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Using Microcomputers in Farm and Ranch Management

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FOREWORD

Some beginning definitions may be in order, if you're not sure just what microcomputer means. Have you wondered? It may help to start with the largest computing operation first.

A mainframe computer (mentioned a few times in our text) is what its name suggests: a large computer that may be connected to 50 or more users. Universities, corporate headquarters, or government offices are places where you might find mainframe computers.

A minicomputer originally meant a small computer, now it's referred to as larger than a microcomputer and smaller than a mainframe. Minicomputers typically serve 5 to 50 users at a time and are found in small to moderate sized businesses, consultant's offices, and universities.

A microcomputer--the one we're concerned with in this publication--is basically a self-contained, desktop operation. It's usually connected to a few pieces of important hardware (we'll explain these in the chapters that follow). It is designed to be used by one person at a time.

And a point to remember as you read these chapters: words that are underlined in the text are defined in the glossary, appendix B, beginning on page 62.

SECTION I
INTRODUCTION TO MICROCOMPUTERS

Recent technological advances have given 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 producers must obtain up-to-date and accurate information. In this environment, many producers look at the microcomputer as the answer to their problems.

A computer can add to your decision-making power as a farm or ranch manager. However, unless you properly evaluate its use in your operation, a computer can be of less use than a lead pencil.

Computer applications are limited only by your imagination and the availability of the right software. Given the right software, a microcomputer 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. This publication will help you evaluate your need for a microcomputer system, and it provides general information on how to select a system that will fit your needs.

Chapter 1
Computer Applications in Agriculture

Farmers, ranchers, and agribusinesspeople often hear how they must be better operators, do long term planning, and keep better records. They also must work for in-depth analyses of the economy, markets, and the financial impact of their decisions. This is easier said than done. With the proper software, the computer has great potential to help a manager handle decision-making.

A microcomputer can ease the generation, storage, and processing of data into information meaningful to you as an agricultural decision-maker. With suitable software, the computer can perform numerous complex mathematical computations accurately at a very high speed. Such capability vastly increases a decision maker's figuring power.

A microcomputer costs money, and it won't do everything all by itself. You'll still need to interpret and use the information coming from it. However, the computer allows you to think more about the information being processed and to analyze better the results of the computer's operation. You become a thinker and an analyst rather than a number manipulator.

Agricultural applications of the microcomputer 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 uses the microcomputer for word processing and name and address file lists, and it selects and sorts data according to alphabetical information. An example of the select and sort feature would be to draw all cows serviced by a particular bull out of a herd of cattle. Another would be to select and group a list of 100 names and addresses by state.

Word processing uses computers for writing letters and manuscripts, or processing, maintaining, and printing text. It can significantly increase the efficiency of a typist. Spell-checking features and merging name and address lists into a single letter to create individualized letters, such as for registered breed buyers, can save time and money.

A microcomputer with appropriate software can assist in accepting and assembling data for computing, and it reduces 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 spreadsheets. This publiction explains the kinds of software available.

Many decisions can be analyzed using "what if"-type programs that are useful 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. They assess the impact of alternative yield levels on profit, look at most profitable crop mixes, look at least-cost feed rations, assess the "fairest" share-leasing arrangement, assess potential price fluctuations in marketing plans, look at farm program participation decisions, and do other tasks. This analysis is particularly important to managers who want to build production and marketing flexibility in their operations 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 entertainment games. Most major computer manufacturers sell educational software that use motivational techniques to build learning, reading, and mathematical skills in school and preschool age children. Home use functions include programs for family financial management, record-keeping, living space monitoring of air temperatures and security, and communications with other microcomputer systems.

Computer experts are developing methods for microcomputer operators to access large computers on a time-sharing basis. Data bases and published information are available to producers with a phone line linkup. National computerized information systems use all sorts of electronic data and educational information transfers--marketing news services, electronic funds transfers, electronic mail, etc. Appendix A lists agricultural computer networks and contacts.

A new and potentially valuable function emerging is using microcomputers as translators for remote sensing devices. These devices monitor heat buildup in grain bins, monitor soil moisture conditions, feed rations for individual dairy animals, and watch for potentially dangerous situations in the family home. This information, fed into the computer from remote sensors, turns on grain bin fans and irrigation systems, feeds individual cows in the dairy barn, dials the police, or sets off fire alarms in the home.

The best way to describe the potential areas of computer application on the farm or ranch is to assign titles to the software packages that could be useful to a manager. The applications are:

- production decision aids for livestock,
- production decision aids for crops,
- performance records and evaluations,
- economic analysis,
- accounting and finance,
- range management,
- range-livestock management information systems,
- electronic spreadsheets, and
- data base management systems.

Chapter 8 describes the packages available for crops and livestock decision-making, however, computer applications are limited only by the imagination, time, and money to develop or acquire the software and the knowledge on how to effectively use the tool.

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 is made up of parts like tires, brakes, and spark plugs, a computer is composed of smaller, more elemental units. What these gadgets do, and what you need to know about them, doesn't have to be a mystery.

Hardware

Hardware is any of the physical pieces of microcomputer equipment that you can see and feel. 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 (CPU), video display (CRT), a keyboard, memory, storage devices, a modem, and a printer.

If you were to open a microcomputer, you'd find a lot of electronic circuits. The brain of the computer is a small electronic part called a microprocessor. Its sole purpose is to carry out whatever instructions it is given, one after another. No microprocessor can reason on its own. Instead, in carrying out commands, it carries out the reasoning of the programmer who gave it the instructions. Computers aren't smart; people are!

Memory

The typical microprocessor is very good at carrying out simple instructions, but it's not very good at remembering. To have a place to store data while processing, the microprocessor is directly connected to circuitry that serves as a temporary workspace for data. This circuitry is called the memory since this 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 "k" (kilobyte approximately 1,000 bytes) the CPU or disk storage will hold. A byte is the amount of computer space required to store one alphanumeric character.

The memory used by the CPU is divided into ROM (read only memory) and RAM (random access memory). ROM is permanent memory in the computer that can't be erased or altered. It gives instructions to the CPU when you turn on the computer.

RAM memory is where computer programs and data are stored for the purpose of execution or to perform the task specified by the instructions. It is erased when you turn off the computer. Your interest should be in the amount of RAM available for programs and data (user RAM). Most 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. The trick is to purchase a RAM size sufficient to do all the calculations you desire.

Besides the memory, other devices often connected to the microprocessor are the console keyboard, the monitor (CRT), printer, and disk drives.

As the computer is used, characters generated by the CPU or input by the user through the keyboard are displayed on the monitor. Monitors are similar to television sets, but they provide sharper images, to enable them to more precisely form characters and graphic displays. The information displayed on a monitor may be printed out on a printer or sent to another computer using a modem.

A modem is a device that transforms a computer's electrical pulses into audible tones for transmission over phone lines to other computers. Modems also receive incoming tones and transform them into electrical signals that can be processed and stored by the computer.

Devices that exist apart from the main computer box are sometimes called peripherals. Considerable flexibility exists in the selection of peripheral equipment. Currently, this equipment accounts for the greatest part of a microcomputer system's cost. This equipment is also referred to as input/output (I/O) devices because of their function.

Software

Each time the computer is turned on, it's as though it has just been born. It knows only enough to start executing commands found in ROM. Unless this ROM 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 a larger area of memory that is erasable and alterable RAM. You can easily change RAM memory's contents so that different information may be stored there as required.

Think of this process of getting started as though the microcomputer were pulling itself "up" by its own "bootstrap." This is the reason why the initial startup process is called booting and why a computer is often said to be either "up" or "down." Booting up a computer leads to two other common terms. A "cold boot" occurs when the computer is first turned on, while a "warm boot" consists of resetting the computer without turning it off and back on.

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 proceeds 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 drive of the computer system. It's 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.

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, changing, and ambiguous for today's computer to handle. The only language that the microprocessor can understand is the electronic states in memory that 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 "human" language like FORTRAN or BASIC, then a "language" translator program must be used to convert it to the electronic form usable by a computer.

Applications programs are the set of instructions that, when interpreted to machine language, cause the operating system to command the central processor (CPU) to compute the desired results and then display those results on a CRT or a printer.

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 users must have a good knowledge of the subjects they're working with as well as a good grasp on how particular programs operate.

For example, in order to use an accounting program, users must, first, know enough about accounting to understand what the program does and, second, know how to operate the computer program to achieve the desired results. The general concepts of accounting change very little, 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 turn on the windshield wipers in a car whose operation you were unfamiliar with? Unfortunately, this initial unfamiliarity is the source of much frustration to new computer users, and many people end up imagining that it's difficult to operate a computer. This is not at all the case, as any experienced computer user can tell you. 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 (CPU's); they all function differently and have different sets of instructions and different operating considerations. This means that computer programs (software) that are designed to work on one microprocessor can't generally be expected to function on any other. Since different microcomputers often use different microprocessors, an accounting system that works on a brand A computer may not work on a brand B.

Second, there are different operating systems that have varying capabilities, responsibilities, and operating methods. Although there are now more "portable" operating systems (available for more than one microprocessor), each is individually geared to a given microprocessor and (therefore) depends on it. Since an operating system controls the functioning of the computer, software developed for one operating system can't be expected to work on another. Some brands of computers now contain more than one microprocessor (coprocessors); they give the flexibility of operating with more than one operating system.

There are many different computer languages (BASIC, COBOL, and FORTRAN, for example). One language may be able to do a certain kind of task better than another. Within a given human language, there are a number 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.

Diskettes and diskette formats differ between different brands of microcomputers. Not only are there different sizes of diskettes, but there are other internal physical differences. Each manufacturer has its own idea about

storing information on a diskette. This means that you shouldn't expect a diskette intended for a brand A microcomputer to be readable on a brand B microcomputer.

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 they 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 connect a different printer. Likewise, software written to take advantage of the functions of a specific computer system configuration can't necessarily be expected to operate on any other computer system configuration.

Why aren't there standards? There are! But few have been widely accepted. To date, the computer industry has introduced technological innovations too fast for serious 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 differently. It's the American way.

There is hope for standards in the industry. Incompatibility isn't a stumbling block unless you're 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 a Ford won't fit a Chevrolet.

You 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 complexity of the program. Knowledge of how one program works may be meaningless when you try to understand a second program. The reason is that microcomputers are machines that can be programmed any number of different ways. Patience, therefore, is not only a virtue--in many cases it's a necessity!

Chapter 3
Tips On Selecting A Microcomputer

Before you buy a microcomputer, take a few minutes to consider what you're getting into. Selecting a microcomputer can be a deceptively simple task. You could simply drop by your neighborhood computer store and let them load you up. What you might bring back is anybody's guess. If you were to buy real estate that way, you could very well end up with a plot of rather expensive Florida swamp land!

Give a little thought to what kind of a system you need and why you need it. A microcomputer is a useful tool, but it's not a solution to all your problems. Before you spend money and get only a headache in return, investigate and plan your purchase. For information on computers, check out your local library. Talk to your county Extension agent.

If possible, spend some time at the keyboard of a computer that's designed to handle the applications you have in mind. Without this experience, you'll have to rely on someone else's opinion. Learn some computer lingo and prepare yourself before you shop (definitions of computer terms are listed in appendix B). The time you spend should help you make a more intelligent buying decision.

To avoid making mistakes, try making a list of 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 questions that you should 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. Hardware is easy to get--most salespeople will load you up on hardware.

Software, the set of computer programs that assists the farm or ranch manager to make timely and accurate decisions, is the key to your needs. Without meaningful and useful software, the computer you bought or are considering buying might as well be used as a lampstand or a flower pot holder. A computer does'nt have a mind of its own; it must be fueled up, started, placed in gear, and guided to give useful results. This is the function of software.

Software is often not transferable between different brands of machines. This means that if you make the mistake of buying the equipment first, you may not be able to find the programs you want. It's wise to look for the software first--then look for a machine that it will run on.

If an urban cowboy from New York drives your tractor, the results could be disastrous. If the software acquired to drive your computer was written by someone who knew nothing about agriculture, the results could also be disastrous. 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'll much less likely be hemmed in to one specific brand of equipment.

What kind of microcomputer equipment should you buy?

The first step is to choose a computer system that will run all of the software on your list of needs. The second step is to evaluate the microcomputer systems hardware.

Microcomputer equipment comes in many configurations. Essentially, there are five units to consider: a central processing unit, a video screen, a keyboard to enter data, a data storage device such as a disk drive, and a printer to provide printed output. Let's look closer at these components.

Components of the computer system

Evaluating the actual differences between the various computer processors can get extremely technical. The primary characteristic you should be concerned with is the amount of memory available. Microcomputer systems are available with as little as 4K (approximately 4,000 characters worth of storage). This may sound like a great deal of space, but it's generally not adequate except for the simplest of applications. Most microcomputers can be equipped with 64K of memory. Although this amount is adequate for most of today's small business applications, your needs will likely increase.

Many microcomputers can access considerably more memory. As a general rule, it's not wise to purchase a computer system with less than 64K of internal memory. Check the memory requirement of the software you want to use in your business when assessing your memory needs. Some software packages, such as enterprise accounting packages, require a minimum of 128K.

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

Video display screens may come as monitors or terminals, in color or black and white, in different sizes, with different character sets, etc. The primary considerations with any video screen are a character set with both upper and lower case characters, and a large enough screen size. An 80-column by 24-row screen meets most needs.

The keyboards of microcomputers are not standardized. Most come with a typewriter-style keyboard, and many have a 10-key number pad similar to the one you'll find on an adding machine. If you plan to enter a lot of numbers, you may find this pad a real advantage. Some keyboards have additional keys that you'd use to perform specific functions; they're called "function keys." These keys may insert or delete characters or go to the next screen of information.

There are a number of data storage devices available. For most serious applications, cassette tape drives are'nt adequate. They are generally too slow, and they use technology that's too unreliable for proper operation.

Disk drives are recommended for most situations. Although they vary considerably in the amount of storage space available, no less than 300K per diskette (300,000 characters worth of storage space) is recommended. One page of printed text, double spaced, is about 2K.

Many applications today involve analyzing and manipulating large amounts of data. For greater speed and capacity, a hard disk system is recommended. The capacity of these comparatively expensive drives usually start at 5 megabytes (5,000,000 characters worth of storage space). Since a 10- or even 20-megabyte hard disk has only a slightly higher price, you might consider the greater capacity drives.

The problem with hard disk systems is that there is so much space in one spot. If all the data is not backed up (copied) somewhere else, an accident could be disastrous. Since a diskette holds only a fraction of the data on a hard disk, using diskettes as backup can mean a lot of time and effort. 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 cheap printer currently runs about $250. A daisy wheel, letter-quality printer may cost $1,500. There are color printers and plotters that may cost even more. Some printers are fast and others are slow. Some will use regular letterheads, some will only use pin-fed, continuous paper; and some use only special aluminized or thermal paper. Here are two general rules: (1) the faster the printer, the more expensive it will be; (2) the better the print quality, the more expensive the printer will be.

How much computer do you need?

There are no simple rules. How much computer you need depends a great deal on the size, organization, and needs of your farm or ranch business. If you're going to use the computer to keep track of your accounting over several years, you may need a 5-megabyte hard disk. On the other hand, if you're going to do word processing, you'll possibly need a letter-quality printer. What you need will depend on your particular situation.

Machine compatibility and other considerations

Unfortunately, most microcomputer equipment is not standardized. This means that the connections between the different pieces of a microcomputer system are often not the same. Some manufacturers seem to make things different just to make you use their equipment. The truth is, there's a serious lack of standardization across the entire microcomputer industry.

The technology is simply too new. Things are slowly changing for the better. 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 the system up 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 expandability. 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 microcomputers.

Because of today's rapidly changing technology, a starter system may be technologically obsolete in a year's time 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 very nonexpandable and inadequate system. It's better to buy a complete system that's capable of handling all your current and predicted future needs. You won't have to worry about obsolete technology in the future, and a complete system will still get the job done, even though it may include less than state-of-the-art equipment.

It may come as a surprise, but not everyone can fix microcomputers. You should consider this very important point, especially if you think that being without the computer for any length of time could hurt your business. It may take anywhere from an hour to a month or more to repair it. Check to see if your dealer will provide a replacement while your machine is in the shop. As you would with any appliance, take a close look at the service warranty. Some dealers have service contracts or extended warranties. Carefully investigate the dealer's service capability.

People who purchase microcomputer equipment often ask what kind of environment is necessary to set up a good work station. There are a number of considerations. Printers, for example, typically create a lot of noise. This may be important if you put your noisy printer in someone else's quiet environment. The solution is either to soundproof the printer or place it in an already noisy environment.

Another consideration is static. Carpeted rooms can make your computer go bananas. Static electricity builds up and can easily damage your computer's sensitive electronic circuitry. It's best to place the computer in a noncarpeted room. If this is'nt possible, obtain an antistatic spray to treat your carpet and make it safe. Or you could lay vinyl mats over the carpet under and near the computer.

If you think that buying a microcomputer is going to make things easier, you may be in for a real surprise. You'll need patience, in large quantity! You'll have to read manuals, get answers for your questions, train people (maybe), and get a good deal of hands-on experience just to get yourself used to the particular way a single program works. Some dealers offer training classes or private instructions. Check with your dealer. When frustration sets in, stick with it until you figure things out. A computer is just like any other tool. Have patience, be diligent, and you should soon learn how to harness it.

When you feel ready for a sales pitch, go to several different computer stores. Be warned: Many salespeople are not computer experts. Think twice before you let someone decide what kind of computer system is best for you. Approach the salesperson 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 salespeople. Ask questions. Find out what's 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're able to make them do.

If you're 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 salesperson might have you believe.

The truth is, what a computer can do costs money, and that can be extra money over and above the cost of the basic machine. Salespeople are interested in making the machine look as powerful as possible. 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 the way the salesperson claims it can. Make sure that the computer does everything and includes everything you need before you commit yourself. Ask the salesperson to spell out all the capabilities and costs of the machine involved so that there is no misunderstanding about what you might be getting.

Make your choice!

If you already own a computer and you're planning to order some "great" software, find out before you order the software whether it will in fact operate on your specific computer system. Find out whether it will run on your operating system, using the language you have. Find out if you can get it on a diskette format readable by your system. Look before you leap and before you buy.

Consulting a local computer expert can make you feel better and may help you to deal with a number of problems. User groups often exist that get together 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, a realization of its limitations and requirements, and a supply of patience.

Chances are, you will not find the perfect computer. The industry is still young and growing, and major advances in computer technology seem to be made daily. Chances are, you will 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. The microcomputer is only a tool, but it is a tool that you can use today with advantage.

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're 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 about how best to apply these new tools. The applications seem limitless, but find out what they can do for you.

Chapter 4
Choosing Appropriate Software

When you buy or acquire software from someone else, what should you look for? This will depend on whether you already own a computer. Assuming that you don't already own one, first develop a written list of what you'd like to accomplish with the software. With list in hand, shop around to find which software can best satisfy your needs. Then--and only then--should you consider purchasing the software (and computer system) that most nearly fits your needs.

If you already own a computer, shop for the software that's compatible with the specifics of your computer system. Primarily, you must find the program that will match the memory size, operating system, language, disk size, printer characteristics, and monitor or screen capabilities of your system. Often this will mean the program you want will not be available for the computer you own.

Depending on the importance of the software, you have several choices. One is to forget the whole idea. Another is either to modify the hardware to match the software or adapt the software to match the hardware. Finally, simply buy another computer or trade in the one you have for a new one.

The whole idea about acquiring software is to determine what jobs you need to accomplish using the computer. Find out who can supply the software to perform those jobs, and which hardware will execute that software.

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. There are several sources of software for the farm or ranch manager.

The first source is the commercially purchased program package. This software package is generally sold by commercial software companies or hardware vendors and has a very general application. If the specific operation for which you buy the software happens to differ in some respect from the general situation it was designed for, the software package becomes somewhat limited in use.

Software custom-written by a professional programmer is another possible source for farmers, ranchers, and agribusinesspeople. This software has the advantage of being designed for a particular operation, but it's usually expensive. At custom-programming rates of $30 to $50 per hour, it doesn't take long to build up a substantial programming fee.

A third type of software is that written by the user. If you're interested in learning programming, and if you have the time to devote to the effort, this can be a very gratifying source. You can derive a lot of satisfaction from writing a workable program and putting it to use in your farm and ranch operation.

Recent software developments have emphasized general purpose business applications that users may adapt for particular situations. For example, programs are available that quickly and easily manipulate numbers. This means that they may be used on a farm to generate crop budgets as well as in a store in town to keep track of receivables. This software is easy to learn and can be widely used on the farm or ranch. Examples of general purpose software will be investigated in chapters 9 and 10.

Programs written by state universities are available to the public at a nominal cost. The advantages of these types of software are that they're relatively inexpensive and are written to be accurate and effective for agricultural applications. However, just as with the commercial source, these programs have the drawback of being general in nature and not necessarily adapted for your individual operation. Your county Extension agent has a catalog of all university software currently available.

An emerging trend is the formation of software co-ops, clubs, or user groups. Computer users are starting to get together to share programs they've written. It's generally illegal to swap commercial software packages. However, some public domain software is available for these clubs to use and modify to fit individual user's unique situations. If you want to start one of these clubs, consider machine and program compatibilities and whether users can legally swap the programs.

Evaluating software

Now that you know which software packages will perform the jobs required, how do you evaluate them? There are five main criteria for evaluating software.

1. Evaluate the credibility of the developer. Does the person or company who wrote the program not only have experience or expertise in agricultural techniques but also use appropriate technology in the analysis?

2. Evaluate the usefulness of the solutions. Several programs may be available that could provide solutions to a particular problem, but are those solutions applicable to your situation?

3. Consider the documentation and instructions. Is the program well described and the methodology accurate? Can you easily understand the instructions, or will you need an interpreter?

4. 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; do you enter it as a decimal or as a whole number?

5. Evaluate the software's error-checking capability. How "idiot proof" is the program? Does the program accept nonsensical answers to input questions?

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

Physical forms of software

After deciding upon which program or software package to acquire, you can usually obtain it in one of two physical forms. The first, source code, is a printed listing of the program similar to the ones you'll find in programming or microcomputer books sold in bookstores. To make this code usable, you'll have to enter the entire code on the computer keyboard. This can be very time-consuming and error-prone.

The second 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's human-readable, you can produce a source code listing on the printer. An attempt to print the machine-readable program will result in garbage, if anything at all. In either case, the software is ready to run without your typing it in one line at a time.

Conclusions

Realize from the outset that acquiring software could 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. You can't expect software, with its associated hardware, to straighten up a poorly managed business. In fact, it would probably make a poor manager poorer 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--and thereby increase the profitability of the business. After all, profit is the name of the game.

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 the operation's pickup. Nor would a crop farmer question the necessity of buying certain farm machinery items. These same managers are frequently less definite in their attitude about the necessity of having modern tools to improve 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. Understanding the ownership and operating costs can help decision makers in their thinking about a microcomputer for the farm, ranch, or agribusiness. Refer to table 1 as we discuss the various costs associated with owning and operating a computer.

As with investment in any tool, the microcomputer system will require a capital outlay. Operating costs consist primarily of repairs and maintenance (5 to 10% of purchase cost annually), paper and other supplies, and electricity cost equivalent to consumption by a couple of light bulbs. One might also add $200 for computer magazines and newsletters and $400 for attending a computer use seminar. Paper and supplies will run around $200.

Countless opportunities will arise to add to the software arsenal. No matter how resistant you are to software temptation, plan on spending $500 to $1,000 per year. Software costs will likely exceed hardware costs over the life of the microcomputer.

These identified costs add up to $1,700 to $2,600 annually, and they don't depend very much on the brand of microcomputer system you purchase.

Table 1--Economic costs of owning and operating a computer

Operating costs per year	$4,000 system	$8,000 system
Repairs and maintenance	$400.00	$800.00
Magazines and newsletters	200.00	200.00
Computer seminar (1/yr.)	400.00	400.00
Paper, disks, etc.	200.00	200.00
Software	500.00	1,000.00
Total operating costs	$1,700.00	$2,600.00
Ownership costs per year		
Depreciation (5-yr. life)	$800.00	$1,600.00
Opportunity Cost (12%)	240.00	480.00
Insurance (1%)	40.00	80.00
Total ownership costs	$1,080.00	$2,160.00
Total annual costs	$2,780.00	$4,760.00

Expect to spend $4,000 to $8,000 for a microcomputer system, including basic software. The higher-cost system would be for handling extensive amounts of data and accounting; lower-cost systems (such as the smaller, perhaps portable, ones) would be used primarily for decision aids.

The original system would include basic software needs for accounting and word processing, an electronic spreadsheet, a communications package, and some relevant decision aids. The main uncertainty about a system's cost is the software cost and equipment options that you find attractive. The upper end of the range for a system's cost can be as high as $21,000 without software.

To estimate ownership cost, take a conservative-cost approach and place a 5-year economic life and zero salvage value on the computer system. This results in an annual charge of 20% of the purchase price. To complete the calculation, add a 12% annual interest cost on half the investment for finance charges and 1% for insurance. This means that annual ownership cost is 33% of purchased cost--$1,080 for the lower-cost system and $2,160 for the larger system.

Adding ownership costs to operating costs gives a total annual cost of $2,780 to $4,760 for the two different systems. This would not include computer operator labor costs that may occur in using the computer or training costs to learn how to use the computer.

All of the above costs developed by this simplified approach are pretax costs. Computer systems are considered 5-year depreciable assets, and all other identified expenses are tax-deductible, including the added software and education workshops when you use your system for business purposes.

Computer hardware purchased for business use can be depreciated over 5 years using the accelerated cost recovery system (ACRS) rules. The rate of depreciation is 15% the first year, 22% the second year, and 21% in the third and later years.

In addition, the option exists of taking a 10% or an 8% investment credit. (If you choose 10%, you must reduce the basis of the property by 5% to determine its depreciable balance. If you choose 8%, you can depreciate the full cost of the system).

You can also depreciate computer software if you use it for business purposes. However, unless you purchased the software with the computer system, it may not be eligible for the Investment Tax Credit. It's best to check with your certified public accountant (C.P.A.) when you consider separate purchases of software and hardware.

As with any property, you may allocate part of the system to business use and part to personal use. Recent tax rulings require that producers use their microcomputers more than 50% of the time for business purposes in order to take advantage of any tax breaks. To support the business use of the machine, keep records of the hours that you allocate to business and to nonbusiness use, and keep a printout of the business work you conducted. Document your purchases of hardware and software with cancelled checks, credit card slips, etc., to establish the cost basis of the equipment.

We can calculate approximate after-tax costs by making some assumptions: the producer or farm advisor is in a 25% tax bracket, pays 9.35% Social Security, uses the 10% investment credit, and uses the 5-year ACRS depreciation allowance. Using these assumptions, the average annual after-tax cost for 3 years of use is approximately $3,200 for the $4,000 system and $4,900 for the $8,000 system (about 75% of the pretax costs).

An additional 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 ($5,000 in 1984-1986; $7,500 in 1987-1989). The amount of the $5,000 limit allocated to each depreciable property item is up to the purchaser. The expensing option can be valuable to those in high marginal tax brackets. The portion of the property not expensed is eligible for depreciation and cost recovery.

Some producers 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 pretax costs of $19 to $16 per day, assuming 300 management days per year, are pretty low, when you consider the potential benefits. It's difficult to imagine a lender, agribusinessperson, or

consultant who couldn't justify an after-tax cost of $19 per day for a portable computer system. Placing a value on the benefits of management tools is difficult. You're often faced with deciding whether improved information really helps you make more profitable decisions. Remember: Computers and software do not make decisions; you, the user, must still make the final move.

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. You can save dollars and effort from 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 you become more experienced in using computers in your business. If you add the costs, and consider the tax breaks and the benefits, you can easily see why experts feel the microcomputer will become a widely used tool of management in the future.

SECTION II
APPLICATIONS SOFTWARE

Newcomers to the computer world invariably ask, "Can I program it myself?" The perfectly accurate response is, "Yes, you can." Just remember: It can snow in the middle of July, too. If you expect to take a computer home, learn everything you need to know about programming, and complete an accounting program over the weekend, you may be sadly mistaken. Programming is an art and science that takes quite a bit of time, effort, and patience to learn. It's not for everyone.

If you're interested in learning to program, you might consider taking a course in BASIC at a local community college or university. Some high schools are now starting to offer adult education courses in computer awareness and programming. If these options are not available, motivated individuals have taught themselves from programming books. Practice and diligence pay the best dividends in learning how to program.

Hiring a programmer to customize software is an expensive proposition. The National Bureau of Standards estimates that it costs from $50 to $70 per line to develop a computer program. Accounting programs can consist of several hundred lines of programming commands. Custom programmers fees range from $30 to $50 per hour. Depending on the software, this quickly puts custom-written programs out of reach for the average individual.

An alternative to self or custom programming is "off the shelf" purchased or public-domain software. These programs, written in BASIC or another programming language, are put together for general applications to financial, production, and marketing management in agriculture. To assist you in evaluating this software, the next three chapters discuss accounting and finance, crops and livestock, and dairy and marketing decision aids.

Chapter 6
Accounting and Finance

Sound financial management is essential to the survival of 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.

Identifying and managing casualty, production, and marketing risks are critical to the success of your farm or ranch operation. Through the use of computerized record-keeping systems, you can provide yourself with the up-to-date financial information necessary to successfully manage your operation.

Computerized accounting systems

The reasons for using a computerized accounting system fall into three categories: (1) generate the information required to file timely income tax returns; (2) generate reports required by lenders; and (3) obtain timely management information.

Farmers and ranchers have traditionally used C.P.A.'s to handle the first two functions. Taxes must be paid, and lenders are requiring producers to supply accurate financial statements before they're willing to make loans.

The generation of timely management information is the most justifiable reason for purchasing a computerized accounting system. Farmers and ranchers are often faced with management decisions, such as whether to accept an offered price for a commodity when there may be only a short time in which to accept or reject the offer. The chances of determining production costs as of today are slim if you have to depend on your accountant to provide the information. While you're waiting, the opportunity is likely to pass.

There's a need to capture selected information from the past and current performance of your business. This information is essential to making effective management decisions for current use and for the future growth of the operation.

Information reports generated

Farm and ranch accounting software packages include production and financial records. Examples of production records include field records for crops and individual animal performance records for livestock. The packages available today are very good at generating basic financial reports. Some of the types of reports and the functions they serve are listed on the following page.

The balance sheet represents a snapshot of a business at any point in time. Its primary function is to list everything your business owns, everything it owes, and what you have invested in it--in short, its assets, liabilities, and net worth.

The balance sheet does not indicate profitability. However, it can indicate problem areas, and a series of balance sheets can show the growth or lack of growth of your firm.

An income statement shows the profitability of your business over a period of time. Its primary function is to report business income, expenses, and profit gained in the production process.

A cash flow outlines the income you received (and where it came from) and the expenses you paid (and to whom) on a period-by-period basis. This report is essential when you try to establish a line of credit at a lending institution.

A checkbook summary lists all the transactions you entered into the accounting system that had an effect on the checking accounts your business maintains.

In most accounting systems, any transaction that affects one account must be offset by an equal and opposite transaction in another account. These transactions are referred to as debits and credits. A trial balance report displays, for a given reporting period, the total debits and credits that affect each account in your business, and what your ending balance will be in these accounts once you post the general ledger. This report normally gives you the opportunity to find errors in your data entry before you actually post the general ledger.

A transactions list shows all the business transactions that you've entered for a particular reporting period.

The general ledger displays in detail how every account in your business is affected by transactions during the reporting period. It also shows your 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.

Types of accounting systems

Most accounting systems fall into the two basic categories, single-entry or double-entry. If the sole reason for a system is to generate income tax information, a single-entry system is adequate. It can't maintain balance sheets and general ledgers, but it can easily provide the tax information you'd normally find on an income statement. You enter your income and expenses, and you divide these expenses and income into types and sources.

Double-entry systems are more commonly used, and they come in many sizes and with many features. They all require the entry of both a debit and a

credit account. Because of this feature, a double-entry system maintains a balance sheet that you can display at any time.

In such systems, you have the option of transferring values between any two accounts in the system. This means that you can move assets and liabilities from fixed to intermediate to current, write off depreciation, and do a number of other transactions affecting the balance sheet.

One feature of double-entry systems is their ability to accumulate the expenses incurred in producing a commodity, keep track of the sale of the commodity by posting to the sales account, and then transferring expenses to the cost of sales account. When you do this, you're doing cost accounting, and you're able to generate enterprise reports to determine the profitability of producing a particular commodity. This feature ties together the income statement and balance sheet: Any profits earned by a commodity become part of your equity and show up on the income statement and balance sheet with no additional effort in data entry.

Another feature found on some double-entry systems is the ability to do cash and accrual basis accounting. In farming, this becomes important when you want to obtain accurate information on your operation. Farmers and ranchers often have production periods that don't coincide with the calendar year.

For example, you report your taxable income on a calendar year basis, but your crops actually overlap the calendar year. 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 incurred pertain to both the crop that you did harvest and the crop that you will harvest next year.

This information is certainly better than no information at all, but you really don't know how profitable your crop was unless you can compare its sales with its own expenses. A system that allows you to enter accrued expense balances as previous year's expenses becomes valuable for your farm's management. While a cash system may be very useful for tax minimization purposes, you should use an accrual system to analyze the profitability of your business.

Financial management software

Financial management software can be classified as budgeting and decision-making software. These programs are relatively easy for a manager to learn to use. However, getting the information necessary to operate the software can take a lot of time and effort. To be an effective manager, you must realize the need to capture this information in order to effectively manage your operation. A good accounting program can provide you with the information you need.

Selecting an accounting system

Financial accounting is primarily concerned with reporting on the business 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 you've defined your purpose, shop around among computer stores to find the system that will serve the purpose you have in mind. The only way to make this decision is to test the system by operating it in the store.

As you're using the system, consider whether it's easy to understand and use. These are a few of the questions to ask yourself as you test the system:

- 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--fictitious account numbers, unbalanced transactions, or words when the system wants numbers?
- How easy is it to correct entries?
- Does the system print trial balances without immediately posting to a general ledger?

When you're selecting the accounting package, discuss it with your accountant or tax consultant. They should be able to determine if an accountant was involved during its development.

Evaluate the vendor of the accounting package and the company producing the software. Will the vendor keep you up to date on errors in current versions of the accounting software? Will the vendor offer updated versions of the software at a reasonable price? What about customer training? Will the vendor or a company representative be available to take calls from you on questions you might have? What about warranties, return policies, and repair facilities?

Friends, neighbors, and others who currently use the accounting package you're considering can give you an idea of its ease of use and the reliability of the vendor.

The last criterion in selecting a system is its price. A cheap system that does not meet your needs is a bigger waste of money than a more expensive system that does more than you need done. You may have a need for the system's advanced capabilities at some future date.

Additional considerations

In shopping around for an accounting system, you'll find other features that can be attached to some systems. These may or may not be useful to you. They include programs for check writing, payroll, accounts payable, and accounts receivable. These features are generally designed for businesses

with quite a few employees or customers. If you hire a large number of seasonal laborers, you may benefit greatly from an integrated accounting and check-writing payroll program.

An option that may have value for your operation is the ability to designate the location affected by a transaction--you can specify that a certain income or expense is related to production in a certain pasture or field. This enables you to produce, at some later time, income statements or enterprise reports for each field, farm, pasture, or other locations of your operation you wish to examine.

Another useful option is the ability to maintain inventories of physical assets as well as dollar values. For example, you could buy 500 stockers and later sell a portion of them. By entering the 500 head bought and the number sold, you can find how many head are left and their value from the general ledger.

Appendix D is a checklist of the features to evaluate when you select an accounting package. Use this checklist to make a side-by-side comparison of alternative packages to find the one that may best fit your needs.

Conclusion

Accounting systems are not the answer to all your financial problems. Doing your own accounting on your own computer won't necessarily save you time. You'll need a fairly substantial amount of time to get started, learning how to use your information and how to get it into the system. Experience is the best teacher, and you'll gain that only with time and by making a few mistakes.

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

You may need to improve your record-keeping to use the system. For example, you'll need to know how much fuel you've allocated to each commodity, how much of your crop you fed to livestock, how much labor you used for each crop, etc. Don't be overwhelmed by the multitude of features on the system. Start out using the basic features and work up to the more exotic ones.

Finally, the profit in a computer system isn't tied to its ability to help you do accounting--it's tied to its ability to help you make decisions. If the accounting system can generate information in a timely manner to help you make critical management decisions, you might consider purchasing one. If the system will simply prepare tax information or help you obtain a loan at the bank, you're probably better off letting a professional keep your books.

Chapter 7
Crop and Livestock Applications

Today's farm and ranch managers work in an atmosphere of volatile prices, uncertain export markets, inflation, the cost-price 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 the operation, including the effects of world and domestic markets and changes in government policy. The capabilities of microcomputers offer 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 four areas: 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, what its limitations and strengths are, and what value it will have in your operation. As we discuss these topics, keep in mind how you might reduce the risks of managing your operation by using a microcomputer.

Farm and ranch applications

One of the primary strengths of a microcomputer is that you can use it to store and rapidly retrieve information on your farm or ranch operation. With the right software, it can assemble the information, make the necessary computations and print the results in the desired form. You can then make decisions based on up-to-the-minute information without depending totally on a C.P.A. or anyone else.

The primary example of storage and retrieval software is a farm/ranch accounting system. You can retrieve information you've stored on the farm or ranch from the accounting package in the variety of ways discussed in chapter 6. Transactions lists, financial statements, tax forms, enterprise analysis, etc., can all be drawn from information you've 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. They could store name lists for later listing by alphabetical order, category, town, state, or ZIP code. For example, all potential grass seed dealers in Benton County could be sorted and listed from all the grass seed dealers in Oregon. Data base management system software, word processing software, or specialized mailing list software are the packages most often used for this purpose.

Livestock record keeping is another example of storage and retrieval software. Using a data base management system, you could maintain individual production records for each breeding animal in the herd. Then you could search and sort the production records according to any number of criteria. In the

case of a cow record keeping system, you could obtain reports on average birth, weaning, and yearling weights of each cow's calves over the last 5 years. Herd averages, sire reports, and cull cow lists are other potential reports.

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

The greatest unrealized potential for microcomputer applications involves the monitoring of 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 buildup. When heat and moisture reach 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 feed, and feed the animal accordingly. Other monitoring applications have included turning on irrigation sytems when soil moisture becomes critical and household security programs that automatically call police or fire departments. Monitoring applications come under the heading of remote-sensing software.

With suitable software, the computer can accurately and rapidly perform complex mathematical computations. The computer uses 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 you to think more about how to use the results of the computations to reduce your risks. Examples of decision-analysis software include finance and tax, crops and machinery, irrigation, livestock, marketing, and vehicle cost-analysis programs.

Finance software allows you to evaluate the interest rate, principal, and down payment alternative results of taking out an agricultural loan or financing land sales or purchases. You can analyze the net present value and internal rate of return of alternative investments and compare them for profitability.

A recently developed program calculates depreciation and investment tax credit alternatives for investments. Financial decision-analysis software available from commercial vendors includes interest income calculators, total farm profit analysis, enterprise budgeting, cash flow budgeting, break-even analysis, financial statement preparation, lease-purchase analysis, and partial budgeting.

Crop and machinery decision-analysis programs include break-even yield analysis, chemical and fertilizer use decisions, government program participation decisions, custom hire versus 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 or a 200-horsepower tractor. Costs per hour and per acre are calculated for the tractors and implements hitched to the tractors. Thus, you can make a better management decision by comparing the results of the program.

Using a break-even program, you could determine, for example, the yield of wheat you'd need to break-even with your expected yield of barley, given the costs of producing your crops and the price you expect for each of them. What if your barley yield turns out lower than you expected? You'll need less wheat yield in order to stay even with the barley. How much less wheat? A break-even program will help evaluate all these alternatives quickly and accurately. That is the primary advantage of a decision-analysis program.

Livestock decision aids have perhaps the widest range of applications 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 environmental conditions, etc., all add complications to livestock production decision-making software.

Hog software includes farrow-to-finish production planning; 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 decision-analysis software for crop marketing compares storage at harvest for future sale or selling on the cash market at harvest. Other programs estimate discounts for high moisture or damaged grain and evaluate 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.

Microcomputers are being 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--anywhere in the country. You can obtain decision-analysis programs, marketing information, government information, electronic mail, and other information through accessing one of these systems.

The University of Nebraska's AGNET and Virginia Polytechnic University's CMN are examples of time-sharing systems available to producers from state universities. Commercial systems such as Pro Farmer's Instant Update, the Reader's Digest Associations The Source, H&R Block's CompuServ, and AgriData Resource's AgriStar are available on a subscription basis. These commercial services provide the latest information on prices from the commodity exchanges

as well as news information relevant to the agricultural sector of the economy. Instant Update and AgriStar were designed for farmers and ranchers. Appendix A is a list of these networks.

The Source and CompuServe offer several hundred features to a user, including electronic mail, national and world news and information, the latest business-related news and information, and games and travel planning. CompuServ, which also offers electronic banking and shopping, is only available 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.

The most important features of CompuServe and The Source 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 for a selection of commodities. AgriStar, the most comprehensive agricultural system, offers decision aids, electronic mail, and on-line assistance, in addition to news, weather, and prices. In Oregon, an interactive system called AGMAN provides the latest market and weather information available for the state.

These represent the services of only a few on-line services 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. You must use a minimum of $10 per month of connect time.

CompuServ 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-6-months fee of $199, plus connect time and information fees. After the first 6 months, the fee will range from $75 to $110 per month. For all of these services you need communications software and a modem (remember to include these charges). Although a number of services are free, the more comprehensive and timely services 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.

Rising transportation costs may mean that Extension Service educational meetings will be offered through the microcomputer. The use of a microcomputer for business applications, word processing, home security, education and entertainment are on the increase. Today, approximately 5% of all farmers and ranchers have microcomputers. As they become cheaper and as more applications become available, we'll likely see the majority of farmers and ranchers using microcomputers in the home or through state university Extension Services.

Limitations

Equally important to an understanding of the applications of microcomputers is the recognition of what they can't do. The most important limitation in the use of any system is finding easy to use software. Agricultural software from private and state university sources has increased in the past 2 years. Spend time to think carefully about finding and selecting the right software for your operation. Figure out what you need, try out a number of packages, and select the software that fits your situation.

A microcomputer is a powerful tool for decision-making; however, the computer and software are only tools, with no more intelligence than a lead pencil. You have to devote the time and effort to analyze the information from the computer to make sound decisions.

If you believe running data through a computer makes it perfectly reliable and error-free, you're mistaken. If the information you put into the computer isn't reliable and error-free, then the analysis from the computer will not be reliable or accurate. Experienced computer users recognize the "GIGO" problem (garbage in--garbage out) as a serious problem in effective computer use.

User-friendly software, such as Lotus 1-2-3 and MultiPlan electronic spreadsheets, helps overcome the need for a producer to be a computer programmer. But they don't eliminate the need to use the right formulas in the right places in order to give a reliable solution to the problem. If you plan 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 that you know the answer to.

Many problems require the use of sophisticated mathematical procedures in order to solve them. The microcomputer uses procedures that previously were solved only on mainframes. The major limitations in using these software packages seem to be these: the producer's lack of knowledge of the procedure, information insufficiently accurate to use the procedure, and the producers inability to interpret the results.

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

Buying a computer will not reduce management time; in most situations, it will increase the time--but it will provide you with more sophisticated information. 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 for you.

Microcomputer hardware and software will undergo technological change for some time. Farmers and ranchers have seen the same thing happen to farm and ranch machinery. Evaluate the microcomputer and crop and livestock software on the basis of its potential to help earn you a profit. The key question should be, will it pay for itself in your operation?

Software sources

Information on software for agricultural use is not always easy to find. The periodicals Doane's Agricultural Computing, Successful Farmer, and AgriComp identify sources and evaluate selected packages. Farm and ranch magazines carry stories on producers who use microcomputers in their operations, often listing the applications they made and the specific software they used. Contact with the people featured in the stories may provide more information on the 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 don't 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. Robert Strain of the University of Florida developed a publication that classifies and lists the computer software available from Land Grant universities around the country. This publication may be examined at your county Extension office or obtained for a charge by writing him at the University of Florida (appendix E). State universities and private companies periodically hold computer education conferences. Conference sponsors often invite commercial software vendors to participate by displaying their programs for the producers who attend.

Year 2000 computerized farm

Backed by a $500,000 grant from the W. K. Kellogg Foundation and a $285,000 grant from Texas Instruments, Inc., Texas A&M University has launched a 3-year, $1.4 million project to design a year 2000 computerized farm. The project involves establishing a full-fledged computer center at the university's Stiles Farm Foundation, a 3,300-acre demonstration farm and ranch for the Texas Blacklands area. Some 2,200 acres of the farm are devoted to crops; the remainder supports pasture, waterways, ponds, and the farm headquarters. The farm produces cotton, corn, sorghum, wheat, oats, vegetables, hay, cattle, swine, and catfish.

The computerized farm project applies computer technology to all aspects of the farming operation. The technology applied will then be tested to provide information that can be transferred directly to other commercial farms and ranches. A total farm information system will be developed to include record keeping and analysis, marketing information and strategy analysis, inventory control, production management systems, risk analysis and total farm planning.

Tours, field days, and scheduled visits will demonstrate project results. Farmers, ranchers, agribusinesspeople, educators, and producers will be able to review and evaluate commercial and public domain agricultural software in a software library located at the farm.

Conclusion

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

Farmers or ranchers should only acquire a microcomputer when they can acquire the needed software to make it a profitable investment and when they can devote enough time to effectively learn how to use it. Remember--the microcomputer is only a tool to help you become a more effective manager.

Chapter 8
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 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 white wheat in eastern Oregon in 1983 and 1984, you find that during this marketing period, cash prices ranged from a low of $3.52/bushel to a high of $4.35/bushel. This $0.83/bushel difference would have returned $62,250 in additional gross revenue to a typical (2,500-acre) Columbia Basin wheat farm producing 60 bushels per acre. Notice the emphasis on gross revenue--storage and holding costs would have been incurred past the harvest period.

The point is that marketing becomes more complex with volatile price movements, and producers don't 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 5 years from now.

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

Marketing uses of the microcomputer

There are six areas in which a farm or ranch microcomputer can be used in marketing and policy:

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.

Market planning and decision alternatives

Today's marketing decisions are complex. You need to evaluate a number of alternatives before you begin production or determine your prices. A major difficulty in market planning is not knowing what price you'll get at the time the commodity is available for sale or what environmental factors will affect your production process.

You're not likely to produce a 100% accurate estimate of prices and yields. However, every farmer and rancher has information about marketing situations and production risks. Market plannning 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:

1. calculate projected production and marketing costs;
2. evaluate expected benefits from each of the available marketing alternatives; and
3. consider cash flow needs within the marketing program.

If you use the futures market and forward contracting, your market period for a major crop can begin before you plant your crop, and it can extend several months after harvest. If a microcomputer with 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 you know how much you invested in the crop and if you can accurately estimate your remaining production costs from past records, you 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. When you add the need for accurate timing to the array of marketing choices available throughout the year, the comparison of the various alternatives can become quite time-consuming. Decision-aid software can help you evaluate the timing and alternatives of storage versus sell, select the best market outlet, compare contracting versus hedging, and evaluate the new agricultural options that are now traded.

For example, storage or immediate sale is a decision that wheat producers face each year. Cattle producers must decide whether to market feeder animals or carry them through the feedlot. With a preestablished marketing plan, decision-aid software can help the producer evaluate potential alternatives in order to best meet planned objectives.

Historical basis information ("basis" is the difference between cash and futures prices) is important in analyzing some marketing alternatives. The microcomputer is very useful in calculating a basis history for several locations. Analyzing these and other marketing activities are essential to formulating a successful marketing plan.

Various commercial software packages that address market planning and decision issues are available from local vendors. Furthermore, Extension Services at a number of Land Grant universities, including Oregon State University, distribute software to address some of these marketing decisions.

Market information

A key ingredient to marketing planning and decision analysis is marketing information. Acquiring marketing information is part of the marketing process. The news media provide a significant amount of market situation and outlook data. However, you may find it hard to use this information effectively because you're often not making marketing decisions when you receive the data, and it comes with little or no analysis. The farm or ranch computer can help you acquire and store marketing information from these sources for later evaluation and analysis that will support the decisions that you must make.

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. The microcomputer, operating as a dumb terminal, can receive reports generated for specified commodities: if you can then transfer the data to a secondary memory device to be retained as part of a marketing 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 pricing from most of the commodity exchanges, USDA reports 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 data base 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 today. They want to check the prices and obtain important market-related weather and crop report information, including the latest USDA reports on supply, demand, carryover, acreage, and yield forecasts.

Electronic data information and retrieval systems can be used to answer producers' questions and acquire market information. Examples of such services are AGMAN, AGNET, Agridata, Dialcom, Dialog, Compuserve, Telplan, and Grassroots (see appendix A). Each service provides somewhat different information; some cover only one region; costs may vary; and some require specific hardware. Consequently, you'll need to review each subscription

service or data retrieval system in terms of your operation, marketing plans, and needs. The decision of which microcomputer time sharing system to use won't be easy for you, but the skilled marketers will likely avail themselves of at least one system.

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 the area of marketing 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 analyses are useful.

Fundamental price analysis focuses on supply and demand conditions, general economic conditions, government policies, and transportation availability. Using the microcomputer to rapidly access situation reports helps you gain a better understanding of these fundamental factors and helps you evaluate the market plan. Further analysis is often necessary for effective projections.

You can use microcomputer forecasting programs 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 may be more useful for long-term planning than for day-to-day market comparisons).

Technical (or price movement) analysis is based on the premise that the behavior of futures prices contains valuable market information that 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 very well adapted for use in technical analysis. Historical data to support this analysis may be downloaded from marketing information time-sharing sources or may be purchased as part of a software package. You could enter the data yourself, but this is a time-consuming process.

Graphics capability is essential to fully use 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. You must do this task by hand if you don't have computer support. An example of a graphic market printout is shown in figure 1.

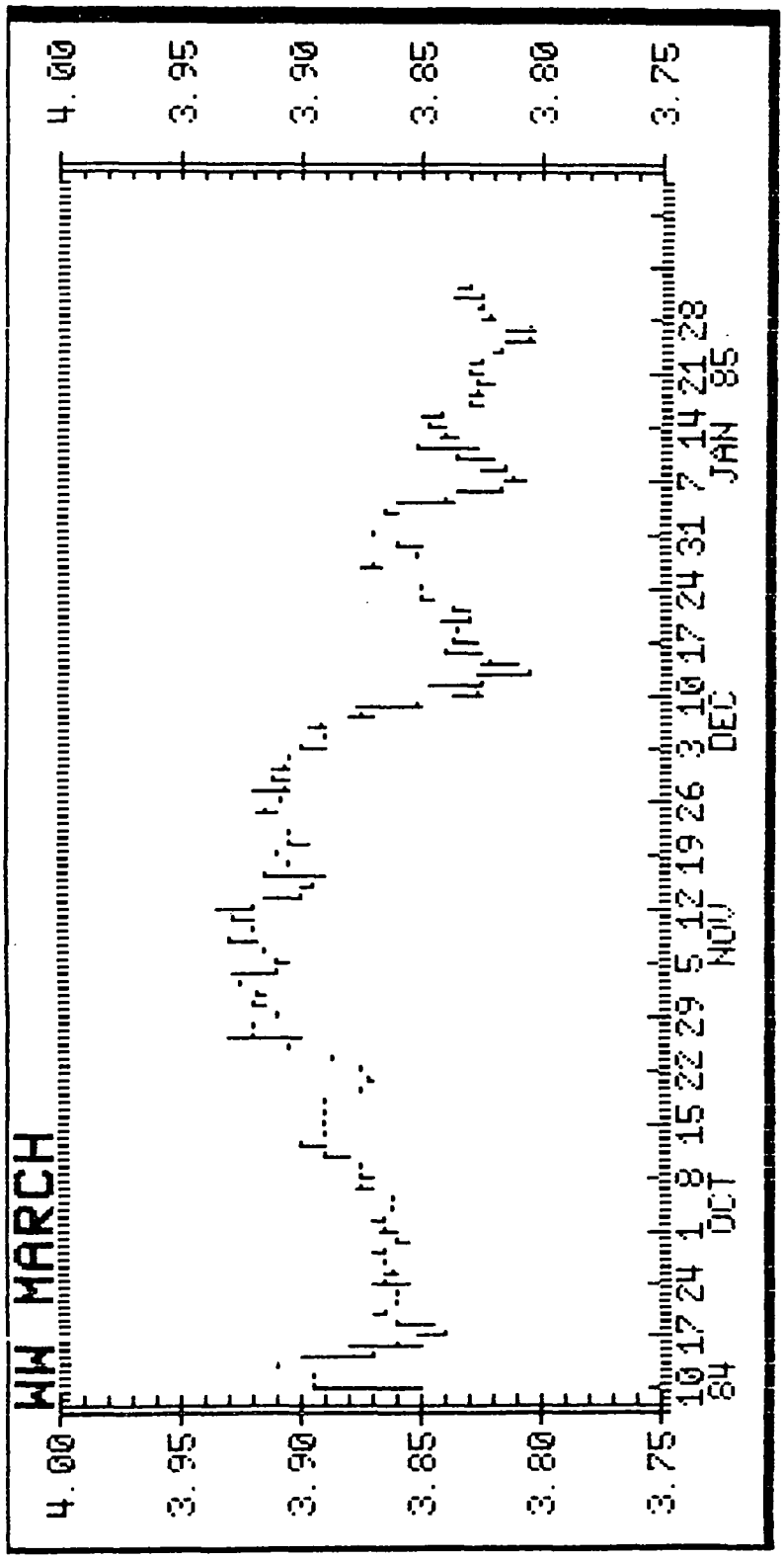

Figure 1. A Plot of High, Low, and Closing White Wheat Prices in Portland.

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. The computer, however, can be of significant assistance by performing the repetitious mechanics of charting and calculating large series of numbers very effectively. This makes the tool available 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.

Policy evaluation and analysis

Over the past several years, farmers have been faced with decisions about participating in farm programs. These voluntary programs, without offsetting or cross-compliance, opened the participation decision to individual crops and/or farms. The increased flexibility of the programs, along with PIK and advance diversion and deficiency payments, increased the complexity of these financially important 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 and provide the calculations necessary to assess the impact of farm program participation for the individual crop/farm. (Spreadsheets are more specifically covered in chapter 9.)

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, you can analyze participation versus non-participation decisions numerous times under different pricing, yield, and acreage alternatives. It's another element of risk management that the computer can aid in effectively analyzing.

If you use spreadsheet templates for policy analysis, you must use software that includes the latest program update. New government programs are announced each year, and they're often modified during the year. Therefore, these computer programs will have a shorter shelf life than most others that you'll purchase for your software library. When you become experienced with spreadsheets, you may find it useful to construct your own policy decision spreadsheets from materials provided by state Extension Services.

Computerized marketing

In order to improve the transmission of market information, data bases on mainframe computers can be used as electronic billboards to stimulate sales. For instance, a rancher who needs hay can store a message in a data bank that advertises the quality and quantity desired, and potential sellers can leave a response on file or contact the rancher 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. 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.

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 similar ones in other years? Compared to what other producers did? Compared to what you expected? You'll need to review each comparison and incorporate the knowledge into 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 your future marketing performance.

Microcomputers offer the technology not only to monitor the marketing decisions for this year's production, but also to look back and evaluate past decisions efficiently. This is particularly important in analyzing previous basis and price estimates compared to actual outcomes. Another example 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 software package for a data base management is useful in this development.

Conclusion

Profitable marketing takes time and understanding. The microcomputer helps you increase your understanding of the marketing process while saving you valuable time. Efficient marketing will no doubt be one of the major keys to farm survival. In the future, onfarm computer technology will become as important and commonplace on commercial operations as your tractor. Without the one, you may have little need for the other.

Chapter 9
Electronic Spreadsheets

Electronic spreadsheets have become extremely popular with microcomputer users in many areas. Businesses use them for sales and budget forecasting; people use them at home to balance checkbooks and figure taxes; educators use them to teach mathematics. This chapter explains the applications and use of a spreadsheet to agricultural problems. We'll also discuss electronic spreadsheets in general and their various components.

The spreadsheet defined

Think of a spreadsheet as a large electronic piece of paper. This piece of paper may contain textual information, numerical values, and formulas. A group of related text, values, and formulas may be saved as a file on a diskette and be recalled into the spreadsheet at some future time, eliminating the need to retype the data. Thus, with this electronic "piece of paper," you can erase it clean, fill it with data, and erase it many times without ever using a pencil or eraser.

This electronic adaptation of paper and pencil gets its power from the data processing capabilities of microcomputers. Calculations are performed on a spreadsheet almost instantaneously. You can calculate results for a wide range of data values, and the calculations will always be numerically accurate.

So, let's define a spreadsheet this way: It's a software program that creates an electronic worksheet on which you can easily enter, calculate, and manipulate data to generate results for one or many problem situations.

Figure 2 is a graphic representation of a spreadsheet. The shaded rectangular area is the area the user can work with--it would be over 5 feet wide and 3-1/2 feet long if it were completely filled with data. The enlarged portion of the spreadsheet in figure 2 is an example of the amount of the worksheet visible at any one time on the computer display. Thus, the display is only a small "window" into the large worksheet.

The spreadsheet described

A spreadsheet has several terms associated with it that must be defined and understood. As we discuss these terms, refer again to figure 2. The various locations in the spreadsheet are identified by unique letter and number combinations, of which there are over 16,000! These locations have two components, a column designation and a row designation.

Columns are formed by vertical lines, and they appear up and down on your computer. A typical spreadsheet contains at least 63 columns, labeled with either letters or numbers. In figure 2, the columns are labeled with letters,

beginning with A, B, C..., Z, moving on to AA, AB, AC..., AZ, BA, BB, BC, ..., BK, etc.

Rows are formed by horizontal lines, and they appear sideways on your computer. Rows are usually numbered beginning with 1 and run up to 255 or more. The rows and columns combine to form a grid into which you can enter data.

The intersection of a column and a row forms an area where you may enter data. This area is referred to as a cell. A spreadsheet with 63 columns and 255 rows contains 16,065 cells (63 x 255). Each cell is referenced by its column designation and row number. For instance, the cell formed by the first column and first row intersection is called A1. The cell directly below A1 is cell A2--same column (A) but one row down (2). Thus, we have a systematic manner in which to refer to each cell in a spreadsheet.

While you work with a spreadsheet, you have to know your position (cell location) on the sheet. Your location is marked with a highlighted rectangle called a cursor, which always identifies your current position.

The cell that contains the cursor at any point in time is called the active cell. This is the cell to which you'll add new data. By moving around the sheet, you change the active cell and (therefore) you choose where you want to enter data the next time.

Each cell of a spreadsheet may contain labels, numbers or formulas. Labels are usually entered to describe or define nearby numerical entries. Numbers are entered for use in calculations. Formulas may be entered as mathematical operations: addition, subtraction, multiplication, division, etc. A spreadsheet file constructed using labels, numbers, and formulas is called a template.

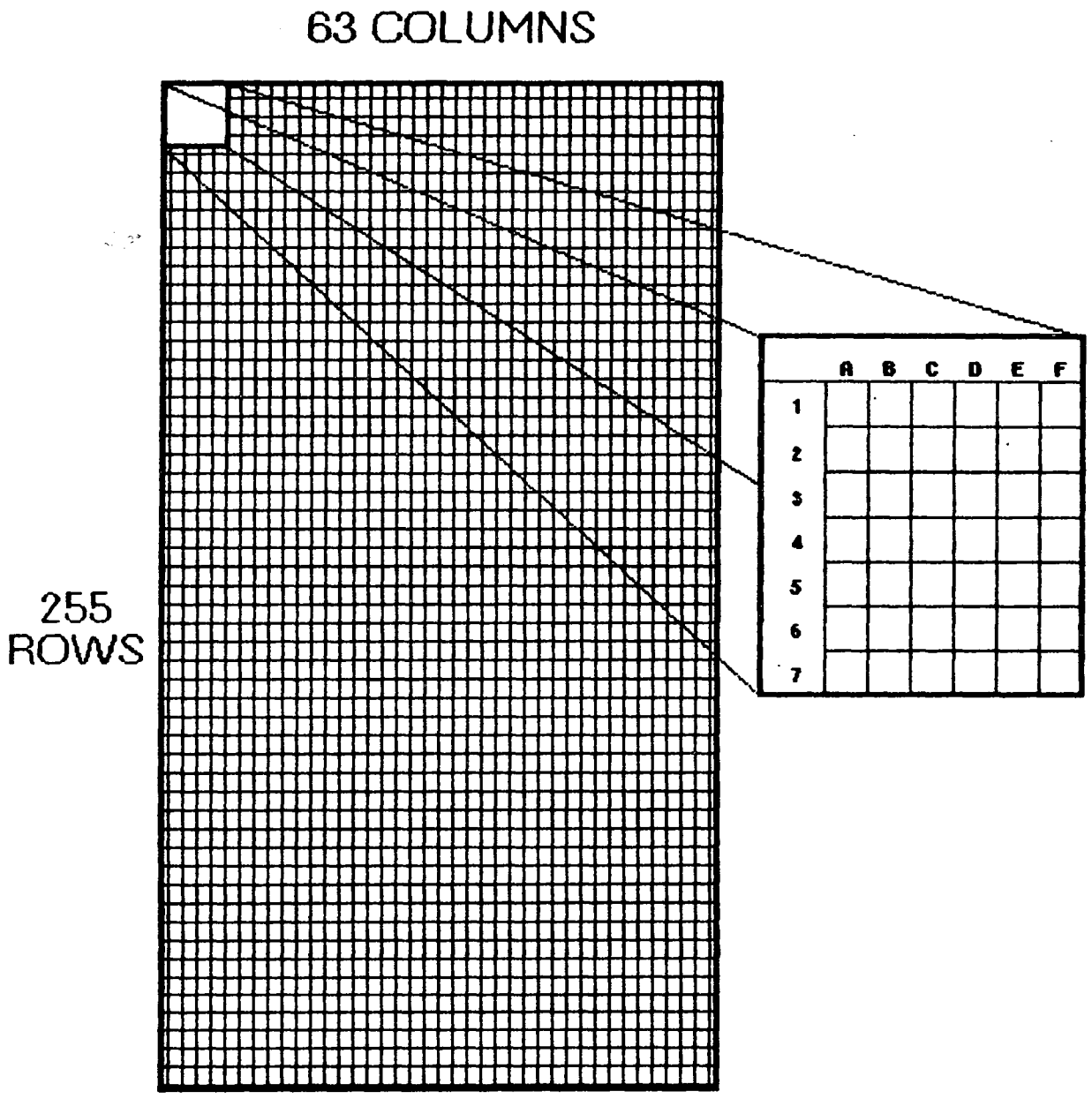

Figure 2--A graphic representation of a spreadsheet

Spreadsheet applications

Spreadsheets are well suited to any application involving numerical analysis. They are excellent tools for use in decision making, where your analyses of budgeting, investment analysis, and projection often rely heavily on numerical data. The following figures are examples of spreadsheet applications to show you the power and versatility of spreadsheets.

Figure 3 contains a spreadsheet template with cost of production information for winter pears in Hood River Valley. This fairly simple template (8 columns and 56 rows of a spreadsheet) shows the production practices and related expenses of a pear orchard.

This cost study is constructed based on three key types of information: yield per acre, operator labor wage rate, and hired labor wage rate. When the data is entered as shown, changing any one of the key values will change many different costs throughout the template. This spreadsheet lets the grower analyze the impacts of a change in yield or wage rates, and it almost instantly recalculates total cost per acre and total cost per ton.

Another spreadsheet application is shown in figure 4. This template calculates the cost per pound of crude protein (CP) and total digestible nutrients (TDN) for five different feedstuffs. It could be used to compare the costs of providing CP and TDN in livestock rations, on a limited basis. As the costs per ton of the five feedstuffs change, the costs per pound of CP and TDN are automatically recalculated. It's possible to determine the least expensive source of CP and TDN.

WINTER PEARS (Hood River Valley)

Based on:

1. 30 acres of pears on a 60 acre orchard .
2. 110 trees per acre.
3. Yield per acre (36 bins). 18.0
4. Operator labor @ $8.00
5. Hired labor @ $5.50

Item	Labor Hrs.	Labor Value ($)	Machinery & Equipment Operating ($)	Machinery & Equipment Ownership ($)	Other Item	Other Value ($)	Total cost ($)
Cultural Operations							
Pruning:							
88 trees @ $2.25 per tree		198.00					
22 trees @ 10 min.per tree	3.7	29.33					227.33
Rake and shred brush	2.0	16.00	18.66	20.87			55.53
Tree replacement					Stump		
Cut & remove(4 trees/ac.)	3.0	20.25	4.21	4.62	removal	45.00	74.08
Replant(8 trees @15min.ea)	2.0	11.00			Trees	38.00	49.00
Fertilize	.3	2.00	1.42	3.86	Mtls.	32.00	39.28
Herbicide	.7	5.36	3.75	6.68	Mtls.	20.00	35.79
Bee rental					Rent	22.00	22.00
Mow (4X)	3.0	24.00	26.68	19.36			70.04
Insect&disease control(8X)	4.0	32.00	31.72	65.92	Mtls.	177.40	307.04
Tieing and propping	1.0	5.50					5.50
Rodent control	1.0	8.00	4.21	4.62	Mtls.	8.81	25.64
Irrigate (3x)	5.0	33.75	31.40	33.68	Water assess.	20.00	118.83
Harvest Operations							
Picking ($11.00/bin.)		396.00			bin rent	52.00	448.00
Yarding & supervision	6.5	43.88	31.40	13.68			88.96
Hauling	2.0	13.50	36.72	79.48	Custom	39.00	168.70
Clean-up	1.0	8.00	13.34	9.68			31.02
Other Charges							
Other labor	.5	3.38					3.38
Other orchard equipment			5.00	15.00			20.00
Miscellaneous						45.00	45.00
Bldg. repair & maintenance	2.0	13.50			Mtls.	30.00	43.50
Pickup	6.0	48.00	47.10	20.52			115.62
Interest: Operating capital (15%)						48.69	48.69
Land & bldgs. ($5,000/ac. @ 12%)						600.00	600.00
Trees ($3,000/ac. @ 12%)						360.00	360.00
Depreciation: Trees						75.00	75.00
Buildings						80.00	80.00
Land taxes ($1215/ac. @ 1.5%)						18.20	18.20
Overhead						100.00	100.00
Total Cash Costs Per Acre		686.21	255.61	19.94		647.41	1609.17
Total Non-cash Costs per Acre		225.24	.00	278.03		1163.69	1666.96
TOTAL COST PER ACRE		911.44	255.61	297.97		1811.10	3276.12
TOTAL COST PER TON (18 ton yield)		50.64	14.20	16.55		100.62	182.01

Figure 3--Winter pear cost of production in the Hood River valley

	A	B	C	D	E	F
1						
2			FEEDS TABLE			
3						
4		NAME	DRYMATT%	PROTEIN%	TDN%	
5						
6		CORN	89.00	10.00	88.00	
7		GR SORGM	89.00	12.50	83.00	
8		OATS	89.00	13.60	76.00	
9		BARLEY	89.00	13.90	83.00	
10		WHEAT	89.10	14.60	88.00	
11						
12		AVERAGE	89.02	12.92	83.60	
13						
14						
15		NAME	COST/TON	$/LB CP	$/LB TDN	
16						
17		CORN	115.00	.58	.07	
18		GR SORGM	95.00	.38	.06	
19		OATS	120.00	.44	.08	
20		BARLEY	131.00	.47	.08	
21		WHEAT	136.00	.47	.08	
22						
23						
24						
25						

Figure 4--Cost per pound of CP and TDN spreadsheet template

Finally, figure 5 shows an IRS 1040 tax form calculated using a spreadsheet. Supporting tax forms (such as schedule F or schedule W) could also be constructed in a similar way. This is a good example of a single application that has the potential of paying for your entire computer hardware and software investment in just 1 year.

```
    |      A      ||      B      ||      C      ||      D      ||      E      |
 95|::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
 96|FORM 1040
 97|7. Wages, Salaries, etc.                .00          .00           .00
 98|8. Sched. B:  Interest                  .00
 99|9a.           Dividends                 .00
100|12. Sched. C                         20000.00
101|13. Sched. D                             .00
102|19. Sched. F                             .00
103|21. Other Income                        .00
104|                                  ------------
105|22. Total Income                     20000.00
106|29. Marital Deduction                    .00
107|                                  ------------
108|32. Adj. Gross Income                20000.00
109|TAX COMPUTATION
110|34a Itemized Deductions              8000.00
111|34b Charitable Contribs.                .00
112|                                  ------------
113|35.                                  12000.00   Subtract 34a or 34b
114|                                  ------------          from 32.
115|36. Exemptions                       5000.00   ($1000 * number you
116|                                  ------------                claim)
117|37. Taxable Income                   7000.00
118|                                  ------------     Current    Next Tax
119|38. Tax                               411.00      Bracket     Bracket
120|::::::::::  Tax Rate---------------)                 .12          .14
121|::::::::::  Taxable Inc. Threshold-)              5500.00      7600.00
122|CREDITS
123|43. Investment Credit                1000.00
124|                                  ------------
125|48. Total Credits                    1000.00
126|                                  ------------
127|49. Tax Minus Credits                    .00
128|OTHER TAXES
129|50. Social Security Tax              2260.00   20000.00 (--Total
130|52. Invmt Credit Recapt.                .00     self-employment
131|                                  ------------          income.
132|56. Total Tax                        2260.00
133|PAYMENTS
134|57. Fed. Tax Withheld                   .00
135|58. Estim. Tax Payments                .00
136|                                  ------------
137|64. Total Payments                       .00
138|                                  ============
139|65./68. Fed. Tax Due                 2260.00
```

Figure 5--Income tax Form 1040, constructed on a spreadsheet.

A spreadsheet can greatly increase your tax management skills with only a small time commitment on your part. Imagine the convenience of being able to calculate your tax liability for a given level of expenses and income--and then recalculate your tax liability for several different expense and income options. A spreadsheet such as the one shown in figure 5 allows you to easily examine these options, and many others, by simply changing a few numbers and recalculating all results.

Conclusion

This chapter presented basic information necessary for understanding a spreadsheet. Spreadsheets contain many other features that space didn't permit us to examine. However, the examples we did present illustrate the power and versatility of electronic spreadsheets and demonstrate their potential usefulness in agricultural applications.

You'll find additional spreadsheet applications for agriculture in two books; Spreadsheet Applications for Animal Nutrition and Feeding and Spreadsheet Software for Farm Business Management (see appendix E). Both are filled with spreadsheet applications and instructions for using spreadsheets.

Chapter 10
Data Base Management Systems

Another generic class of microcomputer programs is referred to in computer jargon as data base management systems (DBMS). If you've visited a computer store, talked with anyone interested in using computers, or participated in any kind of training or educational program on computers, you've probably heard people refer to data base management systems. What is a DBMS? What can it do for you? How does a DBMS work? Should you consider buying one for your computer? These are questions most people ask if they have just had an "encounter" with the term DBMS. The purpose of this chapter is to help you answer some of these questions.

Data base: A definition

A data base 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 data base is your telephone directory. This data base, normally in printed form, contains the names, addresses, and telephone number of everyone in your local service area. The key that makes the telephone directory 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's related to a specific name of an individual, business, or agency, the data base becomes useful to locate or call someone. This is possible only because of the specific way in which the data base is organized.

You can probably think of several data bases that you're 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 stock market report, and the box score for a baseball game.

What sets these data bases apart from the information in a newspaper article or a book is the way in which the information is organized. In all of our data base examples, the information is defined in a specific way to make it easy to understand and use. You don't have to search through a mass of information to find a specific item that you're looking for. The organization of the data base allows you to find the information quickly and with a minimum of frustration. The organization uses some key to relate items to one another.

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

Some examples of column headings for common data bases might be:

Data bases:	Column headings		
Phone book	Name	Address	Phone number
Dictionary	Word	Definition	
Catalog	Item	Description	Weight
	Size	Cost	Part no.
Stock report	Stock	Shares traded	High/low

Data base management system

Now that you have an idea of what a data base is, you're probably asking where the computer comes into the picture. How are computers and data bases related? The answer is fairly simple!

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 your data bases. That is all a computerized data base management system amounts to: using a computer to help you organize your information in a specific way for easy retrieval. The computer won't do anything you couldn't do by hand, but it helps you do it faster and more easily.

As a result of this potential use of the microcomputer, a number of data base management systems have been developed to help the computer user develop specific data base applications. Some of the common programs available are: dBASE II and dBASE III, TIM (Total Information Management), RBASE 4000 and RBASE 5000, Sensible Solution, Perfect Filer, VisiFile, Friday!, Infostar, and Probase.

All these programs are different, but they have a common purpose--to help you organize your information, put it on the computer, and easily manipulate and retrieve it. That's their only function. There's no magic involved, even though it may seem like it when you see some of the things a well designed, computerized data base management system can do for you.

Common applications

Some of the more common applications of DBMS involve:

invoice preparation	livestock herd record-keeping
inventory maintenance records	crop production record-keeping
payroll management	machinery management
customer lists	personnel files

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 records, livestock records, cost of production records,

or machinery maintenance. Just about any records you keep for your farm or ranch business 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 want and/or need on a timely basis.

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

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

General types of data base management systems

If you feel that a DBMS might be useful and you want to start shopping for one, you'll find two basic types, hierarchical/network and relational.

In a hierarchical/network system, all relationships between bits of information are fixed and inflexible. You can't change relationships between pieces of information or data items. This type of software is useful when dealing with bureaucratic organizational structures, family trees, genetic research, or any other application that has a strictly pyramidal structure. However, because of their complexity and storage space requirements, their use is limited primarily to large mainframe or minicomputers.

Relational data base management systems allow relationships between information to remain flexible. The program allows you to establish and change relationships as you wish. Any information (data) can be related to any other information in the data base. This leads to a minimum of data duplication and gives you the ability to investigate many different relationships between items of information in your data base.

The type of DBMS you ultimately buy and use will depend completely on your application needs. Either the hierarchical or relational data base system will do the task for which they were designed.

Because of the flexibility offered by the relational and the complexity of the hierarchical/network DBMS, we'll limit our discussions to those that are relational in nature. Conceptually, the relational systems should have the ability to do any task a hierarchical system can. However, relational systems may not accomplish a given task as efficiently or effectively as more specialized hierarchical systems.

How data base management systems operate

The specific way any DBMS works 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 that you enter and the relationships established between them as you enter them into the data base. All information that you store in the data base must be related to a specified key word. In general, these systems are fairly limited in their application and are seldom used in agriculture.

The most powerful DBMS are those that are programmable. They give the user the ability to do just about anything with the information in the data base. A programmable system allows the computer user to use a data base programming language. This makes it very powerful, but difficult, to use. The user almost has to be a computer programmer to effectively use a programmable DBMS.

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, the menu-driven DBMS has been developed. It makes most of the power of the programmable system available to the typical (nonprogrammer) microcomputer user.

The term "menu-driven" simply means that all the data base design that tells the computer how to store, manipulate, and retrieve information is done by responses you make to questions or command options displayed on the screen in a menu style. This makes the DBMS "user friendly." It may not be as powerful as a programmable system, but you don't need to be a programmer to effectively use a menu-driven system.

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 package using an appropriately powerful DBMS. If you don't need the power of a programmable system, the menu-driven system may work very well for you, and you should be able to design the application yourself.

Data base terms to know

Before you begin using any DBMS, there are general terms to know. In general, they apply to all computerized data bases. Knowledge of them is a prerequisite to effectively use any DBMS. The terms are files, records, and fields.

An electronic file is a little different 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 data base. An example file would be your address book. If you were to enter all of your information from your book

into a computerized DBMS, it most likely would be organized into a table with columns that identified the information. An example of such a table is shown in figure 6, which compares a typical address index card file and a corresponding electronic address file.

Look at figure 6. Can you see how the address data base 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.

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 data base. Each record in the address file is divided into six fields (name, address, city, state, ZIP code, and phone number) that corresponds to the table headings in the electronic file (figure 6).

ADDRESS CARD

NAME:	>>> James Roberts		
ADDRESS:	Rt. 2, Box 551		
CITY:	Burns		
STATE:	Oregon	ZIPCODE:	97363
PHONE:	(503) 573-1168		

ELECTRONIC FILE

NAME	ADDRESS	CITY	STATE	ZIP	PHONE
Adams, Bo	2121 Grand St.	Madras	OR	97211	503-221-4523
Jones, Ted	1414 Union St.	Ontario	OR	97421	503-555-2211
Kretch, Art	2322 Ardmore Av	Enterprise	OR	97772	503-451-5861
Roberts, James	Rt 2 Box 551	Astoria	OR	97363	503-590-2214

Figure 6--Address file example

Regardless of the DBMS application you're considering, the use of files, records, and fields will be basically the same. This type of organization allows the computer to help you to effectively and efficiently store, manipulate, and retrieve your information. It adds organization to the information so that the computer can help you manage it. It's referred to as the data base's "structure."

Planning prevents problems

You must carefully plan your application to effectively use any data base management system. The easiest way to attack designing your application is to decide exactly what you want your final output to look like. Think in terms of the output you desire from your data base and how it should be organized. This determines what data (information) you'll need to enter into your data base and how it will be manipulated once it is entered.

You must have your output tables well specified. This not only determines the exact fields in each record in your data base file, but it also defines the exact size of each field in your records.

You'll most likely run into limitations as you establish your data base structure. The first may be something as simple as the size of the printed page. If you're designing a report in table form and it is to fit on a normal page using a standard printer, you're limited to 80 characters of print across the page. Depending on the number of fields and the size of each field, you may not be able to get everything on the page. This may force you to make compromises 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 the kind of compromises that you may need to make. The easiest way to minimize both the compromises and the frustration that goes with it is to plan your application before you ever go to the computer.

Write down exactly what kind of report you want from the computerized data base. Specify exactly what you want your final output to look like (will it fit on the page?). Once you determine this, decide what information you must obtain and enter it into your data base. Proper planning of your application before you even approach the computer will minimize both the frustration and the time involved in getting your computerized data base management system up and running.

Hardware considerations

Before you buy a DBMS, consider the ability of your microcomputer to run it. Almost any business-oriented small computer can effectively run a data base system. However, if your plans include a data base that will contain large volumes of information, you'll require a minimum of two floppy disk drives with 360,000 characters 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 effectively use a DBMS. Above all, make sure the DBMS will run on your computer before you purchase it.

In many applications you may find a hard disk to be very useful or even necessary. Hard disks can easily store several years of production records for average-sized farms and ranches. If you're maintaining inventory records, large mailing lists, or entering large volumes of data, you'll need a hard

disk. However, if your applications won't involve a great deal of data, a floppy disk system should be sufficient.

Conclusion

A data base management system may prove useful to you if you're going to use your computer system to help you keep up with various record-keeping activities. If you're interested in a DBMS, be sure to shop around, look at a variety of systems, and select one that will best meet your needs. There's no need to buy the most powerful system available if you can't effectively use it. 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 application, is someone who knows how to use it. If you have friends, neighbors, or relatives who are familiar with the system you're learning to use, talk to them. They've been down the same road you're about to travel and should be able to help you. They can most likely show you how to avoid many pitfalls and get you "up and running" with a minimum of time, trouble, and frustration.

Appendix A
Agricultural Computer Networks

System	Contact	Type of Service
AGMAN	Chris Johnson Department of Agricultural & Resource Economics Oregon State University Corvallis, OR 97331-3601 (503) 754-2942	Cash and futures prices, weather information, agricultural reports.
Agnet	Curt Brandhorst Agnet-University of Nebraska Lincoln, NE 68583-0713 (402) 472-2033	Problem solving for farm management, market prices, USDA reports.
AGRICOLA	National Agricultural Library Information Systems Division 10301 Baltimore Blvd. Beltsville, MD 20705 (202) 344-3813	Agricultural research, information retrieval, Extension publications.
AgriData	AgriData Resources 303 E. Kilbourn Milwaukee, WI 53202 (800) 558-9044	Cash and futures prices, price analysis programs, agricultural reports.
CompuServe	CompuServe 5000 Arlington Centre Blvd. Columbus, OH 43220 (800) 848-8199	Agricultural news, reports, information.
ESTEL	ESTEL Maryland Cooperative Extension Room 3212, Symons Hall University of Maryland College Park, MD 27042 (301) 454-4550	News, market information, weather reports.
Grassroots	Gary Enns Grassroots America 1001 Jefferson St., Suite 100 Wilmington, DE 19801 (302) 652-2414	Market prices and analysis, newsletters, reports.

System	Contact	Type of Service
INFOLINE	Beth Killian Doane Publishing 11701 Borman Dr. St. Louis, MO 63146 (314) 569-2700	Electronic mail, software reviews, software, price analysis.
Instant Update	Instant Update 219 Parkade Cedar Falls, IA 50613 (319) 277-1278	Agricultural information, prices, market analysis.
National Weather Service	Joanna Dionne Climate Analysis Center World Weather Bldg., Rm. 201 Washington, DC 20233 (301) 763-8071	Detailed weather data, reports.
NPIRS	User Services, NPIRS Entomology Hall Purdue University West Lafayette, IN 47907 (317) 494-6614	Pesticide registration and information.
ProNet	ProNet 7950 College Boulevard Overland Park, KS 66210 (913) 381-6310	Commodity prices, analysis, availability information.
SCAMP	Jim Tete, IPM Program NYS Agricultural Exp. Station Geneva, NY 14456 (315) 787-2208	Pest information, retrieval, and modelling.
The Source	Source Telecomputing Corp. 1616 Anderson Rd. McLean, VA 22102 (703) 734-7500	Commodity prices, electronic mail, information.
TELPLAN	TELPLAN Dept. of Agricultural Economics, Room 27 Agriculture Hall Michigan State University East Lansing, MI 48824-1039 (517) 353-4522	Problem solving for farm management, nutrition, and family finances.

USDA ON-LINE	Stan Prochaska, Chief Special Programs Division, OGPA Room 536A, 14th & Independence Ave., SW Washington, DC 20250 (202) 447-7454	USDA news releases, electronic mail.

APPENDIX B
Glossary

ACCESS. The ability to communicate with a computer or peripheral.

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

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.

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.

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.

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.

BAUD. A unit of measure indicating the rate of transfer of digital information. This term is used frequently in talking about computer "communications" and actually 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.

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

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.)

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. Now if humans could just get those instructions right.

BOOT. Booting a computer usually means the process of getting a computer up, running, and ready for action. 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 as 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."

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.

BUG. A hardware defect or programming error which causes the intended operation of a computer to be performed incorrectly. Bugs have a tendency to hide; stalking these varmints is often no easy task. Also called a GLITCH. (See also BOMB.)

BYTE. A sequence of eight bits (see BIT). A single byte often represents one alphanumeric character of information. A KILOBYTE is 1,024 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).

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.

CATALOG. See DIRECTORY.

COMPUTER. An electronic device used to process and manipulate alphanumeric data in a predefined fashion. ("MICROCOMPUTER" means "very small computer;" "MINICOMPUTER" means "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.

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.

CONSOLE. The video display terminal. Also called a CRT (Cathode Ray Tube).

COUPLER. Generally, a coupler is a device required by F.C.C. regulations which electrically isolates a computer system from the phone lines.

CPU. An acronym for Central Processing Unit. See MICROPROCESSOR.

CRASH. See BOMB.

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

DATA BASE. An organized collection of related information.

DATA BASE MANAGEMENT SYSTEM. A DBMS 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.

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

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

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.

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 the 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.

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.

ELECTRONIC SPREADSHEET. A screen oriented program using a matrix of columns and rows to define numerical applications in a very straightforward visual fashion.

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

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 specific items in the file. A number of files may exist on a single storage medium. Also known as a dataset.

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

FLOPPY DISKETTE. See DISK.

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.)

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

I/O. Communication (transfer 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.

KILOBYTES. See BYTES.

LANGUAGE. (a) A concise and precisely defined set of commands and functions together with a system of syntax and grammer 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 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. A computer can speak many languages but English is not one of them.

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

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.

MAINFRAME. A large multiple user computer system. They have expansive memories and fast processing times. Typical price range is $100,000 to $5,000,000.

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

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

MICROCOMPUTER. A small but complete microprocessor--based computer system, including CPU, memory, input/output interfaces, and power supply. Typical price range is $100 to $10,000.

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.

MINICOMPUTER. A computer that is larger than a microcomputer but smaller than a mainframe. Whether a computer is a mini, micro or mainframe depends on price, memory size, and the number of users it supports. Typical price range is $10,000 to $100,000.

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

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

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

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.

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

PERIPHERAL. See DEVICE.

PROGRAM. Any set of instructions which tell the computer how to perform a specified task.

PROMPT. See CURSOR.

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

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

SERIAL. A method of implementing data communications between two computer devices that allows sending and receiving related binary signals one after

another in sequence. One kind of common serial interface is the RS-232 standard.

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.)

10-KEY PAD. A set of 10 or so numbered keys arranged similarly to the keys one might find on a 10 key adding machine. It is used to speed data entry of numerical information into the computer.

TEMPLATE. A group of related text, values and functions which, when entered in a spreadsheet, perform some function.

TERMINAL. (a) A VIDEO DISPLAY TERMINAL is a TV. 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 a listing device such as a printer or video screen.

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

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.

WORD PROCESSOR. 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 C
Software Evaluation Check List

Title of software _____ Evaluator _____

Software source _____ Date of evaluation _____

	Specific Software		
	What I've got	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)			
*Version of operating system(s)			
(4) Language(s)			
*Brand and version of language(s)			
(5) Disk drive			
*Brand of disk drive			
*Number of drives			
*Size of disk			
*Number of sides			

*Density (1,2,4) _____ _____ _____

*Minimum K of disk space for software _____ _____ _____

(6) Printer

*Brand and Model _____ _____ _____

*40-, 80-, or 132-column _____ _____ _____

*Speed: Characters/second _____ _____ _____

*Other description _____ _____ _____

(7) Terminal or screen capabilities

*Brand and name _____ _____ _____

*Dimensions (columns and lines) _____ _____ _____

*Clear screen _____ _____ _____

*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 provide:

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

_____

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

_____

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

_____

(4) Can user manuals and instructions or demonstration programs be acquired before purchase 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 $_____

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

Appendix D
Comparison Checklist of Farm Accounting Software

	Package 1	Package 2
I. General		
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		
III. Vendor evaluation		
a. Accounting expertise		
b. Quality of documentation		
c. Years in business		
d. Financial condition		
e. Telephone support		
f. Customer training		
Cost		
Location		
g. Warranty provisions		
h. Return policy		
i. Customization available		
j. Source code available		
k. Cost of updates		
l. Software cost		
IV. Computing considerations		
a. User friendliness		
Prompting		
Help screens available		
Comments		
b. Transactions per disk		
c. Processing speed		
d. Special hardware required		
e. Are transactions data automatically stored		
f. Automatic year end closing		
g. Ability to close income (loss) into one or more equity accounts		
h. Maintain prior year account balance		

Cash, accrual, or both: To maximize management information, choose accrual. However, the system should provide tax-accounting output.

Financial condition: Contact present users of the system. Would they buy the same package today?

Source code available: Source code is the computer program itself. If you want to modify the program to tailor it to specialized needs, you'll need to get the source code.

Software cost: Updates and the cost and convenience of customer training may be as important as the initial software cost.

User friendliness: Review the ratings given by panels of users, as in agricultural computer magazines. Obtain hands-on demonstrations.

Processing speed: Time required to post 100 transactions to the general ledger.

Special hardware required: If your accounts involve a substantial amount of data, you may need a hard disk.

Transactions data automatically stored: Some user's find that this is an essential feature.

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	_____	_____

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		

VII. General Ledger

a. Input description	_____	_____
b. Accounting & 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	_____	_____

Chart of Accounts: A program that 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.

Printed reports: After you post transactions 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.

General ledger: You should determine the amount of detail you'll need in your general ledger and concentrate on systems that will provide it. Accounting and tax detail is generally defined through account numbers or codes. The capability of a system to provide reports--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.

i. Audit trail provided	_____	_____
j. Ledger account summary for audit of individual accounts	_____	_____
k. Cost and market basis values	_____	_____

VIII. Enterprises

a. Maximum number allowed	_____	_____
b. Intrafarm transfers	_____	_____
c. Allows allocation of one accounts dnding balance to other accounts	_____	_____
d. Enterprises at each farm location allowed	_____	_____

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 purchases/sales automatically entered to general ledger	_____	_____

Enterprises: 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., to determine the cost of providing the service.

For accrual-basis enterprise accounting a system must have intrafarm income and expense transfer capability. If you want 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 cost, etc., to specific crop and livestock enterprises.

Auxiliary features: 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.

Appendix E
Reading List

Books

Lane, Ronald J., and Timothy L. Cross, Spreadsheet Applications for Animal Nutrition and Feeding (Reston, VA: Reston Publishing Company, Inc., 1985).

Legacy, James, Tom Stitt, and Fred Reneau, Microcomputing in Agriculture (Reston, VA: Reston Publishing Company, Inc., 1984).

Schmisseur, Ed and Richard Landis, Spreadsheet Software for Farm Business Management (Reston, VA: Reston Publishing Company, Inc., 1985).

Sonka, Steven T., Computers in Farming, Selection and Use (McGraw-Hill, Inc., 1983).

Periodicals and Newsletters

AgriComp, The Reference for Farm Computing.
103 Outdoors Building
Columbia, MO 65201

Farm Computer News
Successful Farming
P.O. Box 10231
Des Moines, IA 50380-0231

Agricultural Computing
Doane's
11701 Borman Drive
St. Louis, MO 63146

Others

Strain, J. Robert and Stephanie Simmons, Updated Inventory of Computer Programs (University of Florida, Circular 531-A, 1984).

Director of Evaluated Software (Northeast Computer Institute, State College, PA, 1985).

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Extension's agriculture program provides education, training, and technical assistance to people with agriculturally related needs and interests. Major program emphases include food and fiber production, business management, marketing and processing, and resource use and conservation.

This publication, adapted for use in Oregon by Timothy L. Cross, Extension computer applications coordinator, Oregon State University, is based on a publication of the Texas Agricultural Extension Service. Trade-name products and services are mentioned as illustrations only. This mention does not mean that the OSU Extension Service either endorses such products and services or intends any discrimination against products and services not mentioned.

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