

COMPUTERS FOR THE FARM BUSINESS

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We are in a computer revolution. We are beginning to see computers everywhere, even in homes. If you have children in school they have probably used computers in the classroom. They don't have to be college kids; in Idaho Falls grade school kids are using computers.

My talk is about how this new electronic technology can be used on farms and ranches. First, I need to say that a computer can't solve all your problems. Only top-notch management can do that. The computer is just a tool for managers. Like any other tool, it isn't any good unless you understand how to use it.

I have divided my talk into six sections: (1) components of a computer system; (2) farm business records; (3) decision aids; (4) electronic marketing; (5) electronic technology in farm equipment; and (6) the decision to purchase an on-farm microcomputer. This gives a preview of what I will be talking about.

Components of a Computer System

Hardware is the first computer component I will discuss. Computer jargon can be confusing to newcomers. Computer hardware is the machine or equipment that sits on the desk and you can actually touch.

You probably know that new developments in the electronics industry has greatly decreased the cost of electronic technology. This slide is a picture of a credit-card size electronic calculator that I bought on sale (as an economist I only buy things that are on sale) last August in Idaho Falls for \$4.99.

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2/ University of Idaho Extension Agricultural Economist, Idaho Falls.

This slide shows that small calculator next to a much bigger one that our secretary uses. This machine was bought about 12 to 14 years ago at a cost of about \$200. The dollar was much more valuable back then, so in terms of today's dollar its cost was about \$500, one hundred times the cost of the small calculator. Although the small calculator doesn't have a printer it is more powerful than the big one.

Why is the cost of electronics falling so drastically when the price of everything else is going up? The answer is the amazing ability of American scientists. Back in the 1950's vacuum tubes and miles and miles of wires were used in computers. The computers themselves were the size of houses and needed a certain temperature and humidity environment. Needless to say, early computers were terribly expensive and only the largest businesses could afford them.

Next, the transistor was developed. This reduced the amount of wires and hardware and the cost somewhat. The invention of the silicon chip, however, is what reduced the size and cost of computers so that farmers can now buy them. As I understand it, the earliest silicon chips were products of NASA. It seems strange that putting a man on the moon eventually helps farmers.

This is a chip from the Apple microcomputer in my office. It is a memory chip with a capacity of 4K, which means that this tiny thing can store up to 4000 characters - letters or numbers. This is a larger processing chip from the same machine. It is used to manipulate, mathematically or otherwise, the information in the memory chips. Actually the silicon chips themselves are much smaller, about the size of a fingernail. To be useful to the machine they need to be surrounded by connections.

I am not an electrical engineer so I don't understand much more about hardware. However, you can see that the chips are arranged on boards that go into the computer, and in the framework of the computer itself. This picture shows how the chips are arranged in the Apple that I use.

Computer technology on the farm has also been an evolution. First, remote terminals were used, then programmable calculators, then microcomputers. This is a remote terminal. You can see that a telephone is attached to it. The telephone is used to call a large computer that may be half way across the country. The terminal is then used to communicate with the computer and get it to solve problems or retrieve information. A few farmers were using these in the 1960's.

This is a programmable calculator that preceded the microcomputer. It started being used by farmers in the mid-1970's for solving mathematical-type problems but could not be used for farm records.

The way the programmable calculator works is that a program or set of instructions is recorded on a small magnetic card about the size of a stick of gum. This card is then inserted into the machine and it will work your problem, such as ration balancing.

This is the Apple microcomputer system that I use. It consists of five components:

- (1) CPU and keyboard - the computer itself
- (2) a screen so you can communicate with the machine
- (3) a printer for a paper copy
- (4) a disk drive which we will discuss later
- (5) a microcoupler so you can communicate with other computers via the telephone.

There are a number of firms that manufacture microcomputers. Apple and Radio Shack have the largest market shares but there are also Commodores, North Stars, IBM's, and many other brands being used by farmers. There are no industry standards and each machine is a little different. This presents a problem we will discuss later.

Software is the other main component of a computer system. Computers are dumb. They can't think for themselves and only do what they are told. They are kind of

like some people. Software is simply a set of instructions, or program, that tells the computer what you want it to do.

Computers, unfortunately, only understand a special language that is not English, although there are similarities. PRINT is one language command that the computer understands. For example, when you type in the command PRINT "HELLO" it comes back and prints HELLO. When you tell it to print $2 + 3$ it comes back with 5.

A list of commands is called a program. This is a simple five-step program that I wrote as an example. It is a very simple payroll program. It asks the user to type in the wage rate and hours worked, then it calculates the gross pay.

I typed in the word RUN and the computer asks for the wage rate (\$5) and the hours worked (40). After I typed these in, it instantly prints GROSS PAY = 200.

This program is too simple-minded to actually be used. To get a useful program, thousands of lines or commands may need to be typed. This is an example of the program listing for one of the University of Idaho programs that includes thousands of lines.

One good thing is that you don't have to type in these thousands of lines every time you want to run a program. They can be stored on what is called a floppy disk. It looks like a 45 RPM record in a square jacket. To run a program you simply insert the floppy disk into the disk drive, and with the Apple, simply turn on the machine. Most disks will then have the computer display a menu, which is simply a list of what is available on that disk.

Now, there is a big problem in the microcomputer industry. It is the incompatibility between machines. It reminds me of an incompatibility problem that we had when I was farming. We had John Deere, International, and White tractors. Their hydraulic hose fittings were all different so that when we changed tractors on an implement we first had to get the right hydraulic hose adapters.

The problem with microcomputers is worse than that, however. There are no simple adapters. A floppy disk from an Apple, for example, will not work if you stick it into a Radio Shack or vice versa.

Farm Business Records

Now that we have had a look at the components of a computer let's look at what they can do for your farm business. One of the most important functions is keeping farm records. There are two types of farm records: financial and physical.

My opinion is that there are two basic types of financial accounting systems. Many farmers use a system that was designed for a retail business that buys a product in quantity and sells some each day. It simply keeps income and expense summaries.

A farm, however, is more like a manufacturing business, and a complicated one at that. The farm buys raw materials in the retail market, puts these together for six to eighteen months and sells most of the production into a wholesale market for further processing and distribution to the ultimate consumer.

An adequate set of farm records applies a manufacturing bookkeeping system to the farm manufacturing business and records the costs associated with all income centers. It allocates all costs (direct and indirect) to each income generating center (crops or livestock). It accrues the expenses for each profit center and matches income and costs for the same time period.

There are some computer accounting packages on the market that are good for farmers and some that are not so good. The four basic things that a good financial records package has includes: (1) Balance sheet; (2) Cash flow statement; (3) Income statement; (4) Enterprise report.

The Balance Sheet simply counts what you own and what you owe. The difference is what you are worth. This is done at one time, usually at the end of the year, and can be thought of as a snapshot or picture of the farm. However, instead of shapes and colors, the picture is in numbers.

To illustrate a Balance Sheet picture, imagine an airplane flies over a farm and takes a picture at the beginning of the year. Imagine the picture shows a house, a pickup truck, a tractor and some implements standing outside. Next year on the same day, another picture is taken. This picture shows the tractors are in a shed, there is a car and a pickup in a driveway and also a large truck. Comparing these pictures shows the farm is making some progress and is accumulating assets. The third year the picture might show a new grainery, too much machinery to fit in the machine shed, the cars are new, the house has been painted, a fence has been put around the yard and a windbreak has been planted. The next year the picture might show a small boat in the yard and yet another grainery. The grass is green and the farm has all of the appearances of being successful and growing. The next year the picture shows an air strip has been added and an airplane is in the hangar, the boat in the yard is much bigger and children are riding motorcycles. The next year the picture shows the boat is gone and the hangar has farm machinery parked in it. The farm still looks very prosperous but, looking very closely the picture shows a new name on the mailbox.

The balance sheet doesn't give the complete financial picture. The second report that is required for adequate financial records is a monthly Cash Flow Statement. This shows all the money that comes into the business and all of the money that goes out of the business each month.

The Cash Flow Statement can be compared to a previously prepared budget to indicate if expenses are running either higher than last year or higher than planned for this year. This allows the manager an opportunity to adjust the flow by reducing expenses, borrowing money, or selling some inventory.

The Cash Flow Statement does not show profit or loss of a business. A business can have a positive cash flow, plenty of funds to operate on and still go broke. On the other hand, a business can be very tight on cash, have no money in the bank and still be very profitable!

The Income Statement does measure a business's profit or loss. It shows the source of income and the costs of producing the income. Depreciation is not a cash expense to the business and therefore would not show on the Cash Flow Statement but, it is an expense item and appears on the Income Statement. Borrowed money on the other hand, appears on a Cash Flow Statement but not on the Income Statement.

The income statement is also adjusted for inventory so that a carryover of stored grain, for example, does not distort the picture. For adequate financial records, a farm should estimate its annual Income Statement before the year starts and then compare the monthly transactions to the budget to be sure profit is progressing on schedule. An Income Statement once a year at tax time is not useable for management purposes. Income Statements need to be prepared quarterly at a minimum and monthly at best so the manager can be aware of the profitability of his entire business as the year progresses.

An enterprise is the smallest managed unit on a farm operation, e.g., potatoes, wheat, cow-calf. Enterprise Reports compared to budgets help determine if costs and returns are over or under budget. An adequate set of Enterprise Reports allows a manager to determine which enterprises should be expanded or eliminated. Also, marketing decisions are easier if the manager has the cost of production recorded to the penny.

An example not of an Enterprise Report, but of an Enterprise Budget, is on this University of Idaho program. This example is for commercial potatoes. We have some estimates of costs and returns but the user can change any of these figures to match his own situation. First the screen shows the returns, then operating costs, then ownership costs, total costs, and profit.

Another option on this program is that the grower can estimate break-even prices and yields. This example shows that at a yield of 300 cwt this grower needs \$4.00 per bu. to break-even. Looking at break-even yield, assuming a \$4.00 price he needs 300 cwt to cover all costs.

This program can also be used to look at livestock enterprises. This is the revenue section for a 200 head cow-calf enterprise. Next, comes the operating costs, and then the ownership cost, total cost, and profits page. This particular example shows a loss, which might be true for a number of cattlemen today.

Physical records is another category of farm records a manager might want to keep on a computer. The value of herd performance records are known to you livestock people, especially the dairymen. Some farmers are also keeping historical records on individual fields. They record information on variety, fertilizer, chemicals, planting and harvest dates, soil moisture, weather, weed problems, tillage methods, yields, etc. A history of such records can tell the manager what fields and production practices are money makers.

Some producers also keep machinery maintenance and repair records on each piece of equipment just like the big trucking companies do. This helps them decide when to replace certain equipment and helps the mechanic find problems with the machine. Also, some farmers use the computer to keep inventories on crops in storage, cattle in the feedlot, or for the big operations - equipment and parts.

Decision Aids

The computer can also be used to help make certain decisions. The University of Idaho has developed some decision aid type programs that probably aren't available in the private sector.

One of our programs is called 'machinery acquisition analysis'. It is designed to help a producer to decide if it is cheaper to purchase, lease, or custom-hire. This example is for a combine. First, the program asks for information on the purchase option, then the lease option, then the rent or custom-hire option. The answer in this case shows purchase to be the cheapest option. The numbers are expressed in terms of present value of after-tax cash flow. This may be a bit confusing to people not familiar with financial analysis but it accounts for tax benefits and the time value of money.

Another UI program is the dairy cow purchase program. It asks for a long list of inputs it needs for analysis then calculates the price you can afford to pay for a dairy cow.

None of these programs do anything that can't be done with pencil, paper, and a calculator. That can be so tedious, however, that most farmers don't have the time to do it. The advantage of the computer is that it takes the work out of it. This is especially useful when the farmer wants to see what happens when he changes one of the variables he is unsure about. That is he can get immediate answers for the "what if..." questions. For example, in the dairy cow program: what if the price of milk drops 50¢. The farmer merely changes that one variable and gets the new answer.

This is an example of another decision aid program that looks at the cost of storing grain. It calculates what price the farmer needs in future months to cover the cost of storing grain. It can be quite useful in 'when to sell' decisions.

Other decision aid programs available through the Extension Service include: (1) Backgrounding Feeder Cattle; (2) Crop Comparison; (3) Machine Cost Analysis; (4) What Can I Afford to Pay for Farmland (5) Income Tax Planning and (6) Government Set Aside and P.I.K. Program.

Electronic Marketing

The next portion of my talk is on electronic marketing. There are two categories of electronic marketing: market information and trading systems that actually facilitate buy-sell transactions.

Market information is available to microcomputer users by calling up special agricultural libraries such as AGNET with a large computer in Nebraska and CMN in Virginia. They can be used to obtain current market prices, USDA statistics, and economists price predictions. These systems also allow you to plot prices on a graph.

The AGNET system also operates as sort of an electronic bulletin board for producers with hay for sale. In the HAYLIST program there are many growers that list what they have for sale. So that a buyer doesn't have to sort through hundreds of listings to find what he wants, he can ask for all listings of a certain type of hay in a certain part of the West.

For example, I requested a listing for square bale alfalfa hay in Park County, Montana. The computer came back with a list of one person matching that description. It gives a description, name of seller, and phone number only. The system does not trade hay or set prices. It merely helps the buyer find hay. If he is interested he can call growers on the list and make an offer.

The AGNET system also has a program called EWESALE for the listing of sheep for sale.

Electronic marketing also includes systems that can be used by producers to actually sell their product. There are different types of electronic trading systems. One that operates in Idaho is the PNW telephone auction. Although not computerized, the telephone is actually an electronic marketing system. The way the PNW system works is that farm flocks are graded on the farm, assembled on paper, and auctioned to buyers in their offices over the telephone. The successful buyer then picks up full truckloads of lambs at an assembly point.

Another type of electronic marketing is the video auction that is being used for cattle in Colorado and Montana. The organization has a professional crew take videotapes of the cattle for sale, prints up a description, and invites the buyers to a comfortable place such as a motel meeting room. They then show the film of the cattle and auction them without the cattle ever leaving the ranch. The buyer then makes a contract for delivery.

The computer auction also exists. Canadian hogs (two-thirds), Texas cotton, and Virginia lambs are now sold through computerized systems. The buyers have computer terminals in their offices through which they receive a description of what is to be sold. They then use a Dutch or English auction or bid-offer procedure to make the sale. The buyer simply bids through his computer. Again, a contract and delivery completes the transaction.

Electronic marketing is, I believe, a coming thing. The advantages are:

- (1) Improves market efficiency

- (2) Reduces marketing costs
- (3) Reduces shrink, death loss, and bruising
- (4) Increases number of buyers
- (5) Price improvement

An agricultural economist recently followed one steer from birth to slaughter and found that it changed owners nine times. This certainly appears to be inefficient. Electronic marketing appears to be a better way.

Electronic Technology in Farm Equipment

My next topic is how the advancements in electronic technology have improved farm equipment. A firm in Colorado has developed a system for communication between an in-office microcomputer and irrigation systems in the field. The computer can show which pivots are running and their speed and their operating history. The system also has options for turn off/on or changing the speeds on each pivot without leaving the office.

Monitoring and controlling grain storages (also potato storages) is another use of electronic technology. Many southern Idaho grain growers store in bins without aeration equipment. This can cause 'hot spots' and insect problems. Jim Halderson, an agricultural engineer at the University of Idaho Aberdeen R & E Center, has developed a system that utilizes temperature and moisture sensing equipment to automatically monitor the environment and with the use of an air system maintain the proper temperature and humidity in the bin.

This slide shows a typical grain bin without the aeration equipment. You can see that grain temperatures reached up to 100^o in parts of that bin in December. This slide shows temperatures in a bin with aeration. You can see that it cools the grain down after harvest and keeps it cool.

Another of Halderson's electronic developments is the electronic potato that can be used by growers to determine where they are bruising their spuds. The artificial potato has internal sensing devices that measure impact. It can be calibrated

with special instruments, then run over the potato handling equipment. The potato sends out signals to a receiver that records the magnitude of the impacts. The grower can then modify his potato handling equipment wherever he has a problem.

Automatic boom controls are another one of Halderson's inventions. It uses an electronic sensing device that can measure distances. The instrument can be used to hold the end of a potato boom within 3 to 6 inches of the pile. This allows the harvester or piler operator more time to pay attention to his other duties. The control system, of course, allows for manual operation when necessary. As you can see, the equipment doesn't add much to the end of the boom.

Another development is for shippers of fresh fruits and vegetables. This machine uses electronic technology to sort produce according not only to size, but also to color. It uses a microcomputer that enables the shipper to change specifications and automatically have an inventory of the different grades and packs.

Electronic dairy feeding systems is another interesting piece of equipment. It uses an identification collar that the cow wears around her neck. The feeder 'reads' this collar and gives the cow a specific ration depending on her production. The dairyman controls what each cow gets. With this system the dairyman makes the most efficient use of feed by adjusting what the cow eats according to her historical production and where she is on her lactation curve.

An Eastern Idaho firm has also developed a remote control for potato pilers. This, of course, allows the operator to do a better job and to do more than just stand at the piler controls all day.

There is another development for planters that I am not too familiar with. The concept is that there is an electronic eye that counts each seed piece for each row in the planter. It actually tells how much seed is dropping into the soil, so if the operator sees one row stop counting he knows there is a problem. I know a potato grower that is quite handy in the shop that has developed a planter of this type.

Purchase Decision

The last part of my talk concerns the decision to buy an on-farm computer. First I will give an example of an operation that was one of the first to buy a computer - Fielding Farms and Livestock of Shelley, Idaho. This is Linden Fielding, one of Arvel Fielding's four sons in the operation. Linden is the one who brought the computer to the farm. His father, at first, didn't like the idea so Linden bought the computer with his personal money rather than the farm's money.

The Fielding operation consists of 2100 acres of cropland. They grow potatoes, grain, hay and corn. They also feed more than 4000 head of cattle each year. They are innovators. They have had a domed potato storage for several years and built a domed grain storage (with aeration) last summer.

They also bought this combine last summer. I suppose it cost close to \$100,000. This piece of equipment, the Radio Shack computer, cost about 1/20th of that. Notice that Linden also uses a programmable calculator.

This poster, "To err is human. To really foul things up requires a computer" is on the wall in the office. The computer gave them difficulties at first but they are pleased with it now. One of the early problems was that when Linden bought the computer there was no software available for farmers. Fortunately, Linden had taken one computer programming course while getting his agricultural engineering degree at Utah State. He wrote all of his own programs.

The Fieldings use their computer for a variety of uses including financial records, physical records (for the feedlot), rations, and marketing. They understand hedging on the futures market and use it as a tool to forward price their cattle. With their cost records, they know what price they need to make a profit. They keep separate records on each lot of cattle, the costs, and expected marketing date. They also use AGNET to obtain market information.

The decision to purchase an on-farm computer is not an easy one. Farmers should put plenty of time and thought into the decision. I have outlined six steps that might help you make a decision.

The first step is to determine your management information needs. Collecting and analyzing information requires time and money. If a producer doesn't use the information it is a waste of money. The farmer needs to determine what are the most important decisions he makes, what information is needed to make better decisions, and if the computer can help. Some farmers hire consultants to help them analyze their situation.

The second step is to identify available programs. Sources of programs include (1) commercial vendors; (2) extension service; (3) custom programming; (4) and writing your own programs. If the farmer can't find what he wants (3) may be a viable, although perhaps expensive alternative. There are a few firms in Idaho that do custom programming for farmers.

The third step is to determine hardware needs. Don't forget that the search for software comes before this step. I know of some farmers that bought hardware then found out that they can't buy useable software for that machine. I probably get 2 or 3 calls every month from growers asking what they can do with the computer they just bought. Often I have to tell them that their machines are useless until someone writes some farm software for it. The software vendor will tell you what the hardware requirements are, but you may want to exceed the minimum and add components.

The fourth step is to contact dealers. You will want to do business with a firm you are comfortable with. The knowledge, service, and financial stability of the dealer are important factors. Also, how would you feel about doing business with a particular dealer? Since you, as farmers, have purchased equipment before, you should feel comfortable with this step.

The fifth step is to look at the costs and benefits. You can easily find out what the hardware and software costs are. You may also have a small cost in hiring someone to operate the computer. Most farmers either do it themselves or have their wife do it but this is not without cost. If you currently hire an accountant or bookkeeper for your record-keeping, cutting this cost is one potential benefit.

Estimating the dollar benefit of having a computerized management information system is difficult. Escalating production costs and depressed commodity prices increase the financial risk of farming and do not leave much room for bad decisions. Preventing one bad decision may pay for the system in the first year. The ability to experiment with a decision on paper before implementation may justify purchase of a microcomputer.

The sixth and last step is to make the decision to buy or not to buy. Some additional things you may want to do before making that decision include: talking to farmers that are using computers and attending farm computer education seminars. Remember that computers are not for everyone and it won't hurt to postpone your decision.

Remember: the computer is only a management tool. It cannot be used in place of a good manager. If you are really interested in operating your farm as a successful business, educate yourself and put effort into better management. Then, the computer can be a useful tool to you.