

BUYING A COMPUTER FOR YOUR FARM OR RANCH

by

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I'm thinking of getting a computer, what kind do you think I should buy? This question or one close to it is often asked of Extension personnel. Before the producer decides what kind of computer to buy, however, the decision of whether to buy a computer should be thoroughly examined. Computers make expensive paper weights even though prices have fallen substantially in recent years.

The decision to buy a computer for the farm should be viewed the same way any machinery purchase is made, will it pay its way. Also, keep in mind that not everyone is computer compatible. Some people don't have the personality characteristics that will produce a long and harmonious relationship with a computer. If you have the opportunity, take an introductory computer class available from vo-tech colleges, vo-ag programs or the University of Idaho Extension System. If you survive one of these courses, you may have what it takes to be a computer jockey.

Take a computer class, not a programming class. There is a big difference. While the majority of us can learn to run computers, only a minority of people have what it takes to program. Taking a class on a specific application program like Lotus 1-2-3, Quatro, Quicken or Microsoft Word will be more beneficial than learning C or BASIC. A class on the operating system, DOS or Windows, would also be very useful. Your objective is to learn enough about computers to operate the programs that others have written. If you are willing to operate a tractor designed by John Deere, shouldn't you be willing to buy and use computer software programmed by the experts?

What Do You Want the Computer to Do?

This is the wrong question to ask. Computers do not think. They respond to user commands. The proper question is, what do YOU want the computer to do?

Many people have unrealistic expectations about what a computer can do. There is virtually nothing that the computer can do that you can't do with a pencil and a piece of paper. The computer is just a lot faster and more consistent.

A word of caution, while most producers acquire a computer for recording keeping, a computer will not make a poor record keeper into a good one. The computer will not absorb data by osmosis. Someone must still collect and input the information. I know that you think your spouse will be happy to do this. But have you asked her/him? Many producers buy a computer assuming that the computer will save them time. That is seldom the case. The best you can hope for is to spend the same amount of time on a task, such as record keeping. For the same time, you will have more and better information on which to base your production, financial and marketing decisions. Your ability to make timely decisions will also be enhanced. Remember, the right decision made too late is no better than the wrong decision made in a timely fashion.

Now that you've determined that you want the computer to keep production and financial records, the next step is to buy a half dozen different computer programs so that everything that walks, crawls or grows on the farm can be put in the computer? Wrong again. Start

with one or two computer programs. Learn them before you launch into another. Not only will this be more realistic in terms of your learning capabilities, you won't end up with out-of-date versions of software that you'll have to upgrade before you start using them.

Eight Steps to Computerizing Your Farm

1. Determine what you want the computer to do for you.
2. Find out if your expectations are realistic by talking to software dealers, farmers with computers, vo-ag instructors, Extension personnel or anyone with knowledge about computers and agriculture.
3. Talk to your neighbors and friends who have computers as to what they did right and wrong when they bought their computer and software.
4. Determine what type of software is available to do what you want.
5. Read some books or magazines on computers to help familiarize yourself with terminology and trends in software and hardware.
6. Visit computer stores in your vicinity to find out what computers and software they carry. Do they carry agricultural specific software? Do they support it?
7. Price a number of different systems and software being sure to include warranty, tech support and whether local support is available.
8. Select the system and the software that best fits both your needs and your budget.

Buying Guidelines

The last two pages of this publication is a bid sheet that you can copy and submit to various computer dealers. You can also fill out the form yourself if you want to compare mail order companies. This will help you make consistent comparisons. The following discussion is provided to help explain computer features, whether they should be required or optional, and what range in prices to expect.

Manufacture and Specifications

Should you buy an IBM or an IBM clone? This is similar to the question of whether you should buy a John Deere or a Case. There are a number of very good clones available. Some of the early clone manufactures have themselves become mainstream PC suppliers, such as Compaq and Dell. Just as important as the computers features and reliability is the reputation of the dealer for support.

A producer should expect to pay between \$900 and \$1,300 for a computer with a 386-SX or 386-DX processor, 2-4 Mb of RAM, an 80-100 Mb hard disk, two floppy disk drive, a color monitor and DOS. The price would range from \$1,300 to \$1,600 for a 486-SX processor, 4 Mb of RAM, two floppy disk drives, a 120-170 MB hard disk, color monitor and operating system software. Moving to the 486-DX processor will increase the cost to between \$1,500 and \$4,000. A dot matrix printer will add another \$250 to \$500 to the purchase price. Ink jet printers are in the same price range and may produce better quality documents.

What About Windows?

Before you make a decision on the specifics of the computer, you should first decide if you will want to run the software in the Windows environment. Windows is a graphical user interface. Rather than having to learn a lot of commands to operate the computer system, the user selects screen icons (symbols) by pointing with a device called a mouse.

The big advantage to the Windows operating environment is the intuitive learning process. It has been well documented that the computer novice will learn to operate a graphical system sooner. For long-time DOS users, however, Windows can prove to be frustrating and can reduce the overall performance of the computer.

The issue of performance is of prime consideration when considering Windows. Reduced performance is a particularly troublesome issue on older, less powerful PC's. You should be using at least an 80386 microprocessor if you want to run Windows without reduced performance. RAM is also an important issue which will be discussed in a later section. Also, much of the agriculture software available today was written for the DOS operating system, not for Windows. That doesn't mean that the software can't be used on a computer with Windows. But it does mean that you may have to leave the Windows operating environment to run the program.

Microprocessor

The processors listed on the bid sheet are in ascending order of power. The name of the microprocessor gives an indication of the relative power. Intel, the leading microprocessor manufacture, has simply added an additional integer. The first generation was the 8086, the next generation was the 80286. The third and fourth generation were the 80386 and 80486, respectively. Roughly speaking, the computing capability doubled with each new generation. The fifth generation microprocessor from Intel is code named the P5 and will be released in the first half of 1993.

Selecting the right processor is one of the more important decisions when you purchase a computer. This is the work center of the computer. It is similar to the horse power of a tractor. Just as you don't buy a 40 hp tractor to pull a 5-bottom plow, you must also match the computer's processing capability to the software it will run.

The microprocessor for the earliest generation of IBM PC's and clones is not listed on this bid sheet. We would recommend that a producer not buy a computer with an 8086 or 8088 microprocessor. This is old technology and it would not have the ability to run the new generation of software. Even buying the 80286 will impose some restrictions on what software you can run.

The 80286 and 80386 are 8-bit and 16-bit processors, respectively, while the 80486 is a 32-bit processor. A bit is the smallest component of data that the computer deals with. The processor determines how much data is brought in, processed and sent out. The bigger the chunks of data are, the faster the processor can accomplish a given job.

An 80386-SX is the minimum that you should consider buying. Prices are only slightly more than an 80286. If you are going to run Windows, than an 80386-DX is the minimum and a 80486 is recommended. The speed of the microprocessor is measured in megahertz (Mhz). The higher the number the faster the processor. If you have the chance to buy a 25 Mhz 80386 or an identical 33 Mhz 80386 for the same money, the 33 Mhz is the better

deal. Many computers now allow the processor to be replaced, allowing the user to upgrade without buying a whole new system or at the very least, replacing the motherboard. Processor upgrades typically cost \$100 - 300.

Random Access Memory

Random Access Memory, or RAM, measures the amount of memory available for the computer to load with software or data. On the earlier generations of computers and software, 640 K or 1 Mb were considered adequate. While many programs will still run with those limitations, the Windows operating environment will not. For someone considering Windows, 4 Mb is the minimum RAM to consider on an 80386, while 8 should be considered a minimum on a 486. Windows will run with less, but overall performance will suffer. If the computer will be running DOS only, then 2 Mb is usually sufficient. To access memory above 640, however, a memory manager program is required.

Just as important as the amount of RAM the computer has is the maximum it can take. If you decide to upgrade the system at a later date, you will want a system that will accept more RAM chips without having to put in an entirely new motherboard. A maximum expansion of 8 Mb should be adequate for most users.

Expanded vs Extended Memory

There are three different kinds of memory you can have installed in your computer: conventional, extended and expanded. The first 640 K of memory in the computer is generally referred to as conventional memory. This is all the memory that DOS is capable of using. DOS was originally written for the 8088 processor which could address only 1 megabyte, of which 640 K was memory. Even though the faster processors in use today can address up to 4 gigabytes, DOS is still tied to the 640 K limitation. Regardless of how much extended or expanded memory your computer has, when conventional memory is fully utilized, the computer is out of memory.

A computer with 640 K of RAM actually has 1 megabyte of address space. That is 640 K plus 384 K. The additional 384 K address space is reserved for the system, including the video memory and the system BIOS (Basic Input Output System). Extended memory starts where the 384 K system memory space ends, or above 1 megabyte.

Expanded memory was first used in the old PC's and PC/XT's. To overcome the 640 K memory limitation, expanded memory uses a technique called bank switching. There are two kinds of expanded memory, LIM 3.2 and LIM 4.0. These are two different Lotus/Intel/Microsoft (LIM) memory specifications. LIM 3.2 allows 64 K of memory to be banked at a given time and supports up to 8 megabytes of expanded memory. LIM 4.0 allows up to 1 megabyte to be banked at a time, if the expanded memory card supports it, and supports up to 32 megabytes of expanded memory.

A device driver must be loaded in order to use expanded memory. Windows 3.x, however, does not use expanded memory. It does require extended memory. Expanded memory is necessary for DOS application programs (i.e. Lotus 1-2-3) that need more than 640 K since DOS cannot use extended memory.

Math Coprocessor

Many computers come with a math coprocessor already installed. You are paying for it even if it is not listed separately. The math coprocessor increases the computing speed of the computer for the same applications. It is of no use when you run a word processing program, but it does come in handy when running spreadsheet programs or data base programs. Even programs that do mathematical computations may not be written to take advantage of the math coprocessor. If you have an accounting program or know which one you will buy, find out if it can use the math coprocessor. If it can't, why spend the extra money? Having a motherboard with a slot for a math coprocessor does, however, provide flexibility even if you don't think you will need it. This is an optional feature that can be added later.

Floppy Disk Drives

Most computers come with at least one internal floppy disk drive. The trend has been toward 3-1/2 inch drives replacing 5-1/4 inch drives as the standard. If you are upgrading your computer system, you will want to have both a 5-1/4 and a 3-1/2 inch drive for greater flexibility. Most PC's are capable of handling two internal floppy drives. A combination drive that can handle both 3-1/2 and 5-1/4 inch diskettes is also available which saves space.

The somewhat confusing issue with floppy disks is that all drives of the same size are not created equal. The density with which the drive can read and write to a disk is as important as its physical size. The standard 5-1/4 inch disk drive had the ability to format and read and write to a disk with 360 K of storage. As technology improved, more information could be placed on the same size disk; thus the high-density 5-1/4 inch drives. High density disks are available in 1.2 Mb (5-1/4) or 1.44 Mb (3-1/2). (There are a 1,024 K per Mb.) While the higher density drives can read a 360-K disk, a 360-K disk drive cannot read or write to a high-density disk. Care must be taken when purchasing diskettes to ensure the proper density. It is even more important that you understand how to properly format these different diskettes.

The newest and most sophisticated drive is a "density sensitive" drive. It determines the type of diskette so that the prospect of ruining diskettes through improper formatting is no longer an issue.

The recommended configuration is to have an internal, density sensitive 3-1/2 inch drive as well as an internal high density 5-1/4 inch drive.

Hard Disks

Hard disks are a necessity, not an option. Much of the current generation of computer software will not fit on a single floppy diskette, not even the high density diskettes. The question is how big a hard disk should you get.

The type and amount of software and the type of operating system on the computer will help dictate the size of the hard disk you should purchase. The cost of hard disks has fallen drastically in recent years, so our philosophy is to buy as big a hard disk as you can afford, within reason.

For someone interested only in running DOS and a limited number of programs, a 60 Mb will suffice. If you plan on running Windows, a 100 Mb is a minimum to consider.

The speed of the hard disk is as important as its size. Not all of them are fast. If it comes down to two identical systems and one has a 28 millisecond hard disk and the other is a 17 millisecond, go for the faster 17 millisecond drive. Hard disks are also referenced by the type of controller used. The controller affects speed so it is important to note the type. Slower hard disks are MFM or RLL controlled. Newer, faster drives are SCSI or EDI controlled.

Expansion Slots

Expansion slots provide the space and the connection for a variety of features you may want to add. Early PC's were "plain Janes" by today's standards and having a PC with a large number of expansion slots was desirable. Adding additional ports to connect peripheral devices, printers, modems, etc., is a primary use of the expansion slots. A computer that comes with two built-in serial ports and two built-in parallel ports will not need the same number of expansion slots as a system with only one parallel and one serial port. Three available expansion slots should be considered a minimum in most circumstances.

Parallel, Serial and Mouse Ports

Parallel and serial cables provide a means of connecting various peripheral devices to the computer, including printers and modems. At a minimum, any computer you buy should have one parallel and one serial port. If you know you are going to use a modem, then you should have two serial ports unless the modem is an internal one.

The mouse port is self-explanatory. If the computer doesn't have one, you will end up connecting the mouse through a serial port. This isn't a problem unless you also planned on hooking your modem to that same port.

Warranty

A one year limited warranty is the industry standard and many manufacturers also offer a 30-60 day no-fault return policy. Chances are if anything malfunctions, it will be in the first month. But that means it's advisable to get the computer set up and operating immediately. After the first several weeks of use, any major problem may result from power fluctuations. Today's computers are extremely reliable. In addition to warranty, what type of technical support is provided? Is it free or does it cost? Is additional support available on a subscription basis?

Monitor

What is considered a minimally acceptable monitor has changed considerably in recent years. The monochrome (single color) is no longer viewed by many as acceptable. These are still a good investment, however, for users on a very tight budget. The image quality of a good monochrome is substantially superior to that of a color monitor for the same amount of money. Cheap color monitors are a poor investment and will cause eye fatigue. If you go with a monochrome monitor, make sure that it has graphic capabilities.

If the software you will be using makes extensive use of color screens, then you will want to spend the additional money for a color monitor and you might even consider a high-resolution monitor. If you are going to run Windows, a color monitor is almost a requirement. VGA (640 x 400 pixels) is the current standard for color. Higher resolution SVGA and XVGA (800 x 600 and 1240 x 1000, respectively) are also common. As you can see, there are a number of computer specifications that are directly tied to the software.

Operating System

An operating system is required to make the computer function. The operating system for a computer is software-based, meaning it is not a permanent part of the computer's memory. The operating system software must be loaded each time the computer is turned on or rebooted. The two basic types of operating systems are the non-graphical and the graphical. At a minimum you will need a copy of the non-graphical operating system (DOS).

The standard non-graphical for IBM PC's is PC-DOS and for the IBM clones, it's Microsoft's generic operating system, MS-DOS. The version of the operating system is also identified, ie. MS-DOS version 5.0. One thing to verify when you buy a computer is that the operating system is the latest release. In addition to the major version changes in the operating system, minor changes are referenced by the number after the decimal point, ie. version 5.1. Version 5.1 is a newer release than 5.0 and likely corrects some deficiency found in the earlier version.

Windows is a graphical operating system. You may see it referenced as GUI, or Graphical User Interface. The OS/2 system from IBM is also a GUI. In addition to the ease of use mentioned earlier, the GUI allows the user to run more than a single application program simultaneously. For most producers, this may not be sufficient reason to go with a GUI. However, a dairyman running a monthly herd summary that ties up the computer for two hours may find this feature very useful. Windows is not a complete substitute for DOS as Windows runs on top of DOS. This is one reason why the performance of some software is reduced when run as a Window's application.

Printers

The type of printer you buy will be dictated by the end use of what you print. For most farmers the less expensive dot matrix printers will work just fine. A step up from these in terms of quality are the inkjet printers. Rather than creating an image using pins impacting a ribbon, these printers spray the ink on the page. Some inkjet printers require higher quality paper which will increase operating costs. If you will be printing checks and the checks have a carbon or carbonless copy, you will need the impact type printer. The impact printers are quite noisy, however.

The type of paper feed can also be important. The two basic types are a tractor feed and a friction feed. The tractor feed has a pinwheel on each side of the carriage. The pins fit into the tear-off perforations on the side of the paper. Friction feed printers use two rotating rollers that pull the paper through as they turn. In most situations, either type of feed is acceptable. When printing on forms, such as checks, the tractor feed is superior as it keeps the forms lined up correctly. Friction feed printers may slip, especially when using heavier paper. If you print a lot of checks, buying a dot matrix printer with a tractor feed to use only in printing checks is a good investment as you avoid the hassle of changing between paper and checks. Discuss this issue with your bank before you make any

decisions. Make sure that the printer you buy will handle the continuous feed checks that the bank can supply.

There are two basic types of impact printers, 9-pin and 24-pin. The 24-pin produces a better quality but at a higher price. Again, for most producers, the 9-pin will be acceptable. The speed of the printer, measured in characters per second (cps), may be more important than slight differences in quality. Also, most printers have two different settings for the quality of the print, draft mode and near letter quality (NLQ). You will want to know the speed, cps, in both draft and in NLQ modes. Most 24-pin printer also do Letter Quality printing.

The majority of printers are 80 column and can handle standard width paper of 8-1/2 inches. Wide carriage printer, 120 columns, are useful for large non-standard forms. They also have the ability to run the standard width computer paper. Wide carriage printers are usually \$200 above the comparable standard width printer.

At the top end of the quality spectrum are the laserjet printers. These are expensive, generally starting at \$700. The speed of the laserjets is substantially greater than the dot matrix printers and is measured in pages per minute (ppm). Laserjet printers come with a variety of built-in fonts, giving the user a wide range in the size and style of characters. These will also accommodate additional fonts on cartridges that simply plug into the front of the printer. Most font cartridges are similar in size to an 8 track tape cartridge, for those of you over 35. or 3-1/2 x 5-1/2 inches.

Cables

To connect peripheral devices to the computer requires a cable. The two basic types of cables match the two general output ports, parallel and serial. Some peripheral devices can be connected to either a serial port or a parallel port and have both connections. Others, such as modems, must use a specific type of connection. For printers that allow either parallel or serial connection, the parallel connection will be faster. But if the printer is more than about 12 feet away, you'll have to use a serial cable. The modem will require a serial cable. When you buy a peripheral device to hook to your computer, make sure you buy the right type of cable as well.

Serial ports and serial cables come in both 25-pin and 9-pin configurations. The trend is toward the 9-pin connection. While they are functionally equivalent, make sure that if your computer has a 9-pin serial port that you get a 9-pin cable.

Modems

Another peripheral device that producers may want to consider is a modem. A modem allows computer-to-computer communication over a telephone line. There are a number of private and public information services that can be accessed with a modem. These are generally referred to as electronic or remote bulletin boards. They provide everything from weather to current commodity prices to computer programs.

Like computers, the price of modems has been dropping. Also like computers, the faster the modem, the higher the price. Speed on modems is measured in bits-per-second (bps). The important thing to know is that the higher the number, the faster the modem. Early modems transferred data at 300 baud. That is considered too slow by today's standards. Twelve hundred- and 2400-baud are the next two levels of modem speed. Producers

serious about telecommunications should not consider anything slower than 2400. This is a rapidly changing area and older and slower technology is rapidly outdated. A 9600 baud modem would be worth the extra money and a 14,400 baud modem should not be dismissed. In areas with poor quality telephone lines, which includes many rural areas, having a modem with noise abatement features is a must. Poor quality telephone lines may limit data transmission to a speed below the modem's maximum. A FAX/Modem should also be considered as it combines the the FAX and the Modem into a single unit. These are available in both internal and external models.

Computer Bid Sheet

Use the attached bid sheet to help you do some comparative shopping between local dealers, or to compare different systems from mail order companies. An important thing to keep in mind is that price is not the only criteria on which your decision should be made. Support, especially support from a local vendor is worth several hundred dollars. Buy locally and support local merchants whenever possible. If you will not get any service support for the higher price, however, than why pay the higher price.

Computer technology is changing every day. Should you wait for the next big technological change before you buy? No. There will always be some significant break through just around the corner. Recognize the difference between technological and functional obsolescence. Before the latest computer comes off the assembly line it is technologically obsolete. However, computers with 8086 processors from ten years ago work just fine for many applications. Buy with an eye to the future but not too far in the future.

References and Useful Reading

Erickson, Duane E., Royce A. Hinton and Ronald D. Szoke. Microcomputers on the Farm: Getting Started. 2nd ed. Iowa State University Press, Ames, IA, 1990.

COMPUTER BID SHEET

Company: _____

Address: _____

Telephone #: _____ Sales Person: _____

COMPUTER (circle the appropriate response when alternatives are listed)

Manufacturer: _____ Model: _____

Microprocessor:

80386-SX / 80386-DX / 80486-SX / 80486-DX Other: _____

Speed: 25 / 33 / 40 / 50 / 66 MHz Other: _____

RAM _____ k or _____ mb Maximum Expandable RAM _____

Maximum RAM on system board _____ mb Upgradeable Processor? Yes/No

Math Coprocessor: yes / no Socket Available: yes / no

Disk Drives: Internal Floppy Disk

Drive #1: 3 1/2" / 5 1/4" 360K / 720K / 1.2 mb / 1.44 mb / 2.88 mb/ds

Drive #2: 3 1/2" / 5 1/4" 360K / 720K / 1.2 mb / 1.44 mb / 2.88 mb/ds

Hard Disk: Internal (specify brand, size, & speed)
Example: Seagate / 80 mb / 17 millisec

External Drives (describe)

Mouse port: yes / no Expansion Slots: _____

Parallel Ports: _____ Serial Ports: _____

Warranty: _____ Price: \$ _____

MONITOR

Manufacturer: _____ Model: _____

VGA / Super VGA Color / Monochrome Screen Size _____

Pixels _____ (ie. 640 x 400)

Warranty: _____ Price: \$ _____

OPERATING SYSTEM: Disks should match drive A.

DOS Version: _____ 3 1/2" / 5 1/4" Price: \$ _____

Windows Version: _____ 3 1/2" / 5 1/4" Price: \$ _____

PRINTER

Manufacturer: _____ Model: _____

Dot Matrix: 9 pin / 24 pin Column Width: 80 / 132

Character per Second: Draft _____ Near-letter Quality _____

Warranty: _____ Price: \$ _____

Laser: Pages per second _____ Memory _____ mb # of Fonts _____

Postscript: Yes / No

Warranty: _____ Price: \$ _____

CABLE

Parallel / Serial Length _____ Price: \$ _____

MODEM (in the price include cable for external)

Manufacturer _____

Baud Rate: _____ Internal / External

Error Handling? _____ Noise Filter? _____

Warranty: _____ Price: \$ _____

OTHER OPTIONS

TOTAL SYSTEM PRICE \$ _____

How long is bid good? _____ days

Date: _____

Signature: _____