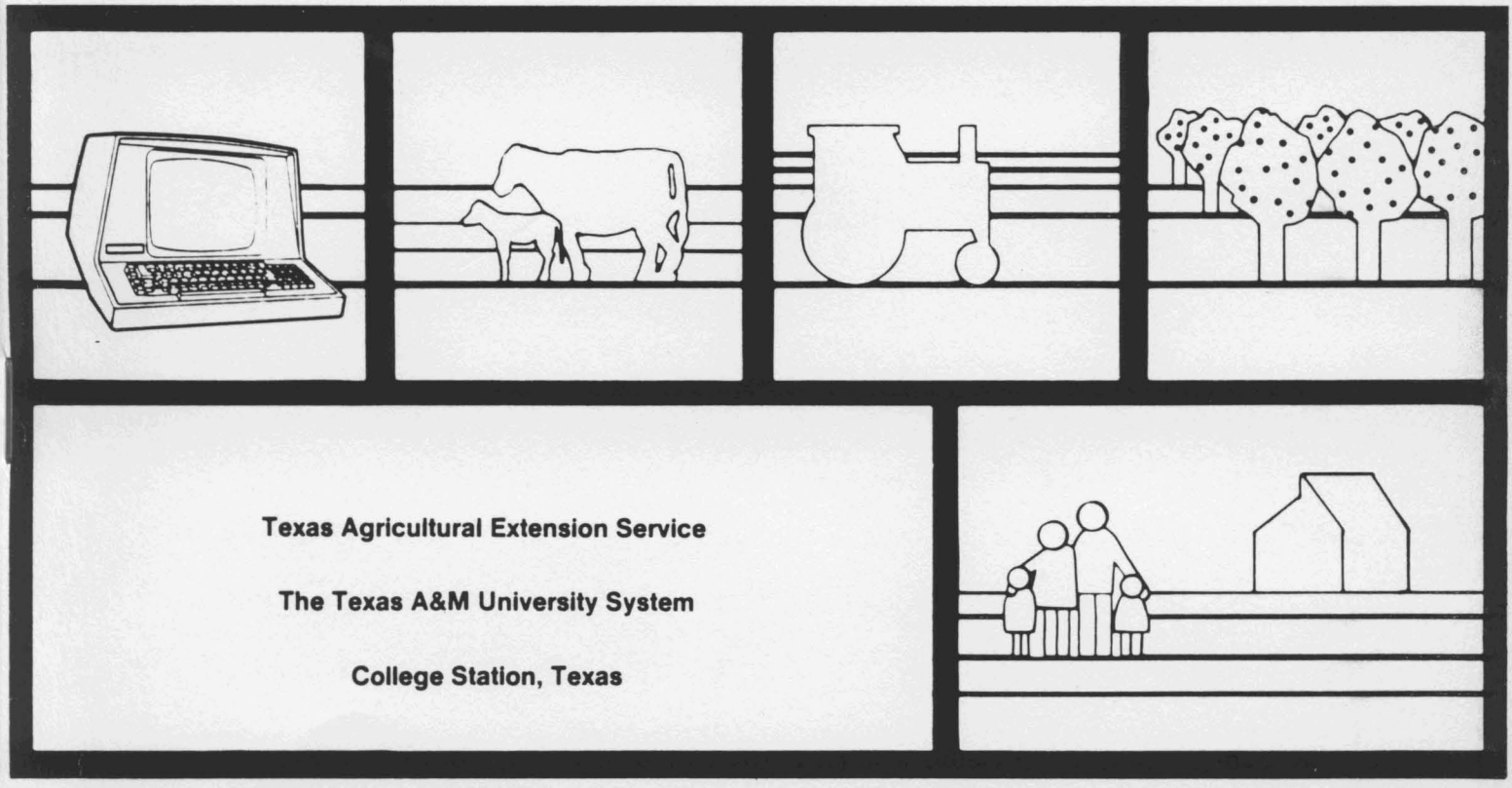
Texas Agricultural Extension Service

People Helping People

MICROCOMPUTERS FOR FARM AND RANCH MANAGEMENT



Texas Agricultural Extension Service

The Texas A&M University System

College Station, Texas

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FOREWORD

For the past five years members of the Economist-Management Project Group, the Texas Agricultural Extension Service, in cooperation with the Texas Agricultural Experiment Station have conducted regional and county microcomputer programs that have reached more than 6,000 farmers, ranchers and agribusinessmen. Additional producers have been reached through television, newspapers, radio and magazine articles. Participants from Hawaii, Canada, Mexico and the Atlantic coast have been attracted by the scope of these programs. The information presented in this publication is a six-year summary of these educational programs. The questions addressed are those most frequently asked by individuals interested in microcomputer uses in agriculture.

The purpose of this publication is to assist producers and agribusinessmen in evaluating the need and possible uses for a microcomputer in their operations. It includes sections on microcomputer hardware, microcomputer uses, microcomputer lingo, microcomputer selection, programming and a few of the software programs available for agricultural application.

A microcomputer is simply a tool and cannot replace the management skills of the user. Potential users are encouraged to thoroughly evaluate whether managerial skill will be enhanced through microcomputer use. They should evaluate carefully whether the potential managerial enhancement will justify the purchase of a microcomputer. The final decision on selection depends on the needs and wants of the individual. This guide will assist potential users in evaluating how well a microcomputer might satisfy their needs. A generic approach is followed and no brand names are recommended.

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Chapter 1

INTRODUCTION

Recent advances in technology have provided agricultural producers the opportunity to use the information retrieval, data storage and calculating power of a microcomputer. Rising production costs and fluctuating commodity prices contribute to an environment in which up-to-date and accurate information must be obtained. In this environment, many producers have been prompted to look to the microcomputer to help solve their problems.

A computer can add to the decision-making power of a farm or ranch manager. However, without a proper evaluation of its use in your operation, a computer can be less useful than the ordinary lead pencil.

As a potential buyer you should start by making a list of the tasks with which you would like a microcomputer to help. Analyze what the microcomputer is going to do and how it is going to pay for itself in your operation. What are you going to get out of it? As you read this paper, carefully consider how your needs fit the information presented. Computer applications are limited only by your imagination and the availability of the right software. Given the right software, a computer can streamline record keeping and the daily decision-making process necessary to run a successful operation. The wrong microcomputer system can frustrate, confuse and create mistakes at a record pace. Hopefully, this publication will assist you to evaluate your needs for a microcomputer system accurately.

1.1 COMPUTER APPLICATIONS IN AGRICULTURE

Farmers, ranchers and agribusinessmen often hear how they must be better businessmen, do long-term planning, keep better records and strive toward a more in-depth analysis of the economy, the markets and the financial impact of their decisions. In practice this is easier said than done. With the proper software, the computer has great potential to help a manager make decisions.

The argument for using a microcomputer in agriculture is that it can ease the generation, storage and processing of data into information meaningful to a decision-maker. With suitable software, the computer can perform numerous complex mathematical computations at a very high speed with accuracy. Such capability vastly increases a decision-maker's "figuring" power.

What the microcomputer can do for a decision-maker is to increase management efficiency. What the microcomputer can not do is take the place of the human interpretation and use of the information coming out of it. However, the computer does have the capability to free the decision-maker to think more about the information being processed and to better analyze the results of the computer's operation. The manager becomes a thinker and analyst rather than a number manipulator.

Applications of the microcomputer in agriculture can be grouped into text processing, data storage and retrieval, analysis and decision tools, household and entertainment uses, information monitoring and networking functions.

Text processing consists of using the microcomputer for word processing, name and address file lists and selecting and sorting data according to alphabetical information. An example of the select and sort feature is to draw all cows serviced by a particular bull out of the records of a herd of cattle. Another example is to select and group a list of 100 names and addresses by state from a mail-

ing list. Wordprocessing is using computers for letter writing or manuscript preparation. It can significantly increase the efficiency of a typist. Spell-checking features and the capability of merging name and address lists into a single letter to create individualized letters can be used to save time and money.

The microcomputer, coupled with appropriate software, can assist in accepting and assembling data in the right form for computation and reduce the time and errors associated with data storage and retrieval. Many kinds of data storage and retrieval software exist. Some are designed for specific purposes such as inventory control, cattle record keeping or accounting. Others are general purpose and can be adapted to various applications. Examples of these general purpose programs are data base management systems and electronic spread sheets.

Many decisions can be analyzed using "what if" type analysis and tools for testing alternatives before taking action. Managers can do sensitivity analysis to help determine what influence changing production and price levels will have on potential profit. A wide variety of "what if" programs exist. These programs can be used for assessing the impact of alternative yield levels on profit, looking at most profitable crop mixes, looking at least-cost feed rations, assessing the "fairest" share-leasing arrangement, assessing potential price fluctuations in marketing plans, looking at farm program participation decisions and analyzing other situations. Such analysis is of particular importance to the manager who wants to build production and marketing flexibility in his operation in order to cope with volatile prices.

Microcomputers have a potential use in the home as well as the business of farming and ranching. Many systems have entertainment programs available. Color graphics and sound create a variety of games for entertainment. Most major computer manufacturers sell education software that uses motivational tech-

niques to facilitate learning, reading and math skills in school and preschool age children. Home use functions include programs for family financial management, record keeping, living space monitoring of air temperature and security, and communications with other microcomputer systems.

Means are being developed by which large computer time-sharing systems can be accessed with microcomputers. Data bases and published information are now available to computer owners over a telephone link-up. National computerized information systems are being used for all kinds of data and educational information such as marketing news services, electronic funds transfers and electronic mail.

A new and potentially valuable function emerging is the use of microcomputers as translators for remote sensing devices. These devices have been used to monitor heat buildup in grain bins, soil moisture conditions, feed rations for individual dairy animals and potentially dangerous situations in the family home. This information, fed into the computer from remote sensors, is used to turn on grain bin fans and irrigation systems, to feed individual cows in the dairy barn and to dial the police or set off fire alarms in the home.

Potential farm or ranch computer applications are described by the titles of a few software packages that could be useful to a manager. The applications are:

A. Production Decision Aids for Livestock Management

B. Production Decision Aids for Crops

C. Performance Records and Evaluations

D. Investment Analysis

E. Farm and Ranch Accounting and Finance

F. Range Management Decision Aids

G. Range-Livestock Management Information System

H. Electronic Spreadsheets

I. Data Base Management Systems

Chapter 8 gives an overview of the packages available for crop and livestock decision-making. Computer application is limited only by one's imagination, time and money necessary to develop or acquire the software and knowledge needed to use the tool effectively.

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Chapter 2

UNDERSTANDING MICROCOMPUTERS

One of the main problems that many people seem to have with computers is knowing what to expect from them. A computer is not a mysterious magic box. It's just a machine. In fact, just as a car or truck is made up of parts such as tires, brakes and spark plugs, a computer is also composed of smaller, more elemental units. What these gadgets do, and what you need to know about them, need not be a mystery.

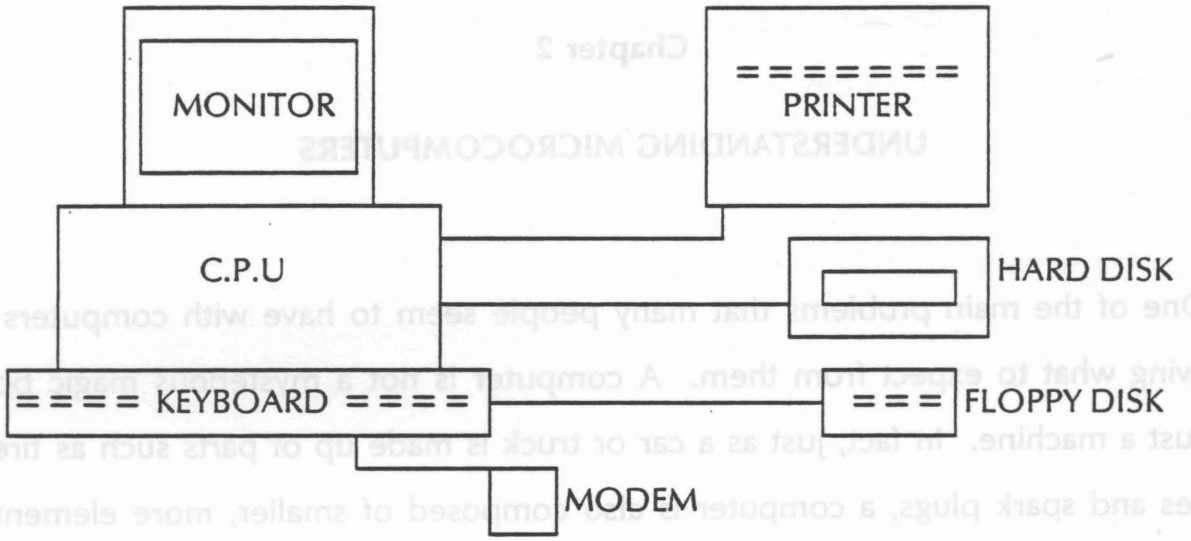
2.1 HARDWARE

"Hardware" is any of the physical pieces of microcomputer equipment that can be seen and felt. It occupies space and has weight. For instance, printers, disk drives, video display terminals, modems and any other computer related electronic boxes are all pieces of hardware.

The hardware of a microcomputer system generally consists of a central processing unit, video display (CRT), keyboard, memory storage devices and a printer. (See Figure 2-1)

If you were to open up the case of a microcomputer, you would find a lot of electronic circuitry. The computer's brain is a small electronic part called a "microprocessor". Its sole purpose is to carry out instructions it is given, one after another. No microprocessor can reason on its own. In processing commands, it follows the reasoning of the programmer who gave it the instructions. Computers aren't smart; people are!

Figure 2.1: TYPICAL MICROCOMPUTER HARDWARE SYSTEM



2.2 MEMORY

The typical microprocessor is very good at carrying out simple instructions, but it is not very good at remembering. To have a place to store data while processing, the microprocessor is connected to circuitry that serves as a temporary workspace for data. This circuitry is called the "memory" because it is "where" instructions and data are retrieved and stored.

In reality, the memory is composed of millions of tiny electronic switches. The computer is an electronic device and all instructions and data are represented within a computer system as electronic on-off states. The current is either off or on, like a light switch.

Memory size is measured in terms of the number of kilobytes or "k" (a kilobyte equals approximately one thousand bytes) the central processing unit (CPU) or disk storage will hold. A byte is the amount of computer space required to store one alphanumeric character.

The memory of the CPU is divided into read only memory (ROM) and random access memory (RAM). ROM is permanent memory in the computer that cannot be erased or altered. RAM stores computer programs and data for the purpose of execution or for performing the task specified by the instructions. The amount of RAM available for programs and data (user RAM) is very important. Most of the business computers use part of the RAM for the computer operating system and language. RAM can be compared to an electronic blackboard where calculations and manipulations are carried out. This blackboard is of limited size and can be filled up. The trick is to purchase a RAM size sufficient to do all the desired calculations.

In addition to the memory, other "devices" often connected to the microcprocessor are the console keyboard, the TV-like video display or cathode ray tube (CRT), printer and disk drives. These devices may run partially on their own but are always subject to the command of the computer. Devices that exist apart from the main computer box are sometimes called "peripherals". This equipment is also referred to as input/output devices because of their function. The user has considerable flexibility in selecting peripheral equipment. Currently this equipment accounts for the greatest part of a microcomputer systems cost.

2.3 OPERATING SYSTEM

Each time the computer is turned on, it is as though it has just been born. It knows only enough to start executing commands at a certain point in memory. Because the computer needs some instructions at this point, a special kind of memory, ROM, is used. This kind of memory is ready upon start-up and cannot ordinarily be erased or altered. Unless this fixed memory is very large, the microprocessor's first instructions are to get more instructions from permanent storage

by "reading" the information from a disk drive and loading it into the RAM which is eraseable and alterable. RAM's contents can be changed easily so that different information may be stored there as required. This process of getting started is somewhat analogous to the idea of the microprocessor pulling itself "up" by its own "bootstrap". This is why the initial start-up process is called "booting" and why a computer is often said to be either "up" or "down".

When "booting up", the first thing that a microprocessor will attempt to read into its memory and start to process is a program of instructions called an operating system. This is an administrative program that the computer uses to keep track of itself. It provides instructions to the microprocessor on how to organize memory, what peripheral devices are present and how to handle the data that proceed to and from them. It carries out arithmetic, logic and control functions. It is the computer's organization. This program usually resides on a special place on the floppy diskette and must be present on the first disk drive of the computer system. It is important to realize that the operating system is not an option; no computer can run without one. Different kinds of operating systems exist under many different brand names. CP/M, UNIX and MS-DOS are examples of operating systems.

2.4 APPLICATIONS SOFTWARE

An operating system alone is not sufficient. It has been compared to a tractor without an implement. Being able to organize information and manage it internally isn't enough. The computer is supposed to do something constructive, such as accounting. Instructions have to be given in a programming language because the computer does not know what accounting is.

Humans do not communicate in on-off electronic states and computers do not understand the English language. Regular human languages, such as Spanish, German or Russian, are too large, ambiguous and subject to change for today's computer to handle. The only language that the microprocessor can understand is the electronic states in the memory (machine language) which it recognizes as instructions it must carry out.

Precisely defined and exacting computer languages have been developed to bridge the gap. The term "language" has come to refer both to the actual human language that a programmer might use (BASIC, FORTRAN, COBOL, etc.) and also to a separate computer program that translates it into the electronic language that only the computer understands. Thus, if one writes a program in a human language like FORTRAN or BASIC, then a language translator program must be used to convert it to the electronic form useable by a computer.

Applications programs are the set of instructions which, when interpreted to machine language, cause the operating system to command the CPU to compute the desired results and then display those results on a CRT or printer. Examples of applications programs include the Machinery Cost Analysis, Vehicle Cost Analysis, Share-Lease Arrangements and the 205-Day Adjusted Weaning Weight programs. Computer programs are usually called software.

2.5 WHAT'S TO UNDERSTAND?

The microcomputer is an incredibly versatile and powerful tool for information management. All too often, however, the information processed is of such a nature that the user must have a good knowledge of the subject he's working with as well as a good grasp of how a particular program operates. For example, to use an accounting program, one must know enough about accounting to under-

stand what the program does, and know how to operate the computer program so that the desired results are achieved. The general concepts of accounting are relatively static, but the actual operation and features of a computer program vary from one program to the next.

This phenomenon can be compared to driving a car. The actual process of driving a car is easily understood. The features of any particular car may differ. Did you ever try to to turn on the windshield wipers in a car with which you were unfamiliar? Unfortunately, this initial unfamiliarity is the source of much frustration to new computer users and many decide that operating a computer is too difficult. This is not at all the case, as any experienced computer user can attest. It just takes some getting used to.

Besides the need to understand the operation of the computer, there is also a need to understand some not so well known general principles relating to hardware and software compatibility. The first principle is that there are different brands of microprocessors (CPUs). Each functions differently and has a different set of instructions and operating considerations. This means that computer programs (software) that are designed to work on one microprocessor cannot generally be expected to function on any other. Since different microcomputers often use different microprocessors, an accounting system that works on brand A computer may not work on brand B.

Second, there are different operating systems that have varying capabilities, responsibilities and operating methodologies. Although there are now more "portable" operating systems (available for more than one microprocessor), each is individually geared to a given microprocessor and is therefore dependent on it. Since an operating system controls computer functioning, software developed for one operating system cannot normally be expected to work on another. Some com-

puter brands now contain more than one microprocessor (coprocessors), giving them the flexibility of operating with more than one operating system.

Third, there are a multitude of computer languages such as BASIC, COBOL and FORTRAN. One language may be able to do a certain kind of task better than another. Within a given human language, there are a multitude of language variants. Human language variants are often understood among users of different but similar human dialects (British and American), but as far as a computer is concerned, there is no such thing as a language variant. If a computer language differs in only one word of its vocabulary, the computer considers it a different language. To complicate matters, language programs are often designed to take advantage of the nonstandard features of a particular machine or operating system.

Fourth, diskettes and diskette formats differ among microcomputer brands. Not only are there different sizes of diskettes, but there are other internal physical differences. Each manufacturer has its own idea of how to store information on a diskette. This means that you should not expect a diskette intended for brand A microcomputer to be readable on brand B microcomputer.

Fifth, the peripheral devices of a computer system (printer, disk drives, keyboard, etc.) recognize different commands to perform the same function, depending on the computer system, and may use different connections. There's no standard way of communicating what is to be done. For example, the simple task of clearing the screen of your video display requires a specific instruction to be sent from the computer to execute the command. The instruction given differs from machine to machine. In addition, the wiring used to connect the peripheral devices to the computer may be different. For example, the cable used to connect one printer may not necessarily be used to connect a different printer. Likewise, software written to take advantage of the functions of a specific computer

system configuration cannot necessarily be expected to operate on any other computer system configuration.

Why aren't there standards? There are!!! But few have been widely accepted. The computer industry to date has been too fast paced with new technological innovations for any lasting standards to develop. Because of our free enterprise system, companies often take advantage of the lack of standards to attempt to get an edge on their competitors by doing things different.

There is hope for industry standards. Incompatibility is not a stumbling block unless you are unaware of the variety of ways people do things. Consider the automobile industry. A wiper blade is not an item with standardized dimensions or characteristics. A carburetor for one car cannot be expected to fit on a car of a different brand.

The IBM microcomputers are so dominant in agriculture today that many agricultural software vendors provide their software for the IBM or MS-DOS compatible machines. The risk of having non-compatible software is reduced today by acquiring an IBM compatible microcomputer.

One can learn to use a handheld calculator in minutes. Learning how to operate a single microcomputer program may take hours, days or longer, depending on the program's complexity. Knowing how one program works may be meaningless in comprehending a second program, because microcomputers are machines that can be programmed in numerous ways. Patience, therefore, is not only a virtue, in many cases it is a necessity.

Chapter 3

TIPS ON SELECTING A MICROCOMPUTER

Before you buy a microcomputer, you might want to take just a few minutes to consider what you are getting into. Selecting a microcomputer can be a deceptively easy task. You could simply drop by your friendly neighborhood computer store and let them sell you something. What you might bring back to the office is anybody's guess. Give some thought to the kind of system you need and why you need it. A microcomputer is a useful tool, but it is not a solution to all your problems. Plan your purchase and check out information from your local library. If possible, gain some hands-on experience on a computer designed to handle the applications you have in mind. Without this experience you will have to rely on someone else's opinion. Try to learn some computer lingo and be well informed before you shop. (Definitions of some computer terminology are listed in Appendix A). The little time you spend should yield a more intelligent purchase.

To avoid mistakes, list the tasks you would like a microcomputer to do. What are you going to get out of it? How is it going to pay for itself in your operation? These are basic questions to consider before buying a microcomputer. Consider what your problems are and approach the purchase of a microcomputer from a practical angle.

The next step is to select the software that will fit your list of needs. Software, that set of computer programs which assists the farm or ranch manager in making timely and accurate decisions, is the key to your needs. Without meaningful and

useful software, the computer is useless. A computer does not have a mind of its own and must be fueled, started, placed in gear and guided to give useful results. This is the function of software.

Software is often not transferrable between different machine brands. If you make the mistake of buying the equipment first, you may not be able to find the programs you want. It is wise to look for the software first and then look for a machine that will run the software. In short, your computer is only as good as your software.

Recently, a number of operating systems have been developed that boast portability between a variety of machines and microprocessor chips. If you can find the software you need on one of these operating systems, you will be much less likely to be hemmed in to one specific brand of equipment.

3.1 WHAT KIND OF MICROCOMPUTER EQUIPMENT SHOULD YOU BUY?

The first step is to choose a computer system that will run most, if not all, of the software on your list of needs. The second step is to evaluate the microcomputer system's hardware.

Microcomputer equipment comes in a multitude of configurations. Essentially there are five basic units to consider. Every system should have (1) the computer processing unit, (2) a video screen, (3) a keyboard to enter data, (4) a data storage device such as a disk drive and (5) a printer to provide a hardcopy on paper. Let's take a closer look at these components.

3.2 COMPONENTS OF THE COMPUTER SYSTEM

Evaluating the actual differences among the various computer processors can be technical. The primary characteristic you should consider is the available memory. Microcomputer systems can be purchased with as little as 4K (or 4,000 characters of storage). Although this may sound like a great deal of space, it is generally not adequate except for the simplest applications. Most new microcomputers can be equipped with 256K of memory. Although this is adequate for many small business applications, your needs will probably increase over time. Many microcomputers can access considerably more. As a general rule, it is not wise to purchase a computer system with less than 256K of internal memory. Check the memory requirement of the software you want to use in your business when assessing your storage capacity needs. Many software packages, such as some accounting packages, may require a minimum of 256K.

Many microcomputer systems are dedicated to a single user at a time. Some manufacturers are now constructing multiuser systems to which more than one terminal can be attached. These systems typically allow for several separate users to use the same computer and peripheral devices. Although such a system is generally more expensive than a typical dedicated microcomputer, it can be less expensive per user than the purchase of four separate systems. If you wish your microcomputer to be used by more than one person at a time, this is an option you may want to consider seriously.

Video display screens may come as monitors or terminals, in color or black and white, in different sizes, using different character sets, etc. The primary considerations with any video screen are a character set with both upper and lower case characters and an adequate screen size. An 80 column by 24 row screen meets most needs. Make sure the screen is large enough to be seen without eye strain.

Microcomputer keyboards are not standardized. Most come with a typewriter-style keyboard and many have an additional ten-key number pad similar to that found on adding machines. If you plan to enter a lot of numbers, you may find this numerical entry pad advantageous.

A number of data storage devices are available. Cassette tape drives are not adequate. They are generally too slow and use technology that is too unreliable for proper operation. Two disk drives are recommended. Although they vary considerably in available storage space, no less than 300K per diskette (300,000 characters of storage space) is recommended. (One page of printed text double-spaced is about 2K.) Many business applications involve the analysis and manipulation of a larger amount of data. For greater speed and capacity, a hard disk system is recommended. The capacity of these comparatively expensive drives usually starts at 10 megabytes (10,000,000 characters of storage space). Because a 20 megabyte hard disk has only a slightly higher price, many opt for greater capacity drives.

There is a problem with hard disk systems. If all the data is not backed up somewhere else, an accident could be disasterous. Since a diskette holds only a fraction of the data a hard disk can, using diskettes as a backup media can mean quite a laborious and time-consuming procedure. As a result, special digital tape drives have been developed just for the purpose of backing up a hard disk. Depending on your situation, it may be wise to purchase one of these devices to make a copy of the information on your hard disk.

Printers come in all sizes, all costs and all kinds of printing methods. A good inexpensive printer currently costs about $400. A daisy wheel, wordprocessing quality printer may cost $2,000. Color printers and plotters may cost even more. Some printers are fast and others are slow. Some will use regular letterhead,

some will use only pinfed continuous paper and some use only special aluminized or thermal paper. Generally, the faster the printer, the more expensive it is. Also in general, the better quality the print, the more expensive the printer. Sturdier, continuous duty printers cost more than those designed for occasional use.

3.3 HOW MUCH COMPUTER CAPACITY DO YOU NEED?

There are no simple rules for how much computer capacity you may need. It can vary a great deal depending on the size, organization and needs of the farm or ranch business. If you are going to use the computer for accounting over several years, you may need a 10 megabyte hard disk. On the other hand, if you are going to be wordprocessing, you may need a wordprocessing quality printer. What you need depends on your particular situation.

3.4 MACHINE COMPATIBILITY AND OTHER CONSIDERATIONS

As you shop for your computer, you should know that mix-n-match purchases may not always be compatible. As a compatibility check, have your dealer set up the system and demonstrate that everything works together before you take it home.

Consider buying a complete system. A number of systems on the market today offer expandable systems. You can buy one piece of hardware today and worry about buying the rest later when you need it. This modular marketing technique offers the advantage of an inexpensive entry into microcomputer use. Because of today's rapidly changing technology, a starter system may be technologically obsolete in a year or less. The manufacturer may be reluctant to continue to support or make add-on products for an old product. This could leave you with a nonexpandable and inadequate system. It is better to buy a complete sys-

tem that is capable of handling all your current and predicted future needs. You won't have to worry about retrograde technology in the future and this system will still get the job done even though it may consist of less than state-of-the-art equipment.

Not everyone can repair microcomputers. If you think that being without the computer for any length of time could hurt your farm or ranch business, available service is an important consideration. It may take anywhere from an hour to a month or more for repairs. You should check to see if the dealer will provide a replacement machine while yours is in the shop. As with any appliance, it is important to evaluate the service warranty carefully. Some dealers have service contracts or extended warranties. Investigate the dealer's service capability carefully. It's good insurance.

Often people who purchase microcomputer equipment ask what kind of environment is necessary for a good computer workstation. There are a number of considerations. Printers, for example, typically create a significant amount of noise. This may be of some consequence if you put your noisy printer in someone else's quiet environment. The solution is either to soundproof the computer or place the computer in an already noisy enviroment. Another consideration is static. Carpeted rooms can affect your computer. Static electricity builds up and can easily damage your computer's sensitive electronic circuitry, so it is best to place the computer in a noncarpeted room. If this is not possible, antistatic sprays can be obtained to treat the carpet to make it safe.

Buying a microcomputer does not solve all your problems automatically. Manuals will have to be read, questions will have to be answered, people may have to be trained, and a good deal of hands-on experience may be necessary just to get used to the particular way a single program works. Some dealers offer training

classes or private tutorials. Check with your dealer. When frustrated, persist until you figure things out. A computer is just like any other tool. Have patience, be diligent, and learn how to use it.

When you are ready to talk to a salesman, go to several different computer stores. Many computer salesmen are not computer experts. Think twice before you let the salesman decide what kind of computer system best meets your needs. Approach him with a "show me" attitude. Don't take anybody's word for it; see the system work with your own eyes. Does it do what you need it to do? Does it have enough capacity to meet your current workload and still have plenty of room for growth? Shop around. Talk to the salesmen. Ask questions. Find out what is available.

Salespeople often seem to have a standard response to questions about computers. Many revolve around the seemingly innocent word "can". Microcomputers are very general machines that can do whatever you are able to make them do. If you are a computer programmer or an electronics engineer, that probably means plenty. If you're not, you may find the machine is considerably less cooperative than the salesman might have you believe. The truth is, what a computer "can do" costs money, and that may be extra money over and above the cost of the basic machine. Salespeople are interested in making the machine look as powerful as possible. Be wary when you are told that a computer can do something. Just because it CAN, does not mean that it WILL when you take it home. A simple inexpensive computer may require numerous and expensive add-ons before it will perform as the salesperson claims it can. Make sure that the computer does everything and includes everything you need before buying. Have the salesman spell out all the capabilities and costs of the machine so that you have no misunderstanding about what you are buying.

3.5 MAKE YOUR CHOICE!

If you already own a computer, before you order software, find out whether it will operate on your specific computer system, using the language you have. Find out if it is on a diskette format readable by your system.

Consulting a local computer expert can make you feel better and may help you deal with a number of problems. Users' groups often meet and discuss common problems and interests.

A computer is, after all, just a machine. Nobody is born knowing how to run one. It takes time, an understanding of its limitations and requirements, and patience.

You will probably not find the perfect computer. The industry is still young and growing. Major advances in computer technology seem to be made daily. You may have a difficult time finding software that caters to your exact needs. That does not mean, however, that you have to wait until the perfect computer arrives.

Socrates, the ancient Greek philosopher, once said, "The unexamined life is not worth living." In today's competitive agricultural marketplace, his words still ring true. The close examination of a new tool has always preceded its correct and profitable application. Which system is best? Which brand should you buy? Ultimately, you must decide for yourself because you are the only person who understands your wants and needs. Look closely at what's available and consider what you need a computer to do for you. Examine your situation and decide what you need before you buy. There are no simple and easy answers to these questions. The applications seem limitless, but find out what they can do for you.

Chapter 4

CHOOSING APPROPRIATE SOFTWARE

When buying or acquiring software from someone else, what should you look for? This depends on whether or not you already own a computer. Assuming that you do not own one, first develop a written list of what you would like to accomplish with the software. With list in hand, shop around to find software that can best fit your needs. Only then should you consider purchasing the software (and computer system).

If you own a computer, the alternative is to shop for software that is compatible with the specifics of your computer system. Primarily you must find the program which will match the memory size, operating system, language, disk size, printer characteristics and monitor or screen capabilities of your computer system. Often this will mean that the program desired will not be available for the computer you own. Depending on the importance of the software, you have several choices. If the software is essential to your operation, you may either modify the hardware to match the software or adapt the software to match the hardware. The other alternative is to buy another computer or trade in the one you have for a new one.

Basic to acquiring software is determining what jobs need to be accomplished using the computer, finding out who can supply the software to perform those jobs and finding which hardware will execute that software.

4.1 SOFTWARE SOURCES

Software is a set of instructions written in a language the computer understands that directs the computer to do useful work for the computer user. As will be noted in Chapter 11, the electronic spreadsheet is also becoming popular for developing and distributing agricultural software.

There are several sources of software for the farm or ranch manager. The first source is the commercial program package. This software package is generally sold by software companies or hardware vendors and has a very general application. Such software may or may not fit your specific application.

Software written by a professional programmer is another possible source for farmers, ranchers and agribusiness. This software has the advantage of being operation-specific but is usually expensive. At custom programming rates of $25 to $45 per hour, it does not take long to build up a substantial programming fee.

A third type of software is that written by the user. If the user is inclined to learn programming and has the time to devote to the effort, this can be very gratifying.

Programs written by state universities are available to the public at a nominal cost. University software is relatively inexpensive and is accurately written for effective agricultural applications. This source, just as the commercial source, has the drawback of being general in nature and not necessarily adapted for an individual operation.

A new trend emerging is the formation of software co-ops or clubs. Computer users do share programs they have written, but it is usually illegal to swap commercial software packages. However, some public domain software is available for use and modification by these clubs to fit individual user's unique situations. If you want to start a club, consider machine and program compatibilities and whether the programs can be legally swapped by users.

4.2 EVALUATING SOFTWARE

After you find software packages which will perform the jobs required, you need to evaluate them. There are five main criteria for software evaluation. First, evaluate the developer's credibility. Does the person or company who wrote the program have any experience or expertise in agricultural techniques and appropriate technology involved in the application? Second, evaluate the usefulness of the solution. Several programs may be available which can provide solutions to a particular problem, but are those solutions applicable to the individual situation? Third, consider the documentation and instructions. Is the program well described and the methodology accurate? Can the instructions be easily understood, or must they be interpreted? Fourth, evaluate the program(s) ease of use. Are the input questions asked by the program well explained so that there is no doubt about how to answer them? An example is entering a percent value. Should that value be entered as a decimal or as a whole number? Fifth, evaluate the software error-checking capability. How "idiot proof" is the program? Does the program accept non-sensical answers to input questions?

Above all, conduct a hands-on self-demonstration to make sure that the program is suitable for the farm or ranch operation, that it provides meaningful results and that it is easy to use. Finally, check the solution the computer provides by running a problem to which you know the answer. Appendix B contains a checklist to assist you in evaluating software packages.

4.3 PHYSICAL FORMS OF SOFTWARE

After deciding which program or software package to buy, a purchaser can usually obtain it in one of two physical forms. One is called the source code. Source code is simply a printed listing of the program similar to that found in programming or microcomputer books sold in bookstores. To make this code usable, the user must enter the entire code on the computer keyboard. This can be very time consuming and error-prone.

The other physical form is found on a hardware storage medium, usually a diskette. The program on the diskette will either be human readable or machine readable. If it is human readable, the user can produce a source code listing on the printer. An attempt to list the machine readable program will result in garbage if anything at all.

4.4 CONCLUSIONS

Acquiring software can easily cost more than the hardware to run it. However, without meaningful software, the hardware is worth nothing except as a trade-in. The profitability of a computer system is related to the software used on it, not to the specific capabilities of the hardware. While hardware is obsolete almost the day it is purchased, good meaningful software is current for a long time. However, a producer cannot expect software, with its associated hardware, to straighten up a poorly managed business. In fact, it would probably make a poor manager less effective because of the "garbage in--garbage out" rule. The benefit of a complete computer system comes from providing a good manager with information to make better and more timely decisions, thereby increasing the profitability of his business.

Chapter 5

COST AND TAX CONSIDERATIONS OF A MICROCOMPUTER SYSTEM

Few modern farm or ranch managers would think twice about the need to purchase and maintain a pickup. Nor would a crop farmer question the necessity of buying certain farm or ranch machinery items. These same managers are frequently less definite in their attitude about the necessity of having modern tools to facilitate farm or ranch business management. A microcomputer system and software are modern management tools that are still not considered a necessity by many producers and their advisors. Yet, just as a pickup, tractor or even a hammer increase our physical power, a computer can increase our thinking power. Understanding the ownership and operating costs can help decision makers to decide on the application of a microcomputer in their farm, ranch or agribusiness operations.

5.1 INITIAL

As with investment in any tool, the microcomputer system will require a capital outlay. One can expect to spend $4,000 to $8,000 for a microcomputer system including a printer and basic software. The higher cost system would contain larger internal memory capacity and a hard disk that would be required to handle extensive amounts of data and recordkeeping information such as an accounting system. The lower cost systems, perhaps portable computers, would contain less internal memory and two floppy disks and could be used for less extensive data

analysis, decision aids and basic recordkeeping. The original system should include basic software needs for recordkeeping, word processing, an electronic spreadsheet program, a communications modem and some relevant decision aid programs. The uncertainty of a system's cost is related to the software cost and equipment options required by the user. Complex systems may cost in excess of $20,000 without software.

5.2 OPERATING

Operating costs consist primarily of repairs, maintenance, paper and other supplies (5 to 10 percent of purchase price annually). Electricity costs are negligable and amount to the equivalent consumption of a couple of light bulbs. One might also add costs of $100 per year for computer magazines and newsletters and initial costs of $400 to attend a computer use seminar. Countless opportunities will arise to add to the software arsenal. A substantial number of software programs are on the market and one should plan on spending $400 to $500 per year on software for the first 2 to 3 years until an adequate software library is established. Software costs will likely exceed hardware costs over the life of the microcomputer. Operating costs will add up to $1,000 to $1,100 annually and are fairly independent of the type of microcomputer system purchased.

5.3 OWNERSHIP

To estimate ownership cost, one can take a very conservative cost calculation approach and place a five year economic life (20 percent per year) with zero salvage value on the computer system. To complete the calculation add a 12 percent annual interest cost on half of the investment for finance charges, and one percent for insurance cost. This means that annual ownership cost is 27 percent

(20%+6%+1%) of purchase costs. This indicates $1,080 per year in annual ownership costs for the $4,000, lower cost system and $2,160 for the $8,000, larger system.

Adding ownership cost to the $1,100 operating cost would give a total annual cost of $2,180 to $3,260 for the two different systems. This would not include computer operator labor costs that may occur in using the computer.

5.4 TAX

The cost estimate outlined above is based on pre-tax costs. When used for business, computer systems are considered depreciable property and the associated operating expenses are tax deductible, including the costs of added software and the expenses involved in attending education workshops.

Under the accelerated cost recovery system, computers used in business are considered 5 year property and may be depreciated at a rate of 15 percent the first year, 22 percent the second year and 21 percent in subsequent years. In addition, the option exist of taking a 10 percent or an 8 percent investment tax credit. (If the 10 percent option is chosen the basis of the property must be reduced by 5 percent to determine its depreciable balance. If the 8 percent option is chosen the full cost of the system can be depreciated.)

Computer software can also be depreciated if it is used for business purposes. However, unless the software is purchased with the computer system it may not be eligible for the investment tax credit. It is best to check with your tax accountant when considering separate purchases of software and hardware.

As with any property, if a computer is used for both business and personal use, the proportion of the system used for business is eligible for the tax benefits. Investment tax credit and the accelerated cost recovery system are only available

if the computer is used more than 50 percent of the time for business purposes. If the computer is used less than 50 percent of the time for business, the user may depreciate that portion used for business using the straight line depreciation method over the life of the computer. To support the business use of the machine, records must be kept of the hours of use allocated to business versus non-business use. A printout of business work conducted should also be kept. Document the purchases of hardware and software with receipts, cancelled checks, credit card receipts etc. to establish the cost basis of the equipment.

It is possible to approximate after-tax costs if some assumptions are made. Let us assume that the user is in a 25 percent tax bracket, pays 11.8 percent net rate in self-employment social security taxes, uses the 10 percent investment credit, and the 5 year ACRS depreciation allowance. Using these assumptions and applying these tax savings to the total annual operating costs of $2,180 for the $4,000 system, the average annual after tax costs for the $4,000 system should drop to approximately $1,160 for the first year and $1,470 per year for the remaining 4 years thereafter. The total operating costs, $3,260, for the more expensive ($8,000) system would drop to approximately $1,630 per year for the first year and $2,250 per year for the 4 years thereafter. Tax savings would mean that actual costs would amount to approximately 50 to 70 percent of pre-tax costs.

A tax option exists of expensing up to $5,000 per year of depreciable property in the year it is purchased. This $5,000 option allows a producer to treat depreciable property as a currently deductible expense. The $5,000 limit applies to the sum total of all depreciable property purchased in a given year. This expensing option can be a valuable option, especially to those individuals in high marginal tax brackets. The portion of the property which is not expensed is eligible for investment tax credit and the accelerated cost recovery deduction (depreciation) as mentioned above.

5.5 TOTAL

Some may feel that owning a computer system is a large management expense even with the tax considerations. To put this cost in proper perspective, the daily after tax costs of $5 to $10 per year, assuming 240 management work days per year, are pretty low considering the potential benefits. It is difficult to imagine a lender, agribusinessman, or consultant who could not justify an after tax cost of approximately $5 to $10 per day for a computer system. Placing a value on the benefits of management tools is difficult. One is often faced with deciding whether improved information really helps make more profitable decisions. Remember, computers and software do not make decision, the user must still make the final move.

5.6 OTHER

The largest payoff from the use of a computer system is the ease and efficiency with which the computer can handle tedious and repetitive tasks and do "what if" type analysis. The manager can save dollars and effort by having more timely and complete information.

The experts agree that the costs of microcomputer systems are unlikely to decline much more in the near future. Hardware is becoming less expensive, but the capacity and opportunity for spending money on software means the total costs will not change appreciably.

Benefits will increase as the manager becomes more experienced in using computers in his business. If one adds the costs, considers the tax breaks and the benefits, it is easy to see why experts feel the microcomputer will become a widely used tool of management in the future.

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Chapter 6

APPLICATION OF MICROCOMPUTER TECHNOLOGY TO FARM AND RANCH SITUATIONS

To fully realize the potential of the microcomputer requires appropriate hardware and software. Equally important however, is the education of the user to effectively utilize the computer as a tool of management. The computer system cannot replace the subject matter knowledge (accounting, economics, nutrition, etc.), intuition and experience of the manager.

Many farmers and ranchers are much more knowledgeable of production agriculture than of economics, finance or general business management where microcomputers are very useful tools. Meeting the needs for subject matter knowledge to complement the microcomputer is extremely important to fully realize the microcomputer's potential benefit to the farm or ranch business.

The Texas Agricultural Extension Service has an expanding educational activity that offers short courses to meet educational needs for use of different microcomputer software. This is part of an ongoing activity associated with the "Year 2000 Computerized Farm Project" described in the following section.

6.1 YEAR 2000 COMPUTERIZED FARM PROJECT

The "Year 2000 Computerized Farm" is a project aimed at meeting the indepth educational needs of farmers, ranchers, agribusiness and extension staff to effectively use microcomputer technology on commercial farms and ranches. The project is implemented by the Texas Agricultural Extension Service and Texas Agricultural Experiment Station of the Texas A&M University System. This project is supported by a three year, $500,000 grant from the W.K. Kellogg foundation, a $300,000 hardware grant from Texas Instruments Incorporated, the Stiles Farm Foundation, numerous grants from agricultural software vendors, and a tractor from the John Deere Company. The project involves development of a computerized information system that is demonstrated on a large commercial sized farm (3300 acres). In addition to having microcomputer applications demonstrated at the farm, there is also a training center used by farmers, ranchers and extension staff, and a software library for evaluating private and public software. Short courses held in the training center deal with specific topics (farm and ranch accounting, beef cattle performance records, etc.) and run for three day periods. The facility offers an opportunity to apply and demonstrate on-farm microcomputer technology and indepth continued education required for full realization of the potential of the on-farm computer. The project also demonstrates how public and private interests can be served by joining in developing computer application efforts that will facilitate adaptive research and user education. Information on the project and short courses can be acquired from the Texas Agricultural Extension Services. The farm is located at Thrall, Texas, 8 miles east of Taylor or about 45 miles from Austin, Texas.

6.2 HARDWARE OPERATION EDUCATION NEEDS

When a microcomputer is acquired it is important to arrange for initial training with the vendor of the hardware. Many retailers have courses that are taught as an ongoing activity. It is extremely important to secure education on how to use operating system software for program loading, back-up and copying. It is also important to receive the basic instructions on how to use each software package. Many of the frustrations with the use of computers are in getting started. Short courses to get one started can really help to overcome these frustrations and should be a part of the purchased package.

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Chapter 7

ACCOUNTING AND FINANCE

Sound financial management is essential to a farm or ranch business. High interest rates, rising production costs and volatile agricultural commodity prices create a set of circumstances that reward correct decisions and penalize the business for poor decisions.

The identification and management of casualty, production and marketing risks are critical to the success of the farm or ranch operation. Through the use of computerized record-keeping systems a farmer or rancher can be provided with the up-to-date financial information necessary to successfully manage their operation.

7.1 COMPUTERIZED ACCOUNTING SYSTEMS

A computerized accounting system assists the user in three ways: to generate the information required to file timely income tax returns, to generate reports required by lenders, and to obtain timely management information.

Farmers and ranchers have traditionally used a certified public accountant (CPA) to handle the first two functions. Taxes must be paid and lenders are requiring producers to supply accurate financial statements before they are willing to make a loan. However, generating timely management information is the most justifiable reason for purchasing a computerized accounting system. A farmer or rancher is often faced with management decisions, such as whether to accept an

offered price for his commodity or reject the offer. He may have only a short time in which to make this decision. The chances of determining costs of production as of today are slim if he has to depend on his accountant to provide the information. While he's waiting, the selling opportunity is likely to pass. This need to capture selected information about the past and the current performance of the farm or ranch is essential in making effective management decisions for, not only, current use, but for the future growth of the operation.

7.2 INFORMATION REPORTS GENERATED

Farm and ranch accounting software packages provide information on the past and current performance of the farm or ranch by generating basic financial reports. Some of the types of reports and the functions they serve are listed below.

The *balance sheet* represents a snapshot of a business at any point in time. Its primary function is to list everything a business owns, everything it owes and what the owner(s) has invested. In short it summarizes assets, liabilities and net worth. The balance sheet does not measure profitability. However, it can indicate problems and a comparison of balance sheets over time can show the growth or the decline of the firm.

An *income statement* shows the profitability of a business for a period of time. Its primary function is to report business income, expenses and profit or loss.

A *cash flow statement* reports the sources of cash and the uses of cash by major categories, usually on a monthly or quarterly basis. This report is used to estimate cash requirements for the next year and is essential when establishing a line of credit at a lending institution.

A *checkbook summary* is a summary of all transactions entered into the accounting system that had an effect on the business checking accounts.

In a double-entry accounting system, a transaction that affects one account must be offset by an equal and opposite entry in another account. These entries are referred to as debits and credits. The *trial balance* report depicts, for a given period, the total debits and credits which affect each account in the business, and the ending balance in the accounts once the general ledger is posted. This report often provides the user the opportunity to find errors in his data entry prior to actually posting the general ledger.

A *transactions list* is a listing of all the business transactions which have been entered for a particular reporting period.

The *general ledger* report displays, in detail, how every account in the business is affected by transactions during the reporting period. It also shows the ending balance in each account. This report is found in most commercial accounting systems and serves as the audit trail if it becomes necessary to determine the sources of account balances.

7.3 TYPES OF ACCOUNTING SYSTEMS

Most agricultural accounting systems fall into two basic categories: single entry and double-entry systems. If the sole purpose for the accounting system is to generate income tax information, a single entry system is adequate. The single entry system does not maintain balance sheets and general ledgers but can easily provide the tax information normally found on an income statement. The user enters income and expenses by types and sources.

Double-entry systems are becoming more universal in agriculture and come with various features. Most double-entry systems require the entry of both a debit and a credit. By doing so, the system can be kept in balance and a balance sheet can usually be displayed at any time. In such systems, one has the option

of transferring values between any two accounts in the system. This makes possible the movement of assets and liabilities from a fixed or intermediate classification to a current classification, the recognition of depreciation, the expensing of other assets and many other types of transactions that are reflected in the income statement and the balance sheet.

One feature of some accounting systems is the ability to keep track of the expenses and sales incurred in producing a commodity. This allows the user to generate enterprise reports to determine the cost of production and profitability for that particular commodity. Double-entry accounting ties together the income statement and balance sheet to the extent that any profits earned by a commodity appear on the income statement and become part of the owner's equity, which is reflected on the balance sheet.

Another feature found on some double-entry systems is the ability to simultaneously do cash and accrual basis accounting. In farming this becomes important to the manager who wants to obtain accurate tax and management information on his operation. Farmers and ranchers often have production periods that do not coincide with the calendar year. For example, a farmer reports his taxable income on a calendar year basis, but his crops actually overlap over two or more calendar years. An income statement produced at the end of a calendar year, used for income tax purposes, reports income from the crop harvested during that year. The expenses reported on the income statement may pertain to the crop which was harvested as well as the crop which will be harvested next year. While this expense information may be better than no information at all, the farmer does not really know how profitable the crop was unless the revenue and expense data are properly matched. A system which allows the user to match revenue and expense data on an accrual basis is valuable for the farm's management. Additionally, it is

convenient to have cash revenue and expenses summarized for income tax reporting.

7.4 SELECTING AN ACCOUNTING SYSTEM

Financial accounting is primarily concerned with reporting on the farm or ranch to lenders and concerned outsiders. Managerial accounting keeps track of the business for the farm or ranch manager. The first step in selecting an accounting system is to define whether you want to use a system for one or both of these functions.

Once the purpose has been ascertained, shop at different computer stores to find the system which will serve the purpose you have in mind. The only way to make this decision is to test the system by a hands on test, either in the store or by borrowing or renting the software. As you are using the system, decide whether or not it is easy to understand and use. Are the information input routines self-explanatory or do you have to constantly refer to the manual? Are reports generated by the system suitable for your purpose and do they provide readable information? Is it possible to enter erroneous information such as fictitious account numbers, unbalanced transactions and words when the program wants numbers? How easy is it to correct entries? Does the system print trial balances without immediately posting to a general ledger? These are just a few of the questions to ask yourself as you are testing the system.

In selecting the accounting package, involve your accountant or tax practitioner. These individuals should be able to determine whether the package is sound from an accounting standpoint.

Evaluate the vendor of the accounting package and the company producing the software. Will the vendor keep you up-to-date on corrections in the current

version of the accounting software? Will he make available to you updated versions of the software at a reasonable price? Is customer training available? Will the vendor or a company representative be available to answer questions you might have? Be sure to check on warranties, return policies and repair facilities. Friends, neighbors and other users of the accounting package can give you an idea of its ease of use and the reliability of the vendor.

The the next consideration in selecting a system is its price. An inexpensive system which does not meet your needs is a bigger waste of money than a more expensive system which does more than you need. You may need the system's excess capabilities in the future.

7.5 ADDITIONAL CONSIDERATIONS

In shopping for an accounting system, you will find other software features which can be attached to some systems. These features may or may not be useful to you. They include check writer, payroll, accounts payable, accounts receivable and asset or depreciation management programs. These features are generally oriented towards businesses with large numbers of employees or with many customers. Most farm or ranch operations will have limited use for these options.

Capabilities which may be useful in an operation are the ability to designate the location affected by a transaction. By using this feature, you can specify that an income or expense transaction is related to production in a certain pasture or field. This enables one to prepare income statements or enterprise reports for each field, pasture or farm.

Another useful feature is the ability to maintain inventories in physical as well as in dollar values. For example, one may buy 500 stockers and later sell a portion of them. By entering the 500 head bought and the number sold, the number left and their cost basis can be determined by the accounting system.

A checklist of the features to evaluate in selecting an accounting package are listed in Appendix D. This checklist can be used to make a side-by-side comparison of alternative packages to find the one which may best fit your needs.

7.6 CONCLUSIONS

Accounting systems are not the answer to all your financial problems. Doing your own accounting on your own computer will not necessarily save you time. A user will need a substantial amount of time to become familiar with the system, to learn how to use it, and to enter his information into the system. Experience is the best teacher and that is gained only with time and practice.

If you buy a double-entry accounting system, you must learn basic accounting procedures. The hardest part of learning the system will be understanding which accounts to debit and which accounts to credit.

To use an enterprise accounting system, many will need to improve their record keeping. To illustrate, one may need to start recording how much fuel is applied to each enterprise, how much of the crop was fed to livestock, how much labor was used for each crop and livestock enterprise, etc.

Do not be overwhelmed by purchasing all the modules or building blocks that may be combined into a "super" accounting system. Begin with the basic features (e.g. general ledger) and work up to the more complex and complete system.

Finally, the profit from a computer system is not tied to its ability to do accounting. It's tied to its ability to help make decisions. Since the accounting system can generate information in a timely manner to help you make critical management decisions, you may want to purchase one. If the system is used simply to prepare tax information or reports for obtaining a loan at the bank, you are probably better off buying accounting services.

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Chapter 8

CROP AND LIVESTOCK APPLICATIONS

Today's farm and ranch managers work in an atmosphere of volatile prices, dependence on uncertain export markets, inflation, the price-cost squeeze and a seemingly ever-changing tax and legal structure. To help cope with today's risks, the successful producer must keep up-to-date on every facet of his operation, including the effects of world and domestic markets and changes in government policy. The capability of the microcomputer offers farmers and ranchers the chance to reduce these risks by improving their management information and problem-solving ability.

A number of farm and ranch software applications packages are available from private companies and state university sources. This software can be grouped into the areas of monitoring, data storage and retrieval, decision analysis and information retrieval from other computers. The successful use of any tool requires that you know what it can be used for, its limitations and strengths and its value in your operation. As these topics are discussed, keep in mind how the risks of managing your operation might be reduced by using a microcomputer.

8.1 FARM AND RANCH APPLICATIONS

One of the primary strengths of a microcomputer is that it can be used to store and rapidly retrieve information on the farm or ranch operation. With the right software, it can assemble the information, make the necessary computations and print it out in the desired form. The manager can then make decisions based on timely information. He does not have to totally depend on a CPA or someone else to get the information to him.

The primary example of storage and retrieval software is a Farm/Ranch Accounting System. Information stored on the farm or ranch can be retrieved from the accounting package in the variety of ways discussed in the Accounting and Finance applications chapter. Transactions lists, financial statements, tax forms, enterprise analysis, etc. can all be drawn from information a producer has stored on the microcomputer.

Using the proper software, the names and addresses of sellers and buyers can also be stored for retrieval. Registered breeders and hybrid seed growers may find this feature of special value in contacting buyers. Name lists can be stored for later listing by alphabetical order, category, town, state or zip code. Data base management system software, wordprocessing software or specialized name and address software are the packages most often used for this purpose.

Other potential data storage and retrieval software are herd performance record keeping systems; livestock feeding records; feedlot record keeping; farm/ranch filing systems for inventory, marketing, price, yield or other records you desire to keep.

The greatest unrealized potential for microcomputer applications involves monitoring farm or ranch functions, leaving you more time to analyze and manage the operation. Monitors have been placed in silos and grain bins to keep track of

moisture and heat build-up. When heat and moisture builds up to critical levels in the bin, a signal is sent to the computer. The computer turns on dryers and fans to reduce the danger to safe levels. Electronic feeder control devices have been attached to dairy cattle. These devices monitor individual animal performance, analyze feeding requirements based on their performance and lactation stage, weigh out feed and feed the animal accordingly. Other monitoring applications have included turning on irrigation systems when soil moisture becomes critical and household security that automatically dials police or fire departments. Monitoring applications come under the heading of remote sensing software.

With suitable software, the computer can be made to accurately perform complex mathematical computations at a very high speed. The computer allows the use of sophisticated analysis tools that greatly increase a producer's decision-making power. The chance of making a right decision can be enhanced by doing a "what if" analysis before taking action. "What if" decision analysis software frees the producer to think more about how to use the results of the computations to reduce his risks.

Examples of decision analysis software are listed in Appendix C. They include finance and tax, crops and machinery, irrigation, livestock, marketing and vehicle cost analysis programs.

Finance software allows a producer to evaluate the interest rate, principal and down payment alternative results of taking out an agricultural loan or financing land sales or purchases. The net present value and internal rate of return of alternative investments can be analyzed and compared for profitability. A recently developed program calculates depreciation and investment tax credit alternatives for investments. Electronic spreadsheet financial statements can help prepare statements and analyze them which is critical for financial management in today's deci-

sion environment. Financial decision analysis software available from commercial vendors includes interest income calculators, total farm profit analysis, enterprise budgeting, cash flow budgeting, breakeven analysis, lease-purchase analysis and partial budgeting.

Crops and machinery decision analysis programs include breakeven yield analysis, chemical and fertilizer use decisions, government program participation decisions, custom hire-machinery purchase decisions, machinery ownership and operating costs analysis and others. Playing "what if" games, a farmer can determine whether it is more economical to own and operate a 150 horsepower tractor or a 200 horsepower tractor. Costs per hour and per acre are given for the tractors and implements hitched to the tractors. Thus, a better management decision can be made by comparing the results of the program.

Using the breakeven program, a farmer can determine what sorghum yield he needs to receive to breakeven with his expected cotton yield, given crop production costs and the price he expects for each of them. What if his cotton yield is lower than expected? He will need less sorghum yield to stay even with his cotton. How much less sorghum will he need? The breakeven program helps evaluate all these alternatives quickly and accurately. That is the primary advantage of the decision analysis program.

Livestock decision aids have perhaps the widest range of application programs available. Livestock species, farm/ranch size, pasture, breeding-market animals, registered-cross breed, wildlife integration, method of marketing, supplemental feeding, veterinary practices, breeding, production time period, special enviromental conditions, etc. all add complications to livestock production decision making software.

A few of the decision aid livestock programs available from the Texas Agricultural Extension Service are the "205 Day Adjusted Weaning Weight", "Fencing Cost Estimator", "Livestock Economic and Production Evaluation Under Range Conditions" and the "Deer Hunting Enterprise Economic and Production Evaluation". Financial decision aids and statements, machinery cost estimator and "Pick-up and Trailer Cost Analysis" programs can also be applied to livestock decision making. Programs available from the private sector include projecting adjusted birth, weaning and yearling weights; cow-calf, stocker and feeder profitability; cattle feeds and feeding analysis.

Hog software includes farrow to finish production planning; hog herd breeding, health, feeding efficiency and productivity planning; farrowing projections including farrowing dates, pregnancy test dates, conception rates and accuracy of pregnancy tests. Individual boar and sow performance projections; costs and returns of alternative production systems and alternative ration nutrient analysis programs are available.

Poultry decision software includes most profitable broiler product mix; projected brooding, growing and laying of commercial layers; laying periods and processing/marketing decisions.

Most crop marketing decision analysis software concerns a comparison of storage at harvest for future sale or selling on the cash market at harvest. Others involve estimating discounts for high moisture or damaged grain and evaluating marketing alternatives. Marketing risk decision analysis programs are available to analyze the use of the futures market, develop price trends for prediction and develop historic basis patterns. The Extension Service has a program available for analyzing the proportion of a crop that will have to be contracted in order to breakeven on projected variable costs of production.

Microcomputers are used by producers to access information from centralized computer systems. A number of time-sharing systems (videotex) allow a farmer or rancher to telephone a computer that may be in Virginia, Nebraska, New York or any where in the country. "What if" programs, marketing information, government information, electronic mail and other information can be obtained by a producer through accessing one of these systems. The University of Nebraska's AGNET and Virginia Tech. University's CMN are examples of two time-sharing systems available to producers from state universities. Commercial systems, such as Pro Farmer's *Instant Update,* Reader's Digest *The Source,* H&R Block's *CompuServe* and AgriData Resource's *AgriStar* are available on a subscription basis. These commercial services provide the latest price information from commodity exchanges as well as relevant agricultural news. *Instant Update* and *AgriStar* are designed for farmers and ranchers.

The Source and *CompuServe* offer the user several hundred features including electronic mail, national and world news and information, the latest business news and information, games and travel planning. *CompuServe* also offers electronic banking and shopping. *CompuServe* is available only at night and on weekends. *The Source* is available 24 hours a day and provides news and business information minutes after it becomes available to the press.

CompuServe and *The Source's* most important features for farmers and ranchers are their commodity news services. These services provide news and price activities of the commodity exchanges, weather information, agricultural, economic and political news. *Instant Update* offers news, prices and marketing information on commodities. *AgriStar* is the most comprehensive agricultural system offering decision aids, electronic mail and on-line assistance in addition to news, weather and prices.

These represent the services of only a few of the on-line service companies. The more comprehensive services charge a user subscription fee and a computer connect time fee in addition to the long distance phone call charge. *The Source* charges a one-time fee of $100 plus an hourly connect fee ranging from $5.75 to $25.75 depending on when you call. A minimum of $10 per month of connect time must be used. *CompuServe* charges $19.95 plus a use cost of $5.00 per hour. State university user fees range from free to $50 per month. *Instant Update* charges range from $110 to $160 per month. *AgriStar* charges a first six months fee of $199 plus connect time and information fees. After the first six months the fee will range from $75 to $110 per month. For all of these services you will need communications software and a modem. Remember to figure in these charges, too. Although many services are free, the more comprehensive and timely services do charge a fee.

In the future, marketing, banking and educational activities are likely to be handled directly from the farm and ranch office through the microcomputer. The rising costs of transportation may even mean that Extension Service education meetings will be held through the microcomputer. The use of a microcomputer for business applications, word processing, home security, education and entertainment is increasing. Today, approximately 5 percent of the farmers and ranchers have microcomputers. As they become less expensive and more applications become available, the majority of farmers and ranchers will probably use microcomputers in the home or through the state universities Cooperative Extension Services.

8.2 LIMITATIONS

Equally important to understanding the applications of microcomputers is the recognition of what they can't do. The most important limitation of any system is finding easy-to-use software. Agricultural software from private and state university sources has increased in the past two years. Finding and selecting the right software for your operation should be carefully thought out. Decide what you need, try out a number of packages and only then select the software that fits your situation.

Using a microcomputer adds a powerful tool for decision making. However, the computer and software are only tools and have no more intelligence than a lead pencil. You have to devote the time and effort to analyze what comes out of the computer in order to make sound decisions.

Running data through a computer does not make it perfectly reliable and error free. If the information you put into the computer is not reliable and error free, then the analysis you get out of the computer will not be reliable or accurate. Experienced computer users recognize the "GIGO" problem (Garbage In-Garbage Out) as being a serious problem in effective computer use.

User friendly software, such as Lotus 1-2-3 and SuperCalc electronic spreadsheets, help overcome the need for a producer to be a computer programmer. This software does not eliminate the need for using the right formulas in the right places to give a reliable solution to a problem. If you are going to create your own program, be sure that you know how to set up and solve the problem. Use the proper mathematical procedure (algorithm) and test the program by using a problem to which you know the answer.

Many problems require sophisticated mathematical procedures to solve them. The microcomputer can now use procedures that could only be solved on main-

frames in the past. A producer's knowledge of the procedure, information sufficiently accurate to use the procedure and ability to interpret the results now have become the major limitation in using these software packages.

If properly used, a computer can supplement a producer's experience, judgment and knowledge. The computer can not make the decision for you. The manager must still analyze the available information and take a course of action. The computer can only help lay out the alternatives and monitor progress towards a set goal.

A computer will not reduce the time spent in managing. In most situations, it will increase the time, but, it will also provide more sophisticated information to a producer. Time will be required for data entry. If your time to do data entry is limited, use the computer for decision analysis programs and let an accountant keep your records.

Microcomputer hardware and software will undergo technological change for some time. Farmers and ranchers should be used to this from seeing changes in farm and ranch machinery. A producer should evaluate the microcomputer and crop and livestock software on the basis of its potential to help him earn a profit. The key question should be whether it will pay for itself in your operation.

8.3 SOFTWARE SOURCES

Information on software for agricultural use is not always easy to find. *Doane Western* and *Successful Farmer* newsletters identify software sources and evaluate selected packages. Farm and ranch magazines carry stories on producers who use microcomputers, often listing the applications made and the specific software used. The people featured in the stories can be contacted to gain information about programs they are using.

Commercial software firms have recognized the importance of the agricultural market and are now listing agricultural programs in software catalogs. However, these catalogs often do not give very detailed descriptions of the programs.

Microcomputer hardware dealers in agricultural areas often have a selection of ag software on hand. By visiting and using the software they have available, you should be able to find out whether or not a particular package will fit your needs.

Finally, most state Cooperative Extension Services have software that they've developed or have information on where to find specific applications programs. Dr. Robert Strain of the University of Florida has compiled a publication that classifies and lists the computer software available from 30 land grant universities in the United States. This publication is available for a charge by writing to him at the University of Florida (Appendix E). State universities and private companies periodically hold computer education conferences. These conferences often invite commercial software vendors to participate by displaying their programs for the attending producers.

8.4 FINALLY

Measuring the profit in an investment in crop or livestock applications programs can present a problem. The cost of a computer program can be quickly estimated. The benefits are sometimes hard to see. The payoff comes in the ability to make better management decisions and make them more quickly than before. The net benefit also depends on how much the computer tool is used. Only by listing your needs, assessing how well you are currently handling those needs and how well their handling might be improved by a microcomputer can a producer estimate its potential profit in his operation.

A farmer of rancher should only acquire a microcomputer when the needed software can be acquired to make it a profitable investment and when he can devote enough time to effectively learn how to use it. Remember that the microcomputer is only a tool to help you become a more effective manager.

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Chapter 9

DAIRY APPLICATIONS

Microcomputer programs using electronic spread sheets, data base management systems and programming languages are numerous in dairy farming. Applications include herd production records, breeding histories, feed inventory, feed ration balancers, field and equipment records, accounting records and other records. Electronic identification now allows for individual cow identification. Individual production and feeding can now be electronically completed without operator assistance.

Two specialized dairy microcomputer applications are the Direct Access to Records by Telephone (DART) and the feed mix program currently being used by Texas Agricultural Extension Service dairy specialists. These two applications will be described in this section as examples of specific dairy applications.

9.1 DART

Direct Access to Records by Telephone (DART) is a program of "on-line" access to Dairy Herd Improvement (DHI) records offered by the Dairy Records Processing Center (DRPC) in Raleigh, N.C. Dairymen whose DHI records are processed at Raleigh can subscribe to DART as an optional service. Subscribers must use their on-farm computer terminal to communicate directly with DRPC's computer in Raleigh. A DART user inputs daily herd activity information including cows fresh, dried, sold, bred or in heat as well as the results of pregnancy checks, fresh

cow checks, group changes, heifer and herd health treatments. After these updates are made, up-to-the-minute management reports can be printed in the farm office. The printouts are tailor-made to each dairyman's individual specifications and can be altered easily at any time.

The DHI computer file for DART herds is maintained, processed and edited just as for any regular DHI herd. DART information takes the place of supervisor input previously done on the barnsheet. When processing the monthly test, DRPC procedures review and edit information from all sources to make the herd's file accurate, complete and up-to-date.

While the dairyman on DART inputs most of the daily status changes for his cows, the DHI Supervisor for official herds bears the responsibility for authenticating milk weights and cow identity, taking samples and checking out any discrepancies which surface on test day. Stand alone collection programs allow for milk weight entry in a milking parlor and transfer to another file for data correction and organization.

9.2 USING THE DART SYSTEM

The DART system has been designed to function in a menu driven self-explanatory manner. Using a wide area telecommunications services (WATS) line or individual private line, a producer establishes contact with the DRPC computer in Raleigh, North Carolina. After the user signs on, DART operates in a "user friendly" conversational manner between the on-farm computer terminal and DRPC computer. The user must respond to each question asked. The computer prompts a user to indicate the form of the reply desired for each question. The producer's herd is password protected for the security of the program.

DART consists of the following five major application programs:

INPUT COW/HEIFER HEALTH STATUS CHANGES
CREATION MANAGEMENT REPORTS
PRINT MANAGEMENT REPORTS
MILK WEIGHTS
SIRE SUMMARIES

Forms (PC-50, PC-50H) have been developed that correspond to sequencing of data input. Computer programs have also been written that allow for off-line entry of data to a disk. Once information is entered, the DART computer is called and the information is transferred at 300, 1200 or 2400 BAUD.

9.2.1 DART

To input status changes, breeding information and other information into the herd's DART file on-line, the farm computer operator must enter the number "1". The collection programs have these prompts built into their data set. The DRPC then prompts for one of the following:

```
F0 - CHANGE DATE REPORTING
F1 - COWS CALVING
F2 - COWS GOING DRY
F3 - COWS LEAVING THE HERD
F4 - COWS BRED
F5 - COWS IN HEAT
F6 - REPRODUCTIVE CULLS
F7 - COWS BRED BUT DIAGNOSED OPEN
F8 - COWS DIAGNOSED PREGNANT
F9 - CHANGE GROUP NUMBER
F10- PUT R IN RECHECK CODE
F11- PUT K IN RECHECK CODE
F12- BLANK OUT RECHECK CODE
F13- ZERO TEMP GRP NUM - ALL COWS
F14- EXCHANGE GRP NUM AND TEMP NUM-ALL COWS
F30- SET TITLE FOR USER DEFINED FIELDS
F31- SET VALUE FOR UDF 1
F32- SET VALUE FOR UDF 2
F33- SET VALUE FOR UDF 3
F34- SET VALUE FOR UDF 4
F35- SET VALUE FOR UDF 5
```

The FO command can be used to enter a date common to several events in the dairy operation. Functions F1 through F12 are used to enter status and breeding update information for individual cows. F13 and F14 are special functions used to regroup cows.

User Defined Fields (UDF) are set by the producer for the cow and heifer herds. Examples of user defined reports are:

1. Cow Classification Scores
2. Service Sire Mating Choices
3. Cow's Body Condition Score
4. Cow's Purchase Price or Value
5. Heifer Body Weight
6. Some other score or value you want to assign

The PC-52 form is designed for recording and entering health data on the cow herd. This information is entered using application "1" and functions 15, 16, 17 and 21. These applications are:

```
F15 - ENTER HEALTH DATA
F16 - CODE TO SICK HERD
F17 - REMOVE FROM SICK HERD
F18 - DELETE HEALTH DATA
```

Under F15, the "TREATED" column is coded "Y" if the cow was treated but not placed in the sick herd; "H" if the cow was treated and placed in the sick herd; and left blank when the cow was not treated. These health event entries can then be printed out for each individual animal using one of the management reports (application "3"). The computer operator can use health codes, days in the sick herd and cows currently in the sick herd to define which animals to list on a management report.

Each DART herd has a number of reports which have been created to fit the needs of the individual dairy operation. Additional reports can be created and

added to the menu. Existing reports can be altered, deleted or replaced at the convenience of the dairy operator.

Management reports can be created, changed or deleted by using option "2". The following options are available:

1 - CREATE NEW REPORT	5 - CHANGE REPORT NAME
2 - REPLACE REPORT	6 - CHANGE REPORT FORMAT
3 - DELETE REPORT	7 - CHANGE REPORT CONTROLS
4 - LIST REPORT SPEC.	8 - CHANGE REPORT ORDER

T - TRANSFER REPORT FROM THE MASTER LIST.

After selecting the desired option, the operator will be led through a list of questions to complete the report.

9.2.2 Heifer Program

Heifer records reported through the regular DHI program are not edited monthly like the milking herd. Therefore, considerable editing is required if a user elects to transfer heifer records from the DHI file to the DART file. It is often easier to enroll and let the DART file build as the heifer calves are born, without using the DHI records.

The procedures for inputing changes, creating reports, printing reports, etc., are similar to those used for cows. Function codes are also similar with the exception that the codes have an "H" as a suffix to designate heifer. The heifer functions are:

```
F1H-HEIFERS CALVING AND ENTERING MILK HERD
F3H-HEIFERS SOLD OR DRIED
F4H-HEIFERS BRED
F5H-HEIFERS IN HEAT
F7H-HEIFERS BRED BUT DIAGNOSED OPEN
F8H-HEIFERS DIAGNOSED PREGNANT
F9H-CHANGE HEIFER GROUP NUMBER
F10H-PUT R IN RECHECK CODE
F11H-PUT K IN RECHECK CODE
F12H-BLANK OUT RECHECK CODE
```

```
F15H-ENTER HEIFER REG. OR EARTAG # AND BARN NAME
F16H-ENTER PURCHASED HEIFERS
F17H-CHANGE HEIFER CONTROL NUMBERS
F18H-HEIFER MNGT ACTIONS (FORMAT 1)
F19H-HEIFER MNGT ACTONS (FORMAT 2)
F20H-HEIFER REMARKS CODES
F21H-DELETE HEIFER REMARKS OR MANAGEMENT ACTIONS
F31H-ENTER UDF 1
F32H-ENTER UDF 2
F33H-ENTER UDF 3
F34H-ENTER UDF 4
F35H-ENTER UDF 5
```

9.2.3 Sire Summary

The Sire Summary application provides to the producer access to the most recent, active USDA Sire Summary. This file has information on predicted differences for milk, fat and dollars. Predicted differences for type categories from the breed association type summaries; and calving ease scores from the National Association of Animal Breeders (NAAB) calving ease summary. Information from these sources is updated as soon as it becomes available to the DRPC.

A user can select specific bulls based on a set of 18 factors. Bulls are selected from all studs or a specified stud(s).

Participants in DART are assessed a normal DRPC processing fee of 12 cents per cow per month plus $10 per herd per month and a telephone connection rate. The connect rate is as follows:

TIME	RATE/HOUR
8 a.m. - 12 p.m. MONDAY - FRIDAY	$ 15
12 p.m.- 8 a.m. MONDAY - FRIDAY	$ 3
SAT. - SUN.	$ 3

WATS line rates are available ranging from $0.35 to $0.17 per minute.

9.3 DAIRY RATION ANALYSIS APPLICATION

The Texas Extension dairy specialists utilize the computer to prepare a dairy ration analysis of a dairyman's feeding program to determine the nutritional status of the dairy herd ration. These specialists make nutritional recommendations for dairymen utilizing computer formulated least cost or profit maximizing ration programs. An explanation follows of the least cost ration program which illustrates the type of information contained in the output. (Table 9.1 - 9.6).

An initial set of data must be put into the program. Along with your name and address, the program requires information on an operation's milk production, fat-percent, cow weight, return per 100 pounds of milk, net energy for activity and percent first and second lactation heifers (Table 9-1). The figures used are average values for your herd.

Table 9-2 shows the feeds used in the least cost ration available to an example dairy farm. Feeds used in Ration lists total roughages, total concentrates, and finally total complete ration. Feeds are listed in the order of greatest to least amount included in the ration.

Pounds per day, "As Fed", lists the number of pounds of each feed to be fed to each cow per day. The percent roughage figure, "As Fed", allows a dairyman to mix batch mixes by multiplying the percentage figure times the batch size. For

TABLE 9.1

LEAST COST DAIRY RATION SPECIFICATIONS, TEXAS DHIA, INC.

Texas A&M University Agricultural Research and Extension Center
Overton, Texas 75684
Max Sudweeks, Ph.D. : (214) 834-6191

TODAYS DATE YOUR NAME

AV. MILK PROD'N = 60 LBS	NE(L) FOR ACTIVITY..... = 10.00 %
AV. MILK FAT... = 3.50 %	1ST LACT. HEIFERS ..... = 22.40 %
AV. COW WEIGHT. = 1300 LBS	2ND LACT. HEIFERS ..... = 24.10 %

MILK BLEND PRICE ($/CWT)=$14.05

example, bermudagrass hay may be 25.2 percent. Multiplying .252 times 2000 would equal 504 pounds of bermudagrass mixed in a ton of ration. The same type calculation can be performed for each feed ingredient in the concentrate.

Percentage dry matter (DM) is the percent of the ration dry matter contributed by each feed ingredient. It is used to calculate the roughage to concentrate ratio.

Price is the costs ($/cwt) for each feed ingredient in the ration. The range in prices gives the lowest and the highest costs for a feed ingredient that the computer will allow before the ration composition must be changed. The higher the price of a feed ingredient, the more likely a less expensive substitute will be used in the ration.

Minimum and maximum nutrient, roughage and energy constraints are placed in the computer to assure a ratio that will supply the necessary ingredients for your herd of cattle. The total ration analysis shows the total pounds of feed per cow per day on an as fed and dry matter basis.

The final information in Table 9-2 is the roughage to concentrate ratio. Cows require enough grain to maintain high milk production. However, if the concentrate portion of the ration gets higher than about 60 percent, digestive tract disorders may occur.

TABLE 9.2

LEAST COST FEEDS USED IN THE RATION

FEEDS IN RATION	LB/DAY AS FED	%ROUGHAGE AS FED	%ROUGHAGE DM	PRICE $/CWT	RANGE LOWER	RANGE UPPER	POUNDS MIN	POUNDS MAX
WINTER GRAZE	65.00	84.9	55.3	.35	-99.99	.94		65.0
CSTL HAY 8.0%	11.52	15.1	44.7	2.75	-.50			
TOTAL ROUGHAGE	76.52	(23.49 LBS DM)						

FEEDS IN CONC.	LB/DAY AS FED	%CONCNTRT AS FED	%CONCNTRT DM	PRICE $/CWT	$ RANGE LOWER	$ RANGE UPPER
CORN, GRAIN	19.40	80.3	79.2	6.91	-17.01	11.33
CTTNSEED MEAL	3.13	13.0	13.5	9.88	7.65	10.55
CTTNSEED WHOLE	.77	3.2	3.3	14.00	10.20	21.95
LIMESTONE	.42	1.7	1.9	4.00	9.08	18.36
DAIRY MINERAL	.25	1.0	1.1	30.00	-11.02	999.99
SALT, TR MINERAL	.20	.8	.9	7.77	-9.19	9999.99

	LBS RANGE MIN	LBS RANGE MAX
CTTNSEED WHOLE		6.0
DAIRY MINERAL	.3	
SALT, TR MINERAL	.2	

TOTAL CONCENTRATE 24.17* (21.79 LBS DM)
TOTAL RATION.... 100.69* (49.28 LBS DM)

*NOTE: PROVIDE SALT FREE CHOICE OR AS 0.5% OF CONCENTRATE MIX.
PROVIDE OTHER ESSENTIAL MINERALS NOT SUPPLIED IN
ADEQUATE AMOUNTS BY FEEDS IN RATION LISTED ABOVE.
ROUGHAGE: CONCENTRATE RATION = 52:48

Least cost ration values are shown in Table 9-3. These costs are shown in dollars per cow per day for the roughage, concentrates and the total ration. Milk income is the price of milk times the quantity of milk produced per day per cow.

The return above feed costs represents the difference between feed costs and the value of milk produced.

TABLE 9.3

COSTS PER COW AND PER CWT OF FEED

	$/COW/DAY	$/CWT OF FEED
ROUGHAGES.....$	.54	.71
CONCENTRATES.....$	1.86	7.72
TOTAL RATION.....$	2.41	2.39
MILK INCOME.....$	8.43	8.37
INCOME ABOVE FEED COSTS.$	6.02	5.98

Additional information is contained in Table 9-4 which shows the nutrient analysis for concentrates, roughages and the total ration. Nutrients are listed as percentages, megacalories or megacalories per pound. Although they are not listed here, constraint levels are set to indicate the minimum and maximum levels of nutrients required to supply animal requirements. These maximum and minimum values are shown in the computerized output of a dairy operation.

Costs per CWT are listed in Table 9-5. These costs on an as fed and dry matter basis are shown for concentrates, roughages and the total ration.

Animal health and productivity is dependent upon them getting enough of the proper vitamins and minerals in a ration. Table 9-6 shows the estimated mineral analysis of the least cost ration suggested by the computer program. The estimat-

TABLE 9.4

LEAST COST RATION NUTRIENT ESTIMATES

ESTIMATED ANALYSIS: (100% DM)	CONCENTRATE	ROUGHAGE	TOTAL RATION
DRY MATTER PCT	90.17 %	30.69 %	44.97 %
NE (L) KCAL	.87 MCAL/LB	.46 MCAL/LB	.66 MCAL/LB
NE (L) KCAL	18.92 MCAL	10.86 MCAL	29.79 MCAL
ENE KCAL	844.07 KCAL/LB	415.16 KCAL/LB	621.58 KCAL/LB
TDN %	83.06 %	58.20 %	70.16 %
CRUDE PROTEIN %	14.79 %	15.20 %	15.00 %
CRUDE PROTEIN #	3.22 #	3.57 #	6.79 #
FAT %	4.41 %	2.75 %	3.55 %
CRUDE FIBER %	3.93 %	29.13 %	17.00 %
ACID DET FIBER %	6.03 %	34.34 %	20.71 %
ASH %	4.79 %	5.84 %	5.34 %
CALCIUM %	.86 %	.35 %	.60 %
CALCIUM #	.19 #	.08 #	.27 #
PHOSPHORUS %	.57 %	.24 %	.40 %
PHOSPHORUS #	.12 #	.06 #	.18 #
CA:PHOS RATIO	1.51	1.47	1.50
NONPROTEIN NIT %	0.00 %	0.00 %	0.00%

TABLE 9.5

RATION COSTS FOR CONCENTRATES, ROUGHAGES AND TOTAL ANALYSIS RATION.

	CONCENTRATE	ROUGHAGE	TOTAL RATION
COST/CWT AS FED	$ 7.72	$ .71	$ 2.39
COST/CWT DRY MATTER	$ 8.56	$ 2.32	$ 5.32

ed mineral analysis is shown for the concentrates, roughages and total ration. Macro-minerals are listed as percentages and micro-minerals as parts per million. By comparing the levels of minerals in the total ration with the National Research

Council's (NRC) mineral requirements, the adequacy of the ration can be determined.

TABLE 9.6

LEAST COST RATION ESTIMATED MINERAL ANALYSIS

MINERAL	CONCENTRATE	ROUGHAGE	TOTAL RATION	NRC MINIMUM
MAGNESIUM	.33 %	.11 %	.22 %	.20 %
POTASSIUM	.53 %	1.85 %	1.21 %	.80 %
SODIUM	.38 %	.06 %	.22 %	.18 %
SULFUR	.16 %	.19 %	.17 %	.20 %
IRON	128.55 PPM	257.19 PPM	195.28 PPM	50.00 PPM
COBALT	.26 PPM	.09 PPM	.17 PPM	.10 PPM
COPPER	18.16 PPM	4.83 PPM	11.25 PPM	10.00 PPM
MANGANESE	48.13 PPM	82.66 PPM	66.04 PPM	40.00 PPM
ZINC	52.06 PPM	22.86 PPM	36.91 PPM	40.00 PPM

Several other tables will be printed out in the computerized ration analysis such as "Feeds Not Used in the Ration", "Price at Formulation", and "Opportunity Prices". This information shows the feeds which were not included in the ration because the price per CWT at formulation was too high. The prices listed under opportunity prices are the cost per CWT at which various ingredients would be included in the ration. The price analysis for feed ingredients allows a person to do comparison shopping and to assess whether that cheaper feed is really a bargain.

Nutrient composition, mineral analysis and prices of feeds available for the analysis tables are also printed out with the least cost ration.

9.4 SUMMARY

Dairy farmers have been at the forefront in applying computers to their operations. As a result, a number of excellent software programs are available from commercial vendors. As with any computer program, if you are interested in a dairy application, shop around, look at several programs, try each of them, and only then, consider buying the one that best fits your needs.

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Chapter 10

MARKETING AND POLICY

The last few years have shown producers the importance of marketing decisions on the long-term financial success of the farm or ranch operation. During the 1950's and 1960's, commodity surpluses and government price support programs helped ensure the stability of farm prices. These factors also lessened the potential for erratic movements in livestock prices as ranchers adjusted to changing feed costs. In the 1970's, however, a more market oriented decade began.

Relatively high price supports and land retirement programs were replaced with a target price concept that resulted in farm prices being more responsive to domestic and worldwide supply/demand conditions. Exports were encouraged and the U.S. farmer became more dependent on a market not defined by the boundaries of the U.S. and its allies. As a result, farm prices became more volatile. Producers no longer had the option of just producing the crop and accepting the government supported price. Marketing became critical and the astute practitioner could reap significant benefits over the old "sell everything at harvest" philosophy.

As an example, if you analyze the price movements of grain sorghum in Central Texas from October 1982 through September 1983, you find that during this 1982/83 marketing period, cash prices ranged from a low of $3.50 per CWT to a high of $5.52 per CWT. This $2.02 per CWT difference would have returned $38,380 in additional gross revenue to the region's typical 500-acre sorghum farm.

Notice the emphasis on gross revenue, in that storage and holding costs would have been incurred past the harvest period. Nevertheless, the $2.02 per CWT was well above these added costs.

The point is that marketing becomes more complex with volatile price movements, and producers do not have the advantage of "hindsight" in developing their marketing plans. Returns to effective marketing can mean the difference between being in or out of business five years from now.

In this section, we want to discuss the potential role of microcomputers in assisting the producer to make more effective marketing decisions. Just like any other marketing tool, using a microcomputer will not guarantee that a farmer or rancher will receive the highest market price or generate the highest net returns each year. The microcomputer, however, can help a farmer or rancher to analyze the numerous marketing choices available at any one time and hopefully improve his marketing decisions and understanding of the marketing process.

10.1 MARKETING USES OF THE MICROCOMPUTER

Six areas in which a farm or ranch microcomputer can be used in marketing and policy include:

1. market planning and decision alternatives,
2. market information,
3. price analysis and forecasting,
4. policy evaluations and analysis,
5. direct electronic marketing and
6. market management information systems.

10.2 MARKET PLANNING AND DECISION ALTERNATIVES

Today's marketing decisions are complex. Many alternatives should be evaluated before production begins or pricing is finalized. A major difficulty in market planning is not knowing what the price will be at the time the commodity is available for sale or what the results of environmental factors affecting the production process will be.

A 100 percent accurate estimate of prices and yields is unlikely to be attained. However, every farmer and rancher has information about his marketing situation and production risk. Market planning and analysis is the systematic process of using that information to select the most desirable production and marketing action.

Three types of analyses are vital in developing a marketing plan. They are to:

1. Calculate projected production and marketing costs.
2. Evaluate expected benefits from each of the available marketing alternatives
3. Consider cash flow needs within the marketing program.

By using the futures market and forward contracting, the market period for a major crop can begin before the crop is planted and extend several months after harvest. If the microcomputer, using accounting software, aids in providing a better understanding of production cost levels, then that capability should also improve marketing skills. Knowing production costs is a natural first step in comparing marketing outcomes, to attain a profit. If a Texas livestock feeder knows how much is invested in his cattle, and from past records can accurately estimate the remaining production costs, he should be better able to evaluate the marketing alternatives, and decide which opportunity will yield the greatest return.

Most farmers and ranchers have several pricing combinations available to them for marketing their commodities. Add the need for accurate timing to the array of

marketing choices available throughout the year, and the comparison of the various alternatives can become quite time consuming. Decision aid software can assist in evaluating the timing and alternatives of storage versus sell, selecting the best market outlet, comparing contracting versus hedging and evaluating the new agricultural options. For example, "graze or grain" is a decision that wheat producers face each year. Cattlemen must decide whether to market feeder animals or carry them through the feedlot. With a pre-established marketing plan, decision-aid software can help the producer evaluate potential alternatives to best meet his planned objectives.

Historical basis information is important in analyzing some marketing alternatives. The microcomputer is useful in calculating a basis history for several locations. Analyzing these and other marketing activities are integral to formulating a successful marketing plan.

Various commercial software packages that address market planning and decision issues are available from local vendors. Furthermore, Cooperative Extension Services at many land grant universities, such as Texas A&M University, distribute software to address some of these marketing decisions.

10.3 MARKET INFORMATION

A key ingredient to market planning and decision analysis is market information. Acquiring market information is part of the marketing process. The news media provide a significant amount of market situation and outlook data. However, it is hard to use this information effectively because producers often are not making marketing decisions when the data is received and it comes with little or no analysis. The farm or ranch computer can aid in acquiring and storing market information from these sources for later evaluation and analysis that will support the decisions that must be made.

There are several roles the microcomputer can play in accessing and storing market data for a producer. One acquisition alternative is to access remote data bases using a telephone modem or some other electronic communications system. The microcomputer, operating as a dumb terminal, can receive reports generated for specified commodities, and then, operating as a computer, transfer the data to some secondary memory device to be retained as part of the microcomputer's data base. Time-sharing systems provide the capability to obtain printed market reports, acquire historical data or use a problem-solving decision aid. Information available in this manner includes futures prices from most of the commodity exchanges in the United States, reports by the U.S. Department of Agriculture (USDA) on crop status or inventories, national and international news affecting commodities, weather reports and other current commodity and financial information. Historical cash and future prices also are available for major commodities and markets. Depending on the database network and access, this information can be displayed, stored and printed. .

Test results indicate that farmers and ranchers want and need current market information. They want to know what happened that day. They want to check the prices and obtain important market related weather and crop report information including the latest USDA reports indicating supply, demand, carryover, acreage and yield forecasts.

Electronic data information and retrieval systems can be used to answer producer's questions and acquire market information. Examples of such services are AGNET, Agridata, Dialcom, Dialog, Compuserve, Telplan and Grassroots. Each service may provide somewhat different information; some are region specific; and some are hardware specific. Costs may vary. Consequently, each subscription service or data retrieval system must be reviewed with the farmer or rancher's op-

eration, marketing plans and needs in mind. Deciding which microcomputer time-sharing system to use will not be easy for the producer, but skilled marketers will probably use at least one system at some time.

10.4 PRICE ANALYSIS AND FORECASTING

Market information is essential to effective market planning and decision-making, but further analysis is often needed. This is particularly important in market timing. Farmers and ranchers decide each day (consciously or unconsciously) to accept or reject the prices offered from different sources. Therefore, many farmers and ranchers need to evaluate and analyze the market trends and movements on a regular basis. Both fundamental and technical price analysis are useful.

Fundamental price analysis focuses on supply and demand conditions, general economic conditions, government policies and transportation availability. Using the microcomputer to access situation reports rapidly aids the producer in gaining a better understanding of these fundamental factors and in evaluating the market plan. Further analysis is often necessary for effective projections. Microcomputer forecasting programs can be used to track changes in the commodity balance sheets and to project exports and other demand components. There are a few software programs available that use trend analysis to evaluate season average price alternatives. This type of analysis may be more useful for long-term planning than for day-to-day market comparisons.

The use of technical, or price movement analysis, is based on the premise that the behavior of futures prices contains valuable market information which can best be observed by a careful and extensive application of charting techniques. Bar charts and moving averages are the most frequently used technical analysis tools, but there are many others that are used in an attempt to identify market trends and turning points.

The microcomputer is well adapted for technical analysis. Historical data to support this analysis may be downloaded from market information time-sharing sources or may be purchased as part of a software package. The data can also be entered by a producer, but this is a time consuming process.

Graphics capability is essential to fully utilize the technical analysis tool. A visual display of the high, low and close of each contract month by day can be shown on the screen and printed out. This task must be done by hand if you do not have computer support.

Some software packages available for technical analysis are Chartmaster, Market Analyst and Chart Trader Plus. Successful use of this tool requires an understanding and interpretation of market movements on the part of the producer. The computer, however, can be of significant assistance by performing the iterative mechanics of charting and calculating large series of numbers very effectively. This makes the tool useful to agricultural producers who have limited time for management.

A producer can use fundamental and technical analysis as an aid to the proper timing of forward cash contracts, hedges or cash sales. It also helps in cash flow planning for the firm.

10.5 POLICY EVALUATION AND ANALYSIS

Over the past several years, farmers have been faced with decisions regarding farm program participation. These voluntary programs, without offsetting or cross-compliance, have opened the particiption decision to include individual crops and/or farms. The increased flexibility of the programs along with payment in kind (PIK) and advance diversion and deficiency payments, have increased the complexity of these financially important participation decisions for farmers.

The microcomputer offers a useful tool for analyzing farm program options and evaluating what will happen to the important variables of prices, costs, yields and deficiency payment levels under alternative decisions. Any decision that needs numerous sources or types of data reviewed repetitively and quickly is suited for computer analysis. State universities and private software vendors have developed and distributed electronic spreadsheet templates that outline the farm program decision process, along with the calculations necessary for assessing the impact of farm program participation for the individual crop/farm. (Spreadsheets are more specifically discussed in Chapter 11.) Given the variation among farms and financial situations, farmers have been encouraged to evaluate their own specific enterprises rather than follow the "community concensus" on whether to participate in farm programs or not. Using a microcomputer spreadsheet, the producer will be able to analyze participation versus non-participation decisions numerous times under many pricing, yield and acreage alternatives. It is another element of risk management that the computer can aid in effectively analyzing.

If producers use spreadsheet templates for policy analysis, they will need software that includes the latest program update. New government programs are announced each year and are often modified during the year. Therefore, these computer programs will have a shorter shelf life than most others that will be purchased for the software library. Producers who become experienced with spreadsheets may find it useful to construct their own policy decision spreadsheets from program analysis materials provided by state Cooperative Extension Services.

10.6 COMPUTERIZED MARKETING

To improve the market information transmission, data bases on mainframe computers can be used as electronic billboards to stimulate sales. For instance, a rancher needing hay can store a message in a data base that advertises the quality and quantity desired, and potential sellers can leave a response on file or contact the buyer directly.

More elaborate computerized marketing activities have been used. For example, in Texas TELCOT uses the host or mainframe computer as a terminal market for cotton. Buyers and sellers make offers until market clearing prices are determined. CATTLEX has applied the same technology to the livestock sector and exhibited its future use as a viable marketing alternative. Both CATTLEX and TELCOT have demonstrated successful direct electronic marketing. Fresh fruit and vegetable growers, shippers and horticultural plant producers are establishing similar computerized marketing efforts. The electronic market continues to improve marketing by exposing the producer's product to an expanding buying public. Improved market information results from the ability to summarize and report electronic market transactions. As the power of the microcomputer increases and the costs decrease, more of them will be used in direct computerized marketing efforts.

10.7 MARKET MANAGEMENT INFORMATION SYSTEM

An important step in improving marketing skills is to develop a system to monitor the performance of both the market and the producer. How good were your marketing decisions last year compared to other years? Compared to what other producers did? Compared to what was expected? Each comparison must be reviewed and the knowledge incorporated in future marketing decisions.

Maintaining a separate data base for market transactions, and comparing the results of past decisions to the alternatives that were available but not chosen, forces a critical evaluation of a farmer's or rancher's own marketing ability. Not every marketing decision will turn out to have been the best one. However, the insights gained from the evaluation process will only serve to improve future marketing performance. Microcomputers offer the technology not only to monitor the marketing decisions for this year's production, but also to provide an opportunity to look back and evaluate past marketing decisions efficiently. This is particularly important in analyzing previous basis and price estimates compared to actual outcomes. Another example use is to compare price movements in a short crop versus a large crop situation. A systematic method of compiling marketing management information on the microcomputer is essential for timely and effective use. A general data base management system software package is useful in this development.

10.8 CONCLUSION

Profitable marketing takes time and understanding. The microcomputer aids the farmer or rancher by assisting his understanding of the marketing process while saving him valuable time. Efficient marketing will no doubt be one of the major keys to farm survival. In the future, on-farm computer technology will become as important and commonplace on commercial operations as the tractor is. Without one there may be little need for the other.

Chapter 11

ELECTRONIC SPREADSHEETS

Electronic spreadsheets are some of the most popular and versatile software programs available for the microcomputer. Electronic spreadsheets are being used by farmers and ranchers to do basic record keeping, financial planning, decision analysis and many other applications. Their popularity is enhanced by the fact that they are easy to use, have a wide variety of applications and are, perhaps, the most cost effective software available to a farm or ranch manager.

A description of electronic spreadsheets and what they can do for a farm or ranch operation are presented in this section. In addition, the features of different brands of spreadsheets are compared.

11.1 WHAT IS AN ELECTRONIC SPREADSHEET

Electronic spreadsheets are basically blank computer screens that are to be used like a pad, pencil, eraser and calculator. However, unlike numbers written on a piece of paper, values set down on the electronic screen can be altered and re-tabulated with a couple of strokes of the computer keyboard. This feature of the electronic spreadsheet program makes it ideal for the construction of "templates" for budgeting, cash flow, simple accounting, family records and other uses that involve adding, subtracting, multiplying or dividing columns or rows of numbers.

A blank electronic spreadsheet screen is organized into rows and columns for the spreadsheet template builder's reference. Columns are displayed across the

top with rows down the left side of the screen (see Figure 11.1). Most electronic spreadsheets have 63 columns and 254 rows. Lotus 1-2-3 has 256 columns and 2048 rows. An intersection of a row and a column is called a *cell*. Specific cells are identified by their row and column coordinates. For example, cell "A1" would be column A and row 1.

Figure 11.1: A TYPICAL "EMPTY" ELECTRONIC SPREADSHEET

```
|   A   ||   B   ||   C   ||   D   ||   E   ||   F   ||   G   ||   H   |
 1|<      >
 2|
 3|
 4|
 5|
 6|
 7|
 8|
 9|
10|
11|
12|
13|
14|
15|
16|
17|
18|
19|
20|
>A1
 Width:  9  Memory: 93 Last Col/Row:A1     ? for HELP
 45>"                    GRAIN PRODUCTION BUDGET[]
```

The TV screen or CRT in front of you does not have 63 columns and 250 rows visible. What you see on your screen is a window. That window moves around to cover the full spreadsheet available to you. So rather than a sheet of paper, a

spreadsheet is like a 4 x 8 foot piece of plywood with a 12-inch window moving across the surface of it. The window moves by the use of a cursor which highlights with brackets (< >) or inverse video the cell in which you are working. Arrow keys, jump commands or scrolling commands move the cursor where you want it to go.

An electronic spreadsheet is separated into two sections. The first section is the location where you are constructing the template and the second is where text, numeric, and formula entry is taking place. The "Entry Line" is where information is typed before it is entered into a cell of the template. Some spreadsheets put the entry line at the top, while others put it at the bottom of the screen. Figure 11.1 shows the entry line for SuperCalc^2 at the bottom of the spreadsheet template. Below line 20, information is given on the location of the cursor (A1), size of the cell in Width (9), available Memory (93), the Last Cell used (A1) in constructing the template and cursor entry information (45>" GRAIN PRODUCTION BUDGET).

Text, numbers or formulas are placed in individual cells of the spreadsheet template by positioning the spreadsheet cursor in the cell, typing the information and by pressing the ENTER or RETURN key. Text, numbers and mathematical formulas are positioned into cells of an electronic spreadsheet to form an applications template. The method used to enter text, numbers and formulas differs among different brands of spreadsheets. Templates can be developed for almost any other application that involves adding, subtracting, multiplying or dividing rows or columns of numbers.

Text consists of labels such as REVENUES, SEED, $/UNIT, NET RETURNS, etc. as shown in rows 1, 2, 3 and 6 and columns A and C of Figure 11.2. Any label can be built into a spreadsheet template to make it understandable to the user.

Figure 11.2: EXAMPLE TEMPLATE OF A GRAIN PRODUCTION BUDGET

```
 |          A          ||   B   ||   C   ||   D   ||   E   |
 1|                  GRAIN PRODUCTION BUDGET
 2|=============================================================
 3|REVENUES                      QTY.      UNIT    $/UNIT    TOTAL
 4|  GRAIN SALES                   50      CWT.      3.00  $150.00
 5|
 6|EXPENSES                      QTY.      UNIT    $/UNIT    TOTAL
 7|  SEED                         15      LBS.       .06     $.90
 8|  CHEMICALS                   150      LBS.       .25    37.50
 9|  FUEL AND OIL                  1      ACRE     15.00    15.00
10|  REPAIRS                      1      ACRE     10.00    10.00
11|  HARVEST & HAUL              50      CWT.       .35    17.50
12|TOTAL VARIABLE COSTS                                    $80.90
13|TOTAL FIXED COSTS                                       55.81
14|  TOTAL COSTS                                          136.71
15|    NET RETURNS                                        $13.29
16|=============================================================
17|
18|
19|
20|
21|>E12  1     Form=SUM(E7:E11)
22|Width:  9  Memory: 92 Last Col/Row:e17    ? for HELP
23|1>
```

Formulas are used to calculate new values using numbers located in individual cells of the template. Formulas specify mathematical calculations and relationships. They consist of operands and operators combined in such a way as to produce a value. When entered into a cell, a formula becomes the cell's contents. Arithmetic operators are addition (+), subtraction (-), multiplication (*), division (/) and exponentiation (¢). The arithmetic operators are evaluated according to algebraic precedence. Parenthesis operators are used to redefine the precedence order of mathematical formulas.

Spreadsheet functions are like abbreviations of long and cumbersome formulas. Functions help the user perform common mathematical computations with a minimum of typing. Instead of typing E7+E8+E9+E10+E11, function SUM(E7:E11) can be used. Common arithmetic functions are built-in formulas for sum, average, variance, trig functions and net present value. Common logical functions are IF, AND, NOT and OR.

In Figure 11.3, a spreadsheet command has been used to display the formulas and the unformatted numbers of the same template shown in Figure 11.2. The formula for calculating total grain sales is located in cell E4. The formula B4*D4 uses the value located in cell B4 and multiplies it times the value located in cell D4. Using the current values, 50 units of grain times a price of $3 per unit results in total grain sales of $150.

The totals of individual expense items are calculated using the formulas located in column E of their respected rows. This calculation is performed by taking the value located in column B and multipling it by the value located in column D. The formula in cell B11 instructs the template to place the value located in cell B4 into cell B11, i.e. the quantity of grain sales equals the quantity which is harvested and hauled.

The formula in cell B12 uses the sum function to total the values in column E row 7 through row 11, which are the individual expense items.

Total Cost located in cell E14 is total variable cost plus total fixed costs, i.e. E12+E13. Net Returns in cell E15 is E4-E14, i.e. total grain sales minus total costs.

Once formulas have been placed into the template, it is easy to ask "what if" questions. If grain production drops to 40 units, what happens to net returns. When 40 is entered into cell B4 the spreadsheet program automatically recalculates the formulas located in cells B4, E4, E11, E12, E14 and E15. It may take a little

Figure 11.3: EXAMPLE TEMPLATE WITH FORMULAS AND UNFORMATTED NUMBERS

```
     |          A          ||    B    ||    C    ||    D    ||    E    |
   1|                    GRAIN PRODUCTION BUDGET
   2|=============================================================
   3|REVENUES                        QTY.      UNIT    $/UNIT    TOTAL
   4|  GRAIN SALES                   50        CWT. 3              B4*D4
   5|
   6|EXPENSES                        QTY.      UNIT    $/UNIT    TOTAL
   7|  SEED                         15        LBS.    .06       B7*D7
   8|  CHEMICALS                    150       LBS.    .25       B8*D8
   9|  FUEL AND OIL                 1         ACRE    15        B9*D9
  10|  REPAIRS                      1         ACRE    10        B10*D10
  11|  HARVEST & HAUL               B4        CWT.    .35       B11*D11
  12|TOTAL VARIABLE COSTS                                    <SUM(E7:E11)>
  13|TOTAL FIXED COSTS                                       55.81
  14|  TOTAL COSTS                                           E12+E13
  15|    NET RETURNS                                         E4-E14
  16|=============================================================
  17|
  18|
  19|
  >E12  1     Form=SUM(E7:E11)
  Width:  9  Memory: 92 Last Col/Row:E17    ? for HELP
  1>
```

time to develop a spreadsheet template, but once it is done it is a great time saver.

One of the major advantages of electronic spreadsheets is that the user does not have to be a computer programmer to construct a template. What it does require is an understanding of the spreadsheet and the commands used to put text, numbers and formulas in the template, an understanding of the problem that the user is trying to solve and a well-thought-out plan of action.

Spreadsheet commands are generally activated by pressing the slash (/) key which manipulates the template in various ways. For example, the format com-

mand is used to change the appearance of the contents of cells. By changing the format, cell contents can be made to appear in a variety of forms. In Figure 11.2 columns D and E, numbers are formatted with 2 decimal places. Additionally, some cells in column E are formatted to have a $ sign in front of them.

After the slash is typed, a menu of commands will appear either at the top or bottom of the screen depending upon the brand of spreadsheet. The user then selects which command is to be implemented. Most spreadsheet programs use the basic command structure pioneered by VisiCalc. Many competitive programs even use the same letters to stand for these commands. Spreadsheet commands can be used at every phase of building and using a template.

11.2 CONSTRUCTING A SPREADSHEET TEMPLATE

To develop the worksheet in Figure 11.2, text was typed into column A. When this was done it was discovered that column A was too narrow to accommodate the text without running over into column B. A slash command was used to increase the width of column A. Text was also typed into rows 1, 2 and 3 and into column C. Another slash command was used to right-justify the text in column C in order to separate the text from the numbers typed into column B. After the $/unit values were typed into column D the decimals were not aligned so a slash command was used to format column D with two decimal places. A formula was entered into cell E4 to calculate total grain sales as shown in Figure 11.3. A similar formula was entered into cell E7 to calculate total seed expenses. Next the formula in E7 was copied into cells E8 through E11 with a slash command that adjusted the formulas for their new location. The function for summation was used to total the individual expense items. Individual cells of column E were changed to include a dollar sign in front of certain numbers for the sake of appearance. Once

the spreadsheet had been developed it was saved to diskette and then a hard copy was printed.

A whole series of other commands is available to the user of a spreadsheet. Most of the other commands involve moving the cursor to different sections of the spreadsheet, modifying, copying or ending the spreadsheet program. Any spreadsheet you consider purchasing should have a manual that gives an easily understandable and complete explanation of these commands.

One final command worth mentioning and that is the HELP command. In most spreadsheet programs, a help guide is available as a quick reference to a command to see how it is written and what it does. The strength of a spreadsheet program is in the ability of the commands to do computer programming for you. As you become more familiar with the command features of your spreadsheet, you will be able to build more sophisticated templates, and build them more easily.

11.3 USES OF SPREADSHEETS

Templates have been constructed to do crop and livestock budgeting, cash flow analysis, amortization schedules, crop sales analysis, tax forms, balance sheets, simple accounting, recipe cost analysis, portfolio analysis, farm program participation decisions and 4-H record books, to name only a few. Although they have been used for word processing, spreadsheets are not as efficient in this application as commercial word processing packages. Spreadsheets may be used for accounting and data base applications; however, it is usually better to use a dedicated accounting or data base program for these applications. As with any tool, spreadsheet programs have their correct and incorrect applications.

11.4 SPREADSHEETS AVAILABLE

VisiCalc, SuperCalc, MultiPlan and Lotus 1-2-3 are the most popular electronic spreadsheet programs on the market today. However, they are by no means the only ones. A 1982 manual on VisiCalc and SuperCalc lists 38 different spreadsheets, ranging in cost from $50 to $2,000. The major differences in spreadsheets are in the commands available, rows and columns available and computer memory required. The most popular spreadsheets cost $200 to $500. Shopping in this price range should help you identify a spreadsheet that is adequate for most farm and ranch applications.

New generations of spreadsheets are being developed by building new functions into the old spreadsheets. SuperCalc^2, SuperCalc^3, Lotus Symphony and Lotus Jazz for the Apple Macintosh are now available. Existing spreadsheets will continue to be enhanced. The trend appears to be to integrate spreadsheet, data base management, graphics and word processing packages into a single software package. This will make the electronic spreadsheet even more versatile and useful for a farm or ranch application.

As with any software, the choice of the brand of spreadsheet should be based on your needs. The primary selection factors should be price, ease of use, commands and functions available, dealer support, dealer training sessions offered and compatibility with existing hardware. A potential purchaser should carefully weigh the advantages and disadvantages of spreadsheet ownership.

11.5 PURCHASED TEMPLATES

Many software companies have begun to market pre-packaged, ready-to-run spreadsheet templates. Depending upon which electronic spreadsheet program you have, there may be several hundred templates for sale, ranging in price from $10 to $500. With these templates most of the work has been done; you just change the values; all the text and formulas have already been placed in the template. The Texas Agricultural Extension Service has several Agricultural templates in SuperCalc and Lotus 1-2-3 formats available for purchase.

11.6 ADVANTAGES AND DISADVANTAGES

The major advantage of a spreadsheet is that it does not require that you be a computer programmer. However, it does require that you have a well-thought-out plan for a template and that you be familiar with the spreadsheet commands. Once you have constructed your template, you will have what amounts to a computer program that will be available to you for as long as you keep it stored on your diskette. You will be able to update that template and use it to do "what if" analysis. For example, "What will your net profit be if the grain sorghum price goes up to $7.00 per CWT?" Changing one value in a spreadsheet automatically changes the template totals. Tedious, repetitious recalculation becomes unnecessary through the use of the spreadsheet program.

The major disadvantage of a spreadsheet is that it is difficult to build in checks to make sure your answers are reasonable. In a written program, a range of reasonable responses can be built in to make sure that the user does not get too far astray. Generally, this is not the case with spreadsheet programs.

The new generation spreadsheets have the ability to transfer data between templates. This makes it unnecessary to input new data every time you build a

template. Lotus 1-2-3 and Context's MBA use an integration of a spreadsheet, data base management, and graphics package to transfer data from the data base to the spreadsheet templates. Multiplan allows a linking up and data sharing of up to eight separate templates.

Templates are spreadsheet specific. They are generally not directly transferable between different brands of spreadsheets and computers by swapping diskettes. Templates and formulas can, however, be printed out and used as guides for constructing identical templates on noncompatible machines. Several new software utility programs are being marketed which allow one to translate data files and templates from one spreadsheet file format to another.

11.7 FINALLY

Despite its shortcomings, an electronic spreadsheet package is perhaps one of the most versatile and useful programs a microcomputer user can own. Most users can start to build templates after only a few hours of hands-on experience. Taking advantage of the lessons that come with the spreadsheet package can make you a proficient user within a couple of weeks -- spreadsheet programs are that easy to use. Because of the simplicity of the spreadsheet concept many individuals will opt for a trial and error method of template construction. They should keep in mind that such an approach is likely to require a longer learning period; however, the user in this case may be less likely to forget what he has learned.

The versatility of the spreadsheet allows a user to construct almost any template desired. Only the size limit of the package and the imagination of the builder can limit its application to a problem. This makes it a software program that no user can afford to ignore.

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Chapter 12

DATABASE MANAGEMENT SYSTEMS

If you have visited a computer store, talked with anyone interested in using computers, or participated in any kind of training or educational program on computers, you have probably heard people refer to Data Base Management Systems (DMBS). What is a DBMS? What can they do for you? How does a DBMS work? Should you consider buying one for your computer? These are questions most people ask when they encounter the term DBMS. The purpose of this section is to help you answer some of these questions.

12.1 DATABASE: A DEFINITION

A database is something all of us are familiar with and use in our daily life. It is nothing more than a collection of information (or data, if you like) organized to serve a specific purpose.

One common example of a database is the telephone directory. This database, which is normally in printed form, contains the names, addresses and telephone number of everyone in the local service area. The key that makes the telephone useful is the fact that the names, addresses and numbers are related to one another. An address or number is of little use by itself, but when it is related to the specific name of an individual, business or agency, the database becomes useful to locate or call someone. This is possible only because of the specific way in which the database is organized.

You can probably think of many databases that you are familiar with and use on a daily basis. Some of the more common ones are a dictionary, the Sears-Roebuck catalog, a library card catalog, The Wall Street Journal stockmarket report and the box score for a baseball game.

What sets these example databases apart from the kind of information contained in a general newspaper article or a book is the way in which the information is organized. In all of our database examples, the information is set out in a specific way to make it easy to understand and use. You do not have to search through a mass of information to find a specific piece. The method of organization of the database allows you to find the information quickly with a minimum of frustration. The organization uses some key to relate items to one another.

The easiest way to think of a database is in terms of a table with specific column headings. The column headings result in the useful organization of the information in the database.

Some examples of column headings for common databases might be:

EXAMPLES:	*COLUMN HEADINGS*		
Phone Book	Name	Address	Phone Number
Dictionary	Word	Definition	
Catalog	Item Size	Description Cost	Weight Part No.
Stock Report	Stock	Shares Traded	High/Low

12.2 DATABASE MANAGEMENT SYSTEMS

One of the powers of the computer is its ability to store, keep track of, sort and retrieve information (data). Therefore, if someone can give specific instructions to the computer about how some information or data should be organized, it should be helpful in putting together (organizing) your databases. A computerized DBMS is simply using a computer to help you organize your information in a specific way for easy retrieval. The computer will not do anything you can not do by hand but it can help you do it faster and easier.

As a result of this potential use of the microcomputer, there have been a number of DBMS's developed to help the computer user develop specific database application. Some of the common programs available are: dBASE II, TIM (Total Information Management), Sensible Solution, Perfect Filer, Visi File, Friday, Infostar and Probase. All of these programs are different, but they have one thing in common. The object of each is to help you organize your information, put it on the computer, easily manipulate and retrieve it. That is their only function. There is no magic involved, even though it may seem like it when you see some of the things a well thought out and designed computerized database management system application can do for you.

12.3 COMMON APPLICATIONS

Some of the more common applications of a DBMS involve:

Invoice Preparation

Inventory Maintenance Records

Payroll Management

Customer Lists

Personnel Files

These are just a few of the applications that have been developed. In addition to the potential uses mentioned, farmers and ranchers have the opportunity to adapt many of their existing record-keeping systems to the microcomputer using a DBMS. These might involve field crop production, livestock, any cost of production or machinery maintenance records. Just about any farm or ranch business records you currently keep can be computerized using a DBMS. If a good DBMS application program is available, you should be able to keep up with information (data) you always wanted and/or needed on a timely basis.

Some examples of the kind of information you may be able to maintain using a database management system are the amount and analysis of fertilizer applied to a particular field over the past 3, 5, or 7 years; the weaning weights of a specific cow's calves over the past 2, 4, or 6 years; the herbicide program followed on a piece of ground over the past 5 years; and oil changes or major overhauls done on the 145 hp tractor over the past years.

Can you think of a number of similar applications with which a good computerized record-keeping system might help you? If so, then a DBMS is probably worth looking into for your computer system.

12.4 GENERAL TYPES OF DATABASE MANAGEMENT SYSTEMS

If you feel that a DBMS might be useful and start shopping for one, you will find several types. These are file-management system, relational, hierarchical and network.

A *file-management system* enables the user to access and update a file containing data records, which are made up of predefined fields. A field would store a particular type of data such as a name, or a social security number. Related fields such as "John Doe"' and "451-35-9400" make up the data record. A file is com-

prised of a group of records. The file-management system is one of the simplest type of databases. One of the limitations of the file-management system is that it allows access to one data file, but it will not allow information in one file to be combined with information in another file.

A *relational database* is similar to the file-management system in that it is also made up of fields and records. The difference between the two is that a relational database allows the user to combine records from four different files as long as both files contain a common field. A relational database is, as the name implies, records containing related data items. An advantage of a relational system is that access to information is not restricted to one record or file. Records can be combined as you need them. However, combining the desired information can be costly in terms of speed. It might take some time to search the database, combine the data and report the results.

Rather than using a common field to establish a relationship as the relational database, the *hierarchical database* allows the users to define relationships between files at the start. The identifying characteristic of this system is the one to many connection between the owner and member files. One owner or parent file can have many member or sibling files, but a member file can have only one owner. The network database is probably the most powerful of the database management systems. This allows the user to define relationships between data elements however they may fit into a particular application, creating subsets of the overall database. These subsets are called schemas or subschemas. The schemas enable the user to define different ways to look at the same data. This greatly increases the power of the database and minimizes data duplication.

The type of DBMS which you buy and use will depend completely on your application needs. Because of the simplicity offered by the file management and relational databases we will limit our discussions to these systems.

12.5 HOW DATABASE MANAGEMENT SYSTEMS OPERATE

The specific way any DBMS functions can be classified as key word, programmable or menu driven.

The *key word* system simply stores, manipulates and retrieves information based on reference to key words entered and the relationships established between them as they are entered into the database. All information stored in the database must be related to a specified key word. In general, these systems are fairly limited in their application.

The most powerful DBMS's are those that are programmable. They give the user the ability to do just about anything with the database information. A *programmable system* allows the operator to use a data base programming language. This makes it very powerful but at the same time difficult to use. One almost has to be a computer programmer to use a programmable DBMS effectively.

In response to the apparent void that existed between the simplicity of the key word system and the power and complexity of the programmable system, a new type of DBMS has been developed. It is the *menu driven system,* which makes most of the power of the programmable system available to the typical (non-programmer) small computer user.

Menu driven means that all of the database design work that tells the computer how to store, manipulate and retrieve information is done by responding to questions or command options displayed on the screen "menu style". This helps to make the DBMS user-friendly. It may not be as powerful as a programmable system, but you do not need to be a programmer to use a menu driven system effectively.

If you are shopping for a DBMS, the general rule to follow is that the more powerful a DBMS is, the more difficult it is to use. As always, you must let your

potential application needs determine the type of system you buy. You should realize that if your application requires a powerful, programmable system, you may have to hire someone to write a custom application package using an appropriately powerful DBMS. If the power of a programmable system is not required, then the menu driven or key word system may work very well for you and you should be able to design the application yourself.

12.6 DATABASE TERMS TO KNOW

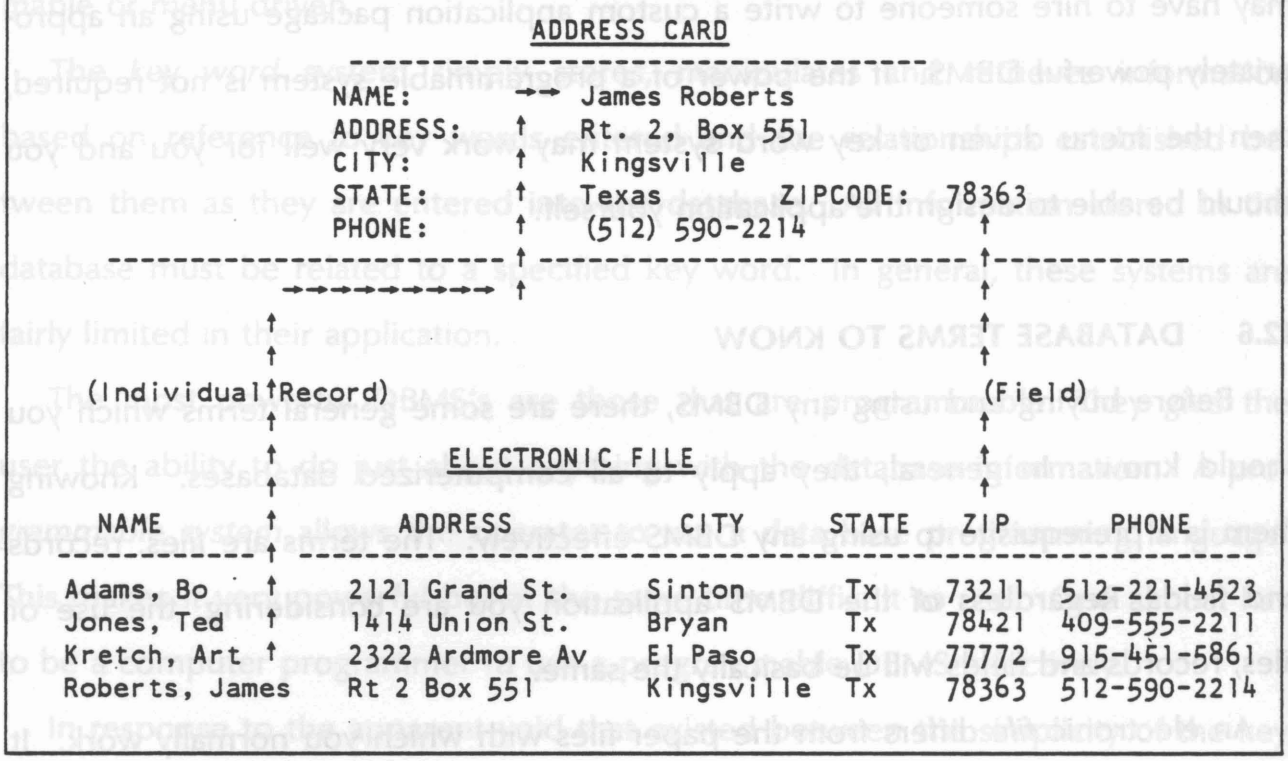
Before buying and using any DBMS, there are some general terms which you should know. In general, they apply to all computerized databases. Knowing them is a prerequisite to using any DBMS effectively. The terms are files, records and fields. Regardless of the DBMS application you are considering, the use of files, records and fields will be basically the same.

An electronic *file* differs from the paper files with which you normally work. It is simply the place where your computer system stores all the information in a specific database.

An example file is your address book. If you entered all of your information from your book into a computerized DBMS, it probably would be organized into a table with columns that identified the information. An example of such a table is shown in Figure 12-1 which compares a typical address index card file and a corresponding electronic address file.

Look at Figure 12-1. You can see how the address database is organized on the computer. Each line in the address file is referred to as a *record.* Basically, a record is a grouping of information that goes together. In the example, all information pertaining to James Roberts would be contained in Roberts' record within your address file.

Figure 12.1: ADDRESS FILE EXAMPLE



Each record in your address file is divided into *fields*. A field is the amount of space allocated to a specific piece of information in your database. Each record in the address file is divided into six fields (name, address, city, state, zip code, and phone number), which correspond to the table headings in the electronic file (Figure 12-1).

This type of organization allows the computer to store, manipulate and retrieve your information effectively and efficiently. It adds "structure" to the information so that the computer can help you manage it.

12.7 PLANNING PREVENTS PROBLEMS

To use any database management system effectively, you must carefully plan your application. The easiest way to attack designing your application is to decide exactly what you want your final output to look like. If you think in terms of a table of information from your database, what will be in that table (or series of tables)? Once you have this firmly in mind, this will determine what data (information) you will need to enter into the database and how it will be manipulated once it is entered.

You must have your output table well specified. This determines not only the exact fields that will be in each record in your database file, but it also acts to define the exact size of each field in the records.

You may have limitations as you establish your database structure. Among these limitations may be something as simple as the size of the printed page. If you are designing a report in table form and it is to fit on a normal page using a standard printer, then you are limited to 80 characters of print across the page. Depending on the number of fields from each record you want to print on the same report and the size of each field, you may not be able to get everything on the page. This may force you to compromise in terms of what you want and what it must look like when it comes from the computer. This page print limitation is only one example of possible compromises. The easiest way to minimize both the compromises and the frustration is to plan your application before you begin working on the computer.

Once you have decided on your final output, then proceed by deciding what information must be obtained and entered into your database. Proper planning of your application before you approach the computer will minimize both user frustration and the time involved in getting your computerized database management system up and running.

12.8 HARDWARE CONSIDERATIONS

Before you buy a DBMS, you may want to consider the ability of your microcomputer to use the DBMS you are going to purchase effectively. Almost any typical business oriented small computer can run a database system. However, if your plans include a database that will contain large volumes of information or if you will be using your database application quite often you will require a minimum of two floppy disk drives with 400-600K of storage space each. Most other parts of a typical microcomputer will accommodate a DBMS. The dual floppy disk system is required to provide the necessary storage space and operating speed to use a DBMS effectively.

In many applications you may find a hard disk useful or even necessary. If you are maintaining inventory records, large mailing lists or entering large volumes of data, you will need a hard disk. However, if your application will not involve a great deal of data, a floppy disk system should be sufficient.

12.9 SUMMARY

A database management system may prove useful to you if you will be using your computer system to keep various records. If you are interested in a DBMS, be sure to shop around, look at a variety and select one that will best meet your needs. There is no need to buy the most powerful system available if you cannot use it effectively. Get one you can use to your best advantage.

An invaluable aid in learning to use a DBMS, or any other piece of computer hardware or software, is someone who knows how to use it. If you have a friend, neighbor or relative who is familar with the system you are learning to use, talk to them. They have been down the same road you are about to travel and should be able to help you. They can show you how to avoid many pitfalls and help you begin with a minimum of time, trouble and frustration.

Chapter 13

PROGRAMMING YOUR OWN COMPUTER

Computers do not have awareness or understanding. They are only machines that translate, interpret and compile information into coded information called *computer languages.* A computer program is a set of instructions, written in a computer language, organized logically with sufficient instruction and used to address and solve a problem. A completed computer program with enough user instructions to operate the program successfully is called *software.* Programs for microcomputers are commonly written in Beginner's All-purpose Symbolic Instruction Code (BASIC). The programing language commands common to most versions of BASIC are listed here and will allow a user to put together simple computer programs on several different brands of microcomputers.

There are many different computer languages, running from low-level machine languages to high-level languages, like Fortran and BASIC. Regardless of the language, the way in which the computer interprets and translates a language is ultimately the same. The computer translates electronic on-off switch settings called bits into letters, numbers or symbols. In an 8-bit machine, eight different configurations of on-off switch settings generally stand for a letter, number or a symbol. Eight bits equals a byte in computer talk. Each byte is a letter, number or symbol.

This mechanical process of converting electronic states (on-off) into letters and numbers made possible the development of computer languages. Each language is characterized by its own logical and concise vocabulary. The process of learn-

ing a computer language, writing the language logically and addressing each step in the logic of a problem you wish to solve is called computer programming.

The most commonly used microcomputer programming language is BASIC. Although BASIC runs on almost all machines, minor variations have been built into the language by computer manufacturers. The result has been that different versions of BASIC have evolved. We now have AppleSoft BASIC, C-BASIC, MicroSoft BASIC and others. Without modification, these different versions will not run on all machines.

13.1 PROBLEM SOLVING THROUGH PROGRAMMING

All computer programming begins with identifying a problem that can be solved effectively using a microcomputer. If no problem exists, or, if a problem can be solved more effectively using a simpler method, a computerized solution may not be necessary.

Having identified a problem, seven steps are necessary to successful programming. They are:

1. Formulate the problem mathematically.
2. Develop a flow chart.
3. Follow through the flow chart with a simple problem.
4. Code the program using a computer language (BASIC).
5. Enter the program in the computer.
6. Test the program with a problem you know the answer to.
7. Document the program with written instruction.

Computers work best on problems that involve mathematical formulas or that can be solved using a mathematically logical structure. They work by the programmers giving a logical structure to the problem using BASIC programming

commands. Listed below are BASIC programming commands common to most microcomputers.

PROGRAMMING COMMANDS IN BASIC

STATEMENT	MEANING
REM	Remark - Identify and describe a program.
PRINT	Print to screen, printer, disk.
INPUT	Solicit value for a variable.
DATA-READ	Used to put data in a computer.
RESTORE	Resets a data set for reuse.
FOR-NEXT	Looping capability.
GOTO	Transfers program to an executable statement.
GOSUB-RETURN	Transfers program to a subroutine and returns.
IF-THEN-ELSE	Decision criteria in a program.
DIM	Sets up a matrix.
END or STOP	End of program execution.

Computers will manipulate numeric data (1,2,3,etc.) or alphanumeric data (Joe Blow, Tractor, Debit, March, etc.). Programs can be written to solve mathematical problems such as 1 + 1 = 2. They can also be written to solve logical problems such as rank ordering milk cows from most productive to least productive, alphabetizing a list of names and recalling the phone numbers of a certain area code from a list of numbers.

Computerized formulas are listed backwards from the way we are used to seeing them in math books. Mathematically we are used to seeing 5/9(F - 32) = C. In programming this becomes C = 5/9(F - 32). This must be done to accomodate the way the computer addresses C as being the logical outcome of 5/9(F - 32).

In programming, formulas are solved one step at a time by evaluating each operation indicated according to a set mathematical hierarchy. This hierarchy solves expressions in parentheses and exponents associated with values in parentheses first, then exponents, multiplication and division, addition and subtraction, relational operators, NOT, AND and finally OR. Relational operators are greater than, less than and equal to signs. The commands NOT, AND and OR are logical operators. For example, IF A AND B are greater than 5, THEN execute line 100. In the shorthand notation of BASIC programming:

```
10 INPUT "What value is assigned to machinery width";A
20 INPUT "What value is assigned to field speed";B
30 IF A AND B > 50 THEN 60
40 D = A * B * .121
50 PRINT "Your acres per hour for plowing are";D
60 PRINT "Your parameters are too large for your tractor."
70 END
```

This is an example of the way a computer program is put together. In BASIC programming, each line of code must have a line number and the lines must be numerically ordered. By convention, the lines are numbered by tens to facilitate inserting logical steps you've forgotten.

Flowcharting is a method of graphically laying out the logic of a computer program. There are different schools of thought on flowcharting. One considers flowcharting an unnecessary waste of effort; the other states that a programmer should always flowchart. Flowcharting can help the beginning programmer. As your skills develop, you may find it more efficient for to write the program without flowcharting. An example of a program designed to convert Fahrenheit temperature to Centigrade temperature would be flowcharted as shown in Figure 13.1.

Without a doubt, the most important part of programming is to lay out the program logic with a simple problem. This point can be illustrated using the temperature conversion problem. Use the right formula.

1. C = 5/9(F - 32)

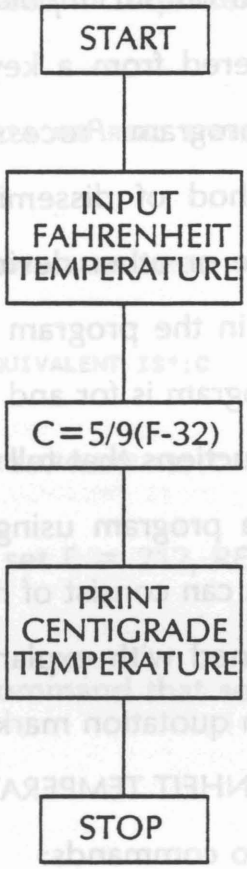
Lay out each logical step.

2. Substitute a value for F in the program: F = 212.

Track the logic to its conclusion.

3. C = 5/9(212 - 32)
4. C = 5/9(180)
5. C = 100

Figure 13.1: Flow Charting Fahrenheit to Centigrade Conversion



Water boils at 212 degrees Fahrenheit and 100 degrees Centigrade. Coding this into BASIC:

```
10 REM THIS PROGRAM CONVERTS FAHRENHEIT TEMPERATURE INTO
20 REM CENTIGRADE TEMPERATURE.
30 PRINT "WHAT FAHRENHEIT TEMPERATURE WILL BE CONVERTED"
40 INPUT F
50 C = (5/9)*(F - 32)
60 PRINT "THE CENTIGRADE EQUIVALENT TEMPERATURE IS";C
70 END
```

13.2 USING PROGRAMMING COMMANDS

A computer program is an oriented list of instructions for a computer to carry out. It consists of input, process and output. *Input* refers to how data is brought into the program. Data may be entered from a keyboard, disk drive, peripheral device or data statement within the program. *Process* refers to the manipulation of the input data. *Output* is the method of disseminating the manipulated data through a monitor, printer, disk drive or other device. *Documentation* is the process of putting sufficient instruction in the program and in written manuals to allow users to understand what the program is for and how to use it effectively.

Programming commands are instructions that tell the machine to do something for you. Information is input into a program using INPUT and DATA - READ - RESTORE commands. Computer data can consist of numbers or text (strings).

INPUT commands may be combined with explanations of what data is being input by enclosing the explanations in quotation marks. For illustration:

```
10 INPUT "WHAT IS THE FAHRENHEIT TEMPERATURE";F
```

Alternatively this could be done in two commands:

```
10 PRINT "WHAT IS THE FAHRENHEIT TEMPERATURE";
20 INPUT F
```

Numeric data is input specified as a variable using the letters of the alphabet. A, B, C, etc. variables are used for the input of 1, 2, 3, 15, 75, 25.75, 1432.01456, etc. Text, such as names and addresses, can be input in a program using letters of the alphabet followed by a $. Text is input using *string variable names* such as A$, B$, DOG$, etc. An example of string variable use is:

```
70 INPUT "DO YOU WANT TO CALCULATE ANOTHER TEMPERATURE";F$
80 IF F$ = "YES" THEN 10
```

Integer variables, in some versions of BASIC, can be specified by using a letter of the alphabet followed by a % such as A%, B%, CAT%, etc.

DATA commands, along with READ commands are used to input and use large amounts of data in a program. Use of these commands are best illustrated with the example of posting cost and income items to a ledger program. Using the temperature example:

```
10 REM THIS PROGRAM USES DATA AND READ STATEMENTS
20 DATA 212, 32, 0,
30 READ F
40 C = (5/9)*(F - 32)
50 PRINT "THE CENTIGRADE EQUIVALENT IS";C
60 READ G
70 C = (5/9)*(G - 32)
80 PRINT "THE CENTIGRADE EQUIVALENT IS";C
90 READ H
100 C = (5/9)*(H - 32)
110 PRINT "THE CENTIGRADE EQUIVALENT IS";C
120 END
```

The READ F command will set F = 212, READ G sets G = 32 and READ H sets H = 0.

RESTORE is a specialized command that sets the data reading command to the beginning of the data file.

```
10 DATA 212, 0, 32
20 READ F, G, H
30 C = (5/9)*(F - 32)
40 PRINT "TEMPERATURE CONVERSION 1 IS";C
50 D = (5/9)*(G - 32)
60 PRINT "TEMPERATURE CONVERSION 2 IS";D
70 E = (5/9)*(H - 32)
80 PRINT "TEMPERATURE CONVERSION 3 IS";E
90 RESTORE
100 READ I, J, K
110 A = I * 2
120 PRINT "THE FAHRENHEIT TEMPERATURE TWICE THE"
130 PRINT "BOILING POINT OF WATER IS";A
140 PRINT "THE CENTIGRADE EQUIVALENT FOR ";J;" DEGREES"
150 PRINT "FAHRENHEIT IS";D
160 B = K * 3
170 PRINT "THE FAHRENHEIT TEMPERATURE THREE TIMES THE"
180 PRINT "FREEZING POINT OF WATER IS";B
190 END
```

More efficient programs can be built using looping commands. Looping commands are used to repeat a section of calculations a number of times. The common looping commands are:

1. FOR - NEXT
2. GOSUB - RETURN
3. GOTO

The best illustration of the use of these commands is by our temperature conversion example. A FOR - NEXT loop with the conversion formula imbedded in it will convert several Fahrenheit temperatures to Centigrade.

```
10 REM THIS PROGRAM WILL CONVERT 5 FAHRENHEIT TEMPERATURES
20 REM TO CENTIGRADE TEMPERATURE.
30 FOR I = 1 TO 5
40 INPUT "WHAT IS THE FAHRENHEIT TEMPERATURE";F
50 C = (5/9)*(F - 32)
60 PRINT "THE CENTIGRADE EQUIVALENT IS";C
70 NEXT I
80 END
```

The program logic starts at line 10. At line 30 the FOR command sets the value of I to 1. The program calls for an input value of F at line 40, calculates the value of C at line 50, and prints the equivalent value for F at line 60. When the program hits line 70, it sends the logic of the program back to line 30. At line 30 the value of I become 2. The program calculates and prints another value for the Centigrade equivalent. The process will be repeated 5 times. Each time, the program will loop from line 70 back to line 30. This is the concept and use of loops.

Another type of looping command is the GOSUB - RETURN. This command sends the program calculation to a subroutine at the line number specified. It works like this:

```
30 FOR I = 1 TO 5
40 GOSUB 500
50 NEXT I
60 END
500 INPUT "WHAT IS THE FAHRENHEIT TEMPERATURE";F
510 C = (5/9)*(F - 32)
520 PRINT "THE CENTIGRADE EQUIVALENT IS";C
530 RETURN
```

Subroutines (GOSUB - RETURN) are specialized looping commands that are used when a section of code will be used more than once in different parts of a program. We could insert line 100 GOSUB 500. The program command would be transferred to line 500 from 100. When program command hits line 530, control is transferred back to the line immediately after the GOSUB command. In our example it would be line 50.

GOTO commands are used to transfer execution of a program to a specified line number. Continuing with the example:

```
10 FOR I = 1 TO 5
20 INPUT "WHAT IS THE FAHRENHEIT TEMPERATURE";F
30 C = (5/9)*(F - 32)
40 PRINT "THE CENTIGRADE EQUIVALENT IS";C
50 NEXT I
100 GOTO 10
```

With the GOTO command, the program will calculate 5 temperature conversions, then transfer from line 100 to line 10 and calculate 5 more. If no other commands are inserted, an infinite loop of calculations will result.

IF - THEN commands are used to make comparisons and to direct the execution of the program based on the results of this comparison.

```
10 FOR I = 1 TO 5
20 INPUT "WHAT IS THE FAHRENHEIT TEMPERATURE";F
30 C = (5/9)*(F - 32)
40 PRINT "THE CENTIGRADE EQUIVALENT IS";C
53 NEXT I
60 INPUT "DO YOU WANT TO REPEAT THE PROGRAM";D$
70 IF D$ = "NO" THEN 110
100 GOTO 10
110 END
```

The IF - THEN statement in line 70 helps to avoid an infinite looping problem. Another example of the use of IF-THEN is:

```
41 IF C = 0 THEN 48
42 IF C = 100 THEN 45
44 GOTO 53
45 PRINT "THIS CENTIGRADE TEMPERATURE IS THE BOILING"
46 PRINT "POINT OF WATER."
47 GOTO 53
48 PRINT "THIS CENTIGRADE TEMPERATURE IS THE FREEZING"
49 PRINT "POINT OF WATER."
```

We could also add the commands:

```
43 IF C > 0 AND C < 100 THEN 51
50 GOTO 53
51 PRINT "THIS TEMPERATURE IS BETWEEN THE FREEZING AND THE"
52 PRINT "BOILING POINT OF WATER."
53 END
```

Three commands have been used in our examples which have not been discussed. They are REM, PRINT and END.

REM is a command used to put descriptions, names, directions and comments into a program. This command is important to the total documentation, or written explanation, of what the program consists of and how to use it. REM statements are not executed in a program nor are they printed on a display device when using the program.

PRINT commands are used to display information on a screen or on a printer. Some versions of BASIC use the command PRINT to display information on the video display and LPRINT or LPRINTER to display information on a printer. A special version of the PRINT command, PRINT USING, allows a programmer to specify the format of the information to be printed. PRINT USING is important when rounding to a few decimal places is necessary, such as in the calculation of the value of pi.

Every BASIC program must end with an END statement. Program execution will terminate when this statement is read by the computer.

13.3 ARRAYS

ARRAYS set up a matrix that can be used to simplify data entry and retrieval. They are primarily used for lists or tables of numeric or string values. The use of arrays can be illustrated by the following string variable data.

NAME	ADDRESS	CITY	STATE	ZIP
Joe Smith	2121 Box St.	Dallas	Tx.	72101
Mike Jones	Rt. 5	Del Rio	Tx.	78840
Art Smart	811 Adams	Victoria	Tx.	77777

Rather than assign a variable name to each item in this data, an array can be used to simplify the naming and printing data process. Name becomes NAME$(A) rather than NAMEA$, NAMEB$ and NAMEC$. Similarly Address can be called variable ADDRESS$(A); City becomes CITY$(A); State becomes STATE$(A) and Zip Code becomes ZIP$(A). Only 5 variables have to be specified using ARRAYS. Under the ordinary method we would have to specify 15 variables. This point can be illustrated by the following example:

```
10 DIM NAME$(3), ADDRESS$(3), CITY$(3), STATE$(3), ZIP$(3)
20 DATA JOE SMITH, 2121 BOX ST., DALLAS, TX., 721011
30 DATA MIKE JONES, RT. 5, DEL RIO, TX., 78840
40 DATA ART SMART, 811 ADAMS, VICTORIA, TX., 77777
50 FOR A = 1 TO 3
60 READ NAME$(A), ADDRESS$(A), CITY$(A), STATE$(A), ZIP$(A)
70 NEXT A
80 FOR A = 1 TO 3
90 PRINT NAME$(A), ADDRESS$(A), CITY$(A), STATE$(A), ZIP$(A)
100 PRINT
110 NEXT A
120 END
```

To use arrays, the size of the array must be specified through the use of a dimension (DIM) statement. String variables must be specified by DIM A$(X). Numeric variables are dimensioned by using DIM A(X) where X is the numeric size of the array of data.

The temperature conversion problem can be used to demonstrate several of the BASIC Programming commands as follows:

```
10 REM THIS PROGRAM IS USED TO CONVERT FAHRENHEIT
20 REM TEMPERATURE TO CENTIGRADE EQUIVALENT TEMPERATURE.
25 DIM C(30) : DIM F(30)
30 INPUT "WHAT IS YOUR NAME ";A$
35 PRINT
40 PRINT "THANK YOU ";A$;".  PLEASE ANSWER THE FOLLOWING"
50 PRINT "QUESTIONS."
55 PRINT
60 PRINT "HOW MANY FAHRENHEIT TEMPERATURES DO YOU WANT TO"
70 INPUT "CONVERT TO CENTIGRADE EQUIVALENT TEMPERATURES";N
75 PRINT
80 FOR I = 1 TO N
90 PRINT "TEMPERATURE NUMBER ";I
95 PRINT
100 PRINT "WHAT FAHRENHEIT TEMPERATURE DO YOU WANT TO"
110 INPUT "CONVERT TO CENTIGRADE TEMPERATURE ";F(I)
120 PRINT
130 C(I) = (5/9)*(F(I) - 32)
140 PRINT "THE CENTIGRADE EQUIVALENT TO ";F(I);" IS ";C(I)
145 PRINT
150 GOSUB 200
155 PRINT : PRINT : PRINT
160 NEXT I
170 GOTO 285
200 IF C(I) > 0 AND C(I) < 100 THEN 230
210 IF C(I) = 0 THEN 250
220 IF C(I) = (5/9) * (212 - 32) THEN 270
224 IF C(I) < 0 THEN 240
226 IF C(I) > 100 THEN 240
230 PRINT "THIS CENTIGRADE TEMPERATURE IS BETWEEN THE"
231 PRINT "FREEZING AND BOILING POINT OF WATER."
232 PRINT
240 RETURN
250 PRINT "THIS CENTIGRADE TEMPERATURE IS THE FREEZING"
251 PRINT "POINT OF WATER."
252 PRINT
260 RETURN
270 PRINT "THIS CENTIGRADE TEMPERATURE IS THE BOILING"
271 PRINT "POINT OF WATER."
272 PRINT
280 RETURN
285 LPRINT
290 LPRINT "                SUMMARY TABLE"
300 LPRINT "FAHRENHEIT TEMP.                CENTIGRADE TEMP."
310 FOR I = 1 TO N
320 LPRINT "   ";F(I);"                          ";C(I)
330 NEXT I
335 LPRINT : LPRINT
340 INPUT "DO YOU WISH TO BEGIN THE PROGRAM OVER";B$
345 PRINT
350 IF B$ = "YES" THEN 30
351 PRINT "GOODBYE ";A$;".  WE ARE FINISHED WITH THE"
352 PRINT "PROGRAM."
360 END
```

13.4 SUMMARY

A few final points should be made. After entering a program in the computer a hard (printed out) copy and a backup disk copy should be made of the program. Any updates to the program should also be copied and saved. There is nothing more frustrating than working for weeks on a program only to have it destroyed by some fluke.

Test the program thoroughly before releasing it to the public or using it yourself. A program may work well for a single application and not for others. Test it on a variety of appropriate problems. Test the final results to make sure they are realistic and applicable to your problems.

Finally, document your program liberally. Documentation is meant to explain what the program consists of, how to use it and what problems it's appropriate for. Part of documentation is to supply example runs of the program and a listing of the program. These explanations make it easy for other users of your program and for you to remember what you did in constructing the program.

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Appendix A

MICROCOMPUTER JARGON

(1) ALPHANUMERIC. Having to do with either numbers or letters of the alphabet.

(2) APPLICATION PROGRAM. Instructions to the computer which tell it how to perform a given specific user-oriented task. For example, an accounting program is an application program. An application program does something useful for the user.

(3) ASCII. (Pronounced 'askee') An acronym for American Standard Code for Information Interchange. This is one standard way (and not the only one) for computers to communicate with the various equipment that is connected to it, including other computers. The code is basically a list of characters linked to a corresponding list of binary computer codes. The purpose of the ASCII standard is to enable all the equipment connected to a computer to recognize the same characters when communicating. It's an alphabet for a computer.

(4) BACKUP. (a) A copy of a program or data file. (b) The process of making a copy of a program or data file. Copies or backups are used to insure program survival in case of a hardware failure, power outage or software defect that destroys the working copy of a program or a data file.

(5) BASIC. A popular programming language available for most microcomputers. It stands for Beginner's All-purpose Symbolic Instruction Code. Originally it was created as a simple language for teaching students and has since grown in complexity and power. (See also LANGUAGE.) There are numerous dialects of this language.

(6) BAUD. A unit of measure indicating the rate of transfer of digital information. This term is used frequently in talking about computer "communications" and often refers to one "bit" of information transferred per second. A computer data transfer rate of 300 baud will actually send or receive data at about 30 characters per second.

(7) BINARY. The state or characteristic of being two valued. Because a microcomputer is an electronic device, its operation can be described in terms of on-off switch states. These binary on-off states are often represented using binary (base two) arithmetic (1's and 0's).

(8) BIT. A binary digit (1 or 0). Internally in the computer, a bit is a single on-off switch state. A bit is the most fundamental element of information stored within a computer. (See also BYTE.)

(9) BOMB. When a computer completely fails to perform given instructions as intended, it is said to 'bomb', or 'crash'. When a computer bombs often it may do wild and highly unpredictable things. Computers attempt to perform instructions exactly as given.

(10) BOOT. Booting a computer usually means the process of getting a computer up, running and ready to use. The term comes from the idea that the computer pulls itself up by its own bootstraps. Each time a computer is turned on, it is though it was just born. It knows nothing, except for a tiny set of instructions (called a bootstrap loader) which tell it how to get going. When these instructions are performed, the computer is said to be "booted" or "up".

(11) BUFFER. An area of computer memory set aside for temporary storage of an input or output record. This can be thought of as a kind of information 'loading dock' of the computer.

(12) BUG. A hardware defect or programming error which causes the intended operation of a computer not to be performed correctly. Also called a GLITCH. (See also BOMB).

(13) BYTE. A sequence of eight bits (see BIT). A single byte often represents one alphanumeric character of information. A KILOBYTE is 1024 bytes. A MEGABYTE is one thousand kilobytes. A GIGABYTE is one thousand megabytes. Kilobytes are referred to most of the time by just K (pronounced kay). A piece of computer equipment, for example, may be able to store 16k of information (about 16,000 alphabetic characters of data).

(14) CARRIAGE RETURN. Originally this meant the mechanical lever used to return a typewriter carriage roller to the home position. On a computer, this is a special key used to alert the computer that you have finished typing in a response. The key is usually marked 'RETURN' but may also be called 'EXECUTE', or 'ENTER'. Sometimes a bent arrow symbol is used.

(15) CATALOG. See DIRECTORY.

(16) COMPUTER. An electronic device used to process and manipulate alphanumeric data in a predefined fashion. "MICROCOMPUTER" means literally "very small computer". "MINICOMPUTER" means literally "small computer". It should be noted that small is a relative term, however, and it is often difficult to discern the difference. Today, the term "microcomputer" generally refers to any desktop computer.

(17) CONFIGURATION. The way the pieces of a system are defined and put together. In the microcomputer world there are few standard ways of doing things.

(18) CONSOLE. The video display terminal. Also sometimes called a cathode ray tube (CRT).

(19) COUPLER. Generally, a coupler is a device required by Federal Communications Commission (FCC) regulations which electrically isolates a computer system from the phone lines.

(20) CPU. An acronym for Central Processing Unit. See MICROPROCESSOR.

(21) CRASH. See BOMB.

(22) CURSOR. Any symbol which indicates where the next character will appear on the video screen when you press a key.

(23) DBMS. A data base management system is a system of programs used to store, maintain, sort, search and list a collection of information in various ways. It is a generalized record-keeping system.

(24) DEDICATED SYSTEM. A dedicated system is one that performs a task exclusively for a single user.

(25) DEVICE. A piece of equipment connected to a computer to perform some specific task, such as printing. Also called PERIPHERAL.

(26) DIRECTORY. A listing of the programs or data files available on a computer. It is usually displayed on the screen of the video terminal. Also called a CATALOG.

(27) DISK. (a) A DISKETTE, often referred to as just a "disk", is a small flat square plastic envelope with a circular disk of magnetically sensitive mylar plastic enclosed. Information is recorded and read from a diskette in much the same way sound information is stored on cassette tape cartridges for a tape player. The diskette is intended to be a medium to store information (although not so permanently that it cannot be erased). Data stored on a disk is machine readable, not human readable. (b) A DISK DRIVE, often referred to as simply a "drive", is the piece of computer equipment that is used to record data onto a diskette or copy it from diskette into computer's memory. It is similar in function to that of a tape recorder. (c) A "HARD DISK" is a similar piece of equipment with a rigid, fixed and unremovable magnetic drum or disk platter used to store and retrieve large amounts of information at relatively high speeds.

(28) DOCUMENTATION. The documentation of a computer system includes any of the user's manuals, technical books and reference guides that might be associated with either the computer itself or the programs that are used on it.

(29) ELECTRONIC WORKSHEET. A screen oriented program using a matrix of columns and rows to define numerical applications in a straightforward visual fashion.

(30) EXECUTE. To "run" a program or have the computer perform a task specified by a previously defined set of instructions.

(31) FILE. A collection of related data stored on a diskette or other storage medium. Examples could include a set of instructions (a program) to the computer, financial data, a phone list, a budget program, etc. Files are made up of individual records pertaining to a specific item in the file. A number of files may exist on a single storage medium. Also known as a dataset.

(32) FILENAME. The name of a file as it is referenced by the system.

(33) HARDWARE. The physical pieces of microcomputer equipment that can be seen and felt. Hardware occupies space and has weight. It is the "black box"

comprising a computer system, such as disk drives, printers, terminals, the computer itself, etc. (See also SOFTWARE).

(34) INPUT. (a) Data entered into the computer. (b) The process of entering data into the computer.

(35) I/O. Communication (transferral of data) between two or more computers or computer devices. Also referred to as "input-output". Sometimes these terms refer to the section(s) of the machine or its programs that have to do with the transfer of data into or out of the computer.

(36) KILOBYTES. See BYTE.

(37) LANGUAGE. (a) A concise and precisely defined set of commands and functions together with a system of syntax and grammar that is used by humans to communicate instructions to the computer. (b) A program that is used to convert a higher level language to the native control language of the computer. Some examples of a few languages and the programs that make them possible are: PASCAL, FORTRAN, BASIC, ALGOL, APL and COBOL.

(38) LOAD. To retrieve (or load) information from a storage device into the memory of the machine.

(39) MACHINE LANGUAGE. The native control language (a series of on-off electronic states) that the computer understands directly and without further conversion. Machine language is specific to the microprocessor used and its form is dependent on the particular configuration of the machine used (not all machine language is the same). It is not human readable.

(40) MEMORY. The internal data processing workspace of a computer. See RAM and ROM. Memory capacity is usually expressed in bytes, kilobytes or megabytes.

(41) MENU. A displayed list of user oriented command options. Menus make getting what you want out of a computer a lot easier.

(42) MICROPROCESSOR. A single digital integrated circuit (electronic part) that contains all the logic, arithmetic and manipulative abilities necessary for the control and operation of the computer system. Consider it an extremely fast idiot without any will whatever to do anything on its own. This is the "brain" of a computer. It only "knows" how to fetch an instruction code from memory and execute it. Microprocessors come in different speeds and sizes and generally use different instruction sets.

(43) MODEM. A physical piece of equipment used to transfer or recieve information over the phone lines. It converts the computer's digital information into a form that can be transferred via phone line and vice versa. (See also COUPLER).

(44) MONITOR. A video display device. Its sole purpose is to accept a video signal and display video output on its screen.

(45) MULTIUSER SYSTEM. A single computer system using multiple video display terminals allowing simultaneous use by several users.

(46) OPERATING SYSTEM. A set of instructions that the computer uses to keep track of itself. It provides information to the microprocessor on how to organize memory, what devices are present and how to handle the data that proceeds to and from them. It is the behind-the-scenes director of activity and the source of a computer's organization.

(47) PARALLEL. A method of implementing data communications between two computer devices that allows sending and receiving related binary signals over many wires simultaneously.

(48) PERIPHERAL. See DEVICE.

(49) PROGRAM. Any set of instructions which tells the computer how to perform a specified task.

(50) PROMPT. See CURSOR.

(51) RAM. An acronym for "Random Access Memory" (RAM). It is the main memory in a computer where programs and data are stored. This kind of memory is nonpermanent, changeable and can be erased if the power to the system is turned off. (See Memory).

(52) ROM. "Read Only Memory" (ROM) is permanent memory in the computer that cannot be erased or altered in any way even if the power is cut off. (See Memory).

(53) SERIAL. A method of implementing data communications between two computer devices that allows sending and recieving related binary signals one after another in sequence. One kind of common serial interface is the RS-232 standard.

(54) SOFTWARE. The various computer programs, including programs that are "built-in" the computer in ROM memory. Sometimes this "built-in" software can take the form of modules that fit into the computer. In many cases, software comes on a diskette. (See APPLICATION PROGRAM).

(55) TEN KEY PAD. A set of ten or so numbered keys arranged similarly to the keys one might find on a ten key adding machine. It is used to speed data entry of numerical information into the computer.

(56) TERMINAL. (a) A VIDEO DISPLAY TERMINAL is a video output device with a keyboard that is linked to the computer directly. (b) A REMOTE TERMINAL is a device for interacting with the computer from a remote location. It normally consists of a keyboard and some listing device such as a printer or video screen.

(57) TIME-SHARING. Making use of another computer's programs, data and computing power remotely.

(58) UTILITY. A program that is intended to serve as an aid, enhancement or supplement to the machine and its use. An example might be a program that tests a diskette for defects, or a program that prints out a list of all variables used in a program and where they may be found, etc.

(59) WORDPROCESSOR. A program used for creating, editing and printing text usually with greater speed, efficiency and effectiveness than the typewriter. Also called a TEXT EDITOR.

Appendix B

SOFTWARE EVALUATION CHECK LIST

Title of Software _____ Evaluator _____

Software Source _____ Date of Evaluation _____

		Specific Software		
		What I Have	What I Need	Compatible (Yes/No)
A.	Hardware characteristics:			
(1)	Brand and model of computer	_____	_____	_____
	-Type of CPU	_____	_____	_____
(2)	Size of memory required in Kilobytes (k)	_____	_____	_____
	-User memory available	_____	_____	_____
(3)	Operating system(s)	_____	_____	_____
	-Release number of operating system(s)	_____	_____	_____
(4)	Language(s)			
	-Brand and release number of language(s)	_____	_____	_____
(5)	Disk drive			
	-Brand of disk drive	_____	_____	_____
	-Number of drives	_____	_____	_____
	-Size of floppy disk	_____	_____	_____
	-Size of hard disk	_____	_____	_____
	-Density: (1,2,4)	_____	_____	_____

-Minimum K of disk space for software _____ _____ _____

(6) Printer

-Brand and Model _____ _____ _____

-80 or 132 Column _____ _____ _____

-Speed: Characters/ Second _____ _____ _____

-Other Description _____ _____ _____

(7) Terminal or screen capabilities

-Brand and name _____ _____ _____

-Dimensions (columns and lines) _____ _____ _____

-Clear screen _____ _____ _____

-Arrows _____ _____ _____

-Clear to end of screen _____ _____ _____

-Home cursor _____ _____ _____

-Intensity of cursor _____ _____ _____

-Terminal cursor position _____ _____ _____

-Memory mapped video (yes/no) _____ _____ _____

Other description _____ _____ _____

B. Mode of distribution and services provided:

(1) Mode of software distribution (source or object) _____

_____

(2) Who will answer user's questions? _____

_____

(3) Where is the person(s) located to respond to user's questions? ____

_____

(4) Can user manuals and instructions or demonstration program be acquired before purchasing or licensing the program? (yes/no) ____

(5) Are software maintenance services provided? (yes/no) _____

(6) Are software enhancement services provided? (yes/no) _____

C. Specific software characteristics (Evaluator's comments):

(1) Credibility of the developer(s): _____

_____

_____

(2) Usefulness and reasonableness of the solution: _____

_____

_____

(3) Documentation and instructions: _____

_____

_____

(4) Ease of use and level of user computer knowledge required: _____

_____

_____

(5) Error checking: _____

_____

_____

D. Cost of the software and support service:

(1) Initial purchase of license fee: $ _____

(2) Cost of new releases of the software $ _____

(3) Service charge, if any: $ _____

(4) Enhancement charge, if any: $ _____

(5) Necessary hardware addition or modification cost, if any: $ _____

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Appendix C

POLICIES AND PROCEDURES FOR DISTRIBUTION OF EXTENSION MICROCOMPUTER SOFTWARE

C.1 IN-STATE REQUESTS FOR SOFTWARE

The goal of the Texas Agricultural Extension Service (TAEX) is to facilitate the use of computer technology through educational programs and the development and distribution of microcomputer software. TAEX will provide support for use of this technology through its educational programs as well as technical support to ensure that creditable software is developed and supported.

Software developed and maintained by TAEX will be distributed as a compiled or assembled computer code which requires the use of the MS-DOS, CP/M-86 or CP/M-80 operating system. Templates for spreadsheeets are available for Lotus 1-2-3 or SuperCalc. There will be a setup charge of $25 per diskette, plus the cost of the software requested. Decision aid software costs range from $10 to $25 per program and record-keeping software from $100 to $500 per program.

Software is available for common computers used in agriculture including the IBM PC, XT or AT, TI-PC, Tandy 2000, KayPro, Compaq or other microcomputers using MS-DOS, CP/M 86 or CP/M opaerating system.

C.2 OUT-OF-STATE REQUESTS FOR SOFTWARE

An additional fee calculated at fifty (50) percent of the established fee scheduled will be charged for software requested from outside the state of Texas.

C.3 COMMERCIAL SALES OR DISTRIBUTION OF TAEX PRODUCED SOFTWARE

Commercial sale or redistribution of software may be permitted with written approval from the Directors of the Texas Agricultural Extension Service and the Texas Agricultural Experiment Station. Some of the software may be protected by copyright, either by the individual author or by certain parts of the Texas A&M University System.

C.4 CONDITIONS OF SALES

All computer programs distributed by the Texas Agricultural Extension Service are on an "AS IS" basis. Individuals, firms, agencies, and organizations requesting microcomputer software developed, maintained and distributed by TAEX will be required to sign a request for microcomputer software certifying that they are licensed to use the operating system and programming languages they have provided on a diskette for the distribution of the software.

C.5 PROGRAMS AVAILABLE FOR DISTRIBUTION

Finance and Tax

- Agricultural Loan Analysis
- Calculating Loan Unknowns
- Calculation of Net Present Value and Internal Rate of Return
- Financing Land Sales
- Financing Land Purchases
- Future Value - Present Value Analysis

Crops and Machinery

- Breakeven Price or Yield for Alternative Crops
- Share-Lease Arrangements
- Machinery Cost Estimates
- Combine Ownership vs. Custom Harvest: After Tax Cost
- All Risk Crop Insurance Evaluator (ARCIE)

Irrigation

- Calculating Irrigation Capacity Unknowns
- Irrigation Pumping Plant Efficiency and Fuel Cost
- Irrigated vs. Dryland Crop Production: Value of Water and Energy

Livestock

- 205-Day Adjusted Weaning Weight and Performance Evaluation
- Bull Gain Test Analysis
- Fencing Cost Estimator
- Beef Cow-Calf Economic and Production Evaluation Under Range Conditions
- Deer Hunting Enterprise Economic and Production Evaluation
- Stocker Cattle Economic & Production Evaluation Under Range Conditions
- Angora Goat Economic & Production Evaluation Under Range Conditions
- Spanish Goat Economic & Production Evaluation Under Range Conditions
- Sheep Economic & Production Evaluation
- Stocker Lamb Feeding Economic & Production Evaluation
- Mutton Angora Goat Economic & Production Evaluation Under Range Conditions
- Stocker Cattle Production/Marketing Analysis
- Range and Permanent Land Improvement Cost Calculator
- Templates - Grazing and Ranch Management Worksheets

Marketing

- Forward Contracting Crops

General

- Vehicle Cost Analysis
- Pickup and Trailer Cost Analysis

C.6 MISSISSIPPI STATE SOFTWARE DISTRIBUTED BY THE TEXAS AGRICULTURAL EXTENSION SERVICE*

- Farm Record System
- Catfish Package
- Service Record Keeping and Production Management
- Store vs. Seed Decisions For Grain
- Sprayer Calibration
- Dairy Ration Balancer
- Crop Lease Breakeven Analysis

(* Available only for TRS-80 Model II.)

C.7 CONTRIBUTORS

Contributors to the software development at Texas A & M include the W. K. Kellogg Foundation, Federal Crop Insurance Corporation, Soil Conservation Service, Temple, Texas, Texas Instruments Incorporated and several Texas ranches.

C.8 FOR FURTHER INFORMATION

For a catalog of available software or ordering procedures, call Steve Lybrand, (409)845-3929 or write Computer Operations Unit, Attn: Steve Lybrand, Texas Agricultural Extension Service (2468), College Station, Texas, 77843.

Appendix D

COMPARISON CHECKLIST OF FARM ACCOUNTING SOFTWARE

I. General	Package 1.	Package 2.
a. Program Name:	_____	_____
b. Vendor's Name:	_____	_____
c. Vendor's Address:	_____	_____
	_____	_____
d. Computer:	_____	_____
e. Operating System:	_____	_____
f. RAM. Required:	_____	_____
II. Type		
a. Single or Double Entry:	_____	_____
b. Cash, Accrual or Both:	_____	_____

(To maximize management information, choose an accrual system. However, the system should provide tax accounting output.)

III. Vendor Evaluation		
a. Accounting Expertise:	_____	_____
b. Quality of Documentation:	_____	_____
c. Years in Business:	_____	_____
d. Financial Condition:	_____	_____
c. References:	_____	_____
d. Number Packages in Area:	_____	_____

(Contact present users of the system to determine if they would buy the same package today.)

e. Telephone Support:	_____	_____
f. Customer Training:	_____	_____
Cost	_____	_____
Location	_____	_____
g. Warranty Provisions:	_____	_____
h. Return Policy:	_____	_____
i. Customization Available:	_____	_____
j. Source Code Available:	_____	_____

(Source code is the computer program itself. If you want to modify the program to tailor it to specialized needs you will need to get the souce code.)

k. Cost of Updates: _____ _____
l. Software Cost: _____ _____

(Updates and the cost and convenience of receiving customer training may be as important as the initial cost of the software.)

IV. Computing Considerations
a. User Friendliness: _____ _____

(Review the ratings given by panels of users, such as in agricultural computer magazines. Obtain hands on demonstrations.)

Prompting _____ _____
Help Screens Available _____ _____
Comments _____

b. Transactions Per Disk: _____ _____
c. Processing Speed: _____ _____

(Time required to post 100 transactions to the general ledger.)

d. Special Hardware Required: _____ _____

(If the user's accounts involve a substantial amount of data, the use of a hard disk may be required.)

e. Are Transaction Data Automatically Stored: _____ _____

(Some user's find that this is an essential software feature.)

f. Automatic Year End Closing: _____ _____
g. Ability to Close Income (Loss) into One or More Equity Accounts: _____ _____
h. Maintain Prior Year Account Balance: _____ _____

A program which has a predetermined Chart of Accounts may be the best software choice for the beginner. In any case, the beginner should expect the training provided by the vendor to include assistance in establishing a chart of accounts for the farm or ranch operation.

Advanced systems with more flexible features are required by complex businesses. Greater flexibility means the ability to specify user defined account names and numbers, four digit account numbers, an unlimited number of accounts and the capability of modifying the chart of accounts as needed.

The output from a system should include a current listing of the chart of accounts and show account names and numbers.

V. Chart of Accounts

a. Account Names User Defined:	_____	_____
b. Account Numbers User Defined:	_____	_____
c. Maximum Length of Account Numbers:	_____	_____
d. Maximum Number of Accounts:	_____	_____
e. Maximum Number of Checking Accounts:	_____	_____
f. Account can be Set Up Before, After or During Transactions Entry:	_____	_____
g. Chart of Accounts can be Modified Later:	_____	_____

After transactions are posted to a general ledger, a system should print the general ledger and trial balance reports. The output of an ideal system should include a Profit and Loss statement, Balance Sheet and Sources and Uses of Funds statement.

VI. Printed Reports

a. Transactions Listing:	_____	_____
By Date	_____	_____
By Check Number	_____	_____
By Account Class	_____	_____
b. Trial Balance:	_____	_____
c. P&L Statement:	_____	_____
d. Balance Sheet:	_____	_____
e. Sources and Uses of Funds:	_____	_____
f. User can Modify Format of Financial Reports:	_____	_____
g. Depreciation Schedule:	_____	_____
h. Enterprise Reports:	_____	_____
i. Schedule F or C Reports:	_____	_____
j. Cash Flow Statement:	_____	_____
k. Checkbook Reconciliation:	_____	_____
l. Landlord Settlements:	_____	_____
m. Loan Activity Summary:	_____	_____
n. Family Income & Expenditures:	_____	_____
o. Frequency of Reports:	_____	_____
p. Farm Comparative Analysis for _____ Years:	_____	_____

A user should determine the amount of detail required in a general ledger and concentrate on systems which will provide it. Accounting and tax detail is generally defined through using account numbers or codes. The capability of a system to provide reports such as the cash flow, tax reports, landlord settlements, etc. is directly linked to the sophistication of the numbering or coding scheme and therefore to the accounting and tax detail.

VII. General Ledger

a. Input Description:	_____	_____
b. Accounting and Tax Detail:	_____	_____
c. Quantities Entered:	_____	_____
d. Maximum Entries per Period:	_____	_____
e. Assures Transactions Entries Balance:	_____	_____
f. Confirms that Account Numbers Entered are Valid:	_____	_____
g. Errors Changeable Later:	_____	_____
h. Adjusting Entries Allowed:	_____	_____
i. Audit Trail Provided:	_____	_____
j. Ledger Account Summary for Audit of Individual Accounts:	_____	_____
k. Cost and Market Basis Values:	_____	_____

An excellent system provides for enterprise accounting as well as accounting for different activities within an enterprise. This feature allows a measurement of the profitability of the various crop and livestock enterprises in an operation. Service centers may be identified for major pieces of equipment such as tractors, grain mills, etc. for the purpose of determining the cost of providing the service.

For accrual basis, enterprise accounting, a system must have intra-farm income and expense transfer capability.

If you desire enterprise accounting, make sure the system allows a sufficient number of enterprises and quantity as well as dollar values. Additional desirable features include the ability of the system to account for activities at several different farms and the ability to allocate labor, fuel, machinery costs, etc. to specific crop and livestock enterprises.

VIII. Enterprises

a. Maximum Number Allowed:	_____	_____
b. Intrafarm Transfers:	_____	_____
c. Allows Allocation of One Accounts Ending Balance to Other Accouns:	_____	_____
d. Enterprises at Each Farm Location Allowed:	_____	_____

The majority of the manufacturers of farm accounting software market separate add-on modules. Generally, these packages are designed to integrate with the general ledger or primary accounting package. This desirable feature saves the user from having to enter the same data more than once.

IX. Auxiliary Features

a. Check Writing:	_____	_____
b. Stores Payees' Names and Addresses:	_____	_____
c. Payroll Calculation and Checks:	_____	_____
d. Labor Reports by Employee:	_____	_____
e. Prepare W-2's and 1099's:	_____	_____
f. Depreciation Schedule: Both ACRS & Pre-ACRS:	_____	_____
g. Capital Pruchases/Sales Automatically Entered to General Ledger:	_____	_____

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Appendix E

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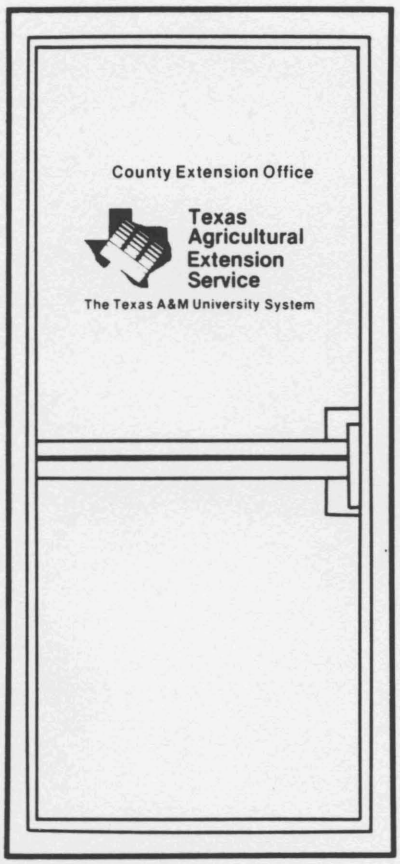

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