However, to gain the full advantages of using database and modelbase procedure, the ability to extract and manipulate data is equally important; thus, there is a need for modelbase

tools. These tools can either be developed using higher-level languages (e.g., FORTRAN or C) that have access to a library of routines that can create, access, and update the databases discussed above or special modelbase/database interface packages such as the DAX Package (Data Access and eXchange Package).

To illustrate the usefulness of linking database and modelbase, the DAX Package will be used. A DAX set of commands has been developed to generate reports (only the variable expense proportion is illustrated) along the lines suggested in this chapter. DAX commands that have been developed to generate the desired reports from the CAR data are contained in the data file ENTRPRSE. Applying these commands to the file results in the file contained in Figure 13B.1.

It is also noted in the section of this chapter entitled Formats for CAR Summaries and Supporting Tables and Footnotes that different users of the CAR data may desire different report structures. Because the basic data are contained in the database, the modelbase (e.g., DAX) can be designed to generate a wide variety of reports depending upon the needs of the user.

DETAILED REPORT:

Item Code	Description	Unit	Price	Qty	Value
001	Hybrid seed	BAG	70.0000	.3300	23.10
	Subtotal for Seed				23.10
00203	Urea	POUND	.1100	100.0000	11.00
00204	Anhydrous Amonia	POUND	.8750	80.0000	70.00
	Subtotal for Fertilizer				81.00
0030201	2,4-D Amine L	PINT	1.2800	2.0000	2.56
003020201	Atrazin, Aatrex, 4L	QUART	3.0470	1.5000	4.57
	Subtotal for Pesticides				7.13
	Grand Total (Operating):				111.23

SUMMARY REPORT:

Non-detailed summary:

Subtotal for Seed	23.10
Subtotal for Fertilizer	81.00
Subtotal for Pesticides	7.13
Grand total:	111.23

FIGURE 13B.1 CAR Reports Generated by the DAX Package

TABLE 13B.1 CAR Budget Using Database Procedures

Cotton Budget -- Option I (B1)				
Operating Inputs	Units	Price ($)	Quantity	Value ($)
Cotton Seed	Lbs.	0.6 (P111)	28.8 (M314)	17.28
Pre-Merge Herbicide	Acre	6.75 (M19)	1.00 (Q100)	6.75
--				
etc.				

TABLE 13B.2 Suggested Database for CAR

Files	Function
ENTRPRSE	Provide details regarding the enterprise for which the costs and returns relate.
PRICE	This file contains details regarding the prices used in the enterprise CARs.
C_R_TRN	This file, (a unique one for each CAR data) contains the CAR data for a particular CAR study.
NOTES	This file (a unique one for each CAR data set) contains the back-up notes regarding the various costs and returns in the CAR data set. It can be a database file or a referenced word processing file, or fields of a database management program.

TABLE 13B.3 Possible Database Structure for Enterprise Definition

Filename: ENTRPRSE				
Column Name	Column Description	Column Type	Std Code[a]	Importance[b]
ENTR_CD	Enterprise Code	C20	Y	H
ENTR_NM	Enterprise Name	C40		H
DATA_DIR	Data Directory to Store Data	C80		
TIME_SCOPE	Historic or Projected	C1	Y	H
TYPE	Current or Normalized	C1	Y	H
VARIETY	Variety or Type	C30		
CNTCT_PER	Contact Person	C30		H
CNTCT_ADD1	Address 1 of Contact Person	C30		H
CNTCT_ADD2	Address 2 of Contact Person	C30		H
CNTCT_ADD3	Address 3 of Contact Person	C30		H
CNTCT_ADD4	Address 4 of Contact Person	C30		H
CNTCT-PH	Phone of Contact Person	C24		H
CNTCT_EM	E-mail of Contact Person	C30		H
CNTCT_FAX	FAX of Contact Person	C24		H
SOFTWARE	Software Used for Budget	Memo		R
COUNTRY	Country for CAR	C20	Y	H
REGION	Region or County for CAR	C20	Y	H
STATE_AREA	State or Province of County for CAR (Area by state for CAR)	C20	Y	H
DATE	Date CAR Prepared	D8	Y	H
PROD_STRT	Starting Period of Production	D8	Y	H
PROD_END	Ending Period of Production	D8	Y	H
ANAL_UNIT	Unit of Analysis (e.g., acre, sow, head, etc.)	C10	Y	H
YIELD_UNIT	Yield Unit (e.g., bushel, cwt.)	C5	Y	H
YIELD_LV	Yield/Production Level			H
YIELD_QLTY	Yield Quality	Memo		H
MNGT_LEVEL	Level of Management Assumed	Memo		R
FARM_SIZE	Size of Farm Assumed	C40		
SOIL_TYPE	Predominate Soil Type	C30		
TECH_TYPE	Technology Used	Memo		H
MARKETING	Marketing Used	Memo		
ROTATION	Rotation Plan Used	Memo		R

[a]If a code of "Y" is used, this means a standardized code should be used. This use of a standardized code is needed if easy sharing of data is to be accomplished.

[b]H = Highly recommend data, R = Recommended that data be supplied.

TABLE 13B.4 Possible Database Structure for Costs and Returns Transactions

Filename: C_R_TRN[a]

Column Name	Column Description	Column Type	Std Code[b]
ITEM_CODE	Code for Item Type	C9	Y
ITEM_DESC	Description of Item	C30	
DATE	Date of Transaction	D8	Y
OPERATION	Nature of Operation (e.g., planting)		
UNIT	Unit Used for Item	C5	
PRICE	Price of Item/Unit	N12.4	
PR_A_CODE	Attribute Code for Price (can link to PRICE file)	C8	
QUANTITY	Quantity of Item Used	N12.4	
QNTY_A_CODE	Attribute Code for Quantity	C8	
NOTE	Notes Related to Item	Memo	

a = each CAR analysis should have a unique directory in order to keep data of various analyses separated.

b = if a code of "Y" is used, this means a standardized code should be used. This use of a standardized code is needed if easy sharing of data is to be accomplished.

TABLE 13B.5 Possible Coding System for CAR

The codes used will have the following form:

TCCDDSSFF

LEVEL 1: (Type, 1 letter)

P = Primary Income
S = Secondary Income
O = Operating Expenses
F = Ownership Expenses
Q = Other Quantity Data[a]
A = Activity definition (e.g., planting)

LEVEL 2: (Classification, 2 digits)

For Primary Income:	For Operating Expenses:
01 = Dairy	01 = Seed
02 = Beef	02 = Fertilizers
22 = Field Crops	03 = Pesticides
23 = Fruit Crops	..
..	..
..	..
99 = Other Primary Income	99 = Other Operating Expenses

LEVEL 3: (Detail of Classification, 2 digits)

For Dairy:	For Pesticides:
01 = Milk	01 = Insecticide
..	02 = Herbicide
..	03 = Fungicide
..	..
..	..
99 = Other Dairy	99 = Other Pesticides

LEVEL 3: (Sub-Detail of Classification, 2 digits)

For Milk:	For Herbicide:
01 = Grade A	01 = 2:4-D Amine
02 = Grade B	02 = Atrazine
..	..
..	..
99 = Other Dairy	99 =

LEVEL 3: (Fine-Detail of Classification, 2 digits; this will be defined)

For Milk:	For Herbicide:
01 = Quota Market	01 = Antrex, 4C
02 = Non-Quota Market	02 = Antrex, 80W
..	
99 = Other	

a = This allows the entering of additional quantity data that are related to a transaction (e.g., 300 pounds of 12-24-16 supplies 36 pounds of N, 72 pounds of P_2O_5, and 48 pounds of K_2O).