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Microcomputers for the Farm Business

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Microcomputers are fast becoming an important tool in many areas of business and education. Technological developments have made the capabilities of a large computer available in small compact units adaptable to the farm and the home.

Farmers use microcomputers as aids in making farm management decisions. It is becoming commonplace for them to access data banks (such as AGNET) for the latest market information, procedures for formulating feed rations, planning cropping programs, etc. Some households use the computer to keep records, research family genealogy, and pay bills. The computer is coming into use as a teaching tool in our high schools as well as in colleges and universities. It is rapidly becoming essential for students to understand how computers are being used in their chosen fields. Already, major universities are thinking in terms of requiring students to bring personal computers to plug into the university computing system much as they now bring pocket-size calculators to the classroom.

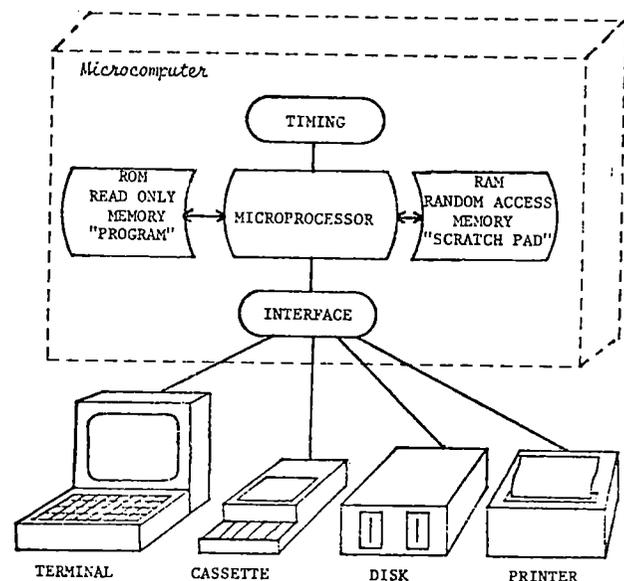
This tremendously rapid growth of computer technology raises questions as to the feasibility of purchasing a personal computer as well as questions on what kind of a computer system to purchase. The Electrical Engineering Department and The Economics Department at South Dakota State University conducted a cooperative study to determine the requirements for a microcomputer based system that would be functional

and economical as a farm or ranch business management tool. This newsletter reports the results of our findings.

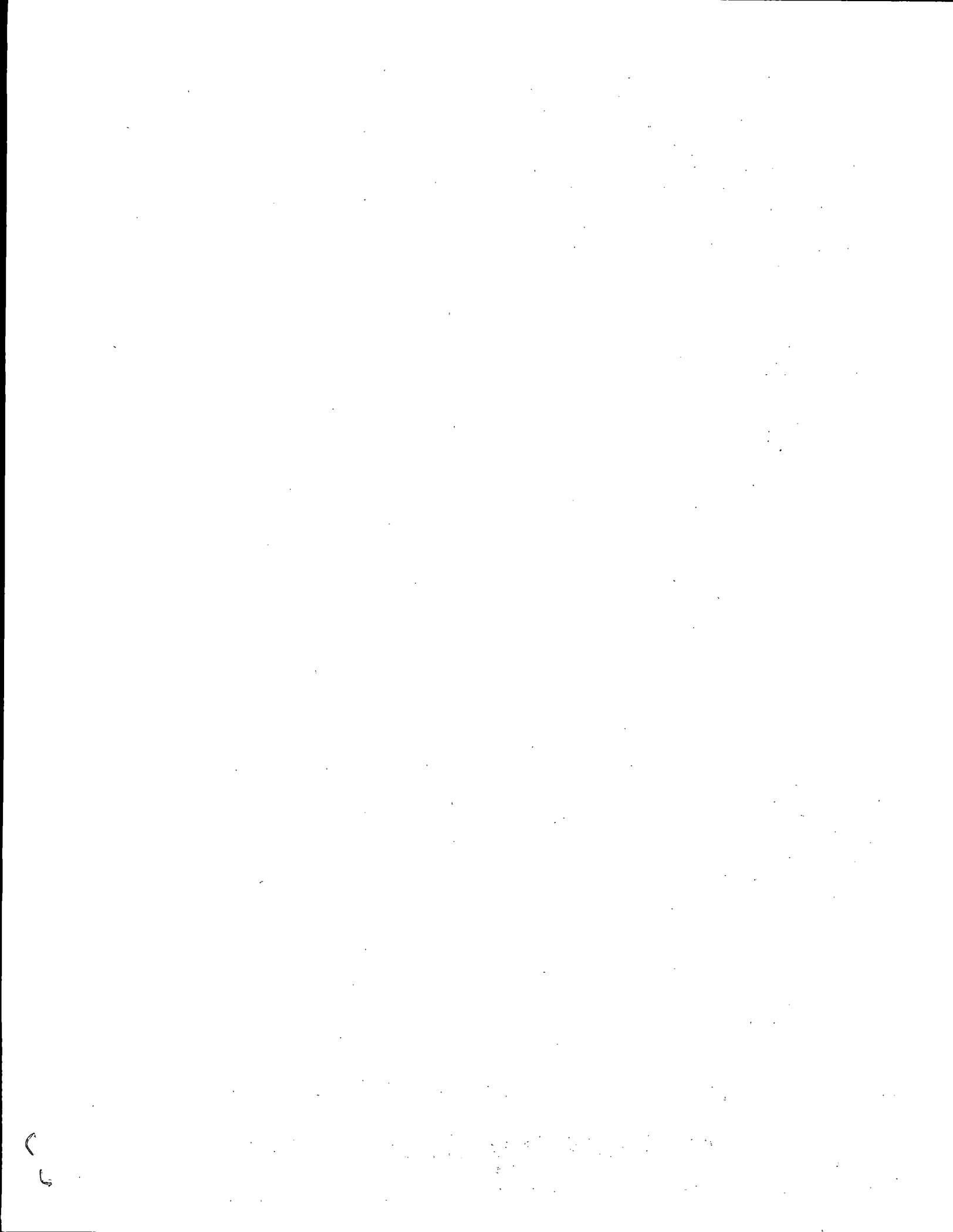
Microcomputer Design

In order to understand the computer and what it does, it is important to know some of the terminology and general makeup of a microcomputer system. A microcomputer system is made up of devices referred to as the microprocessor, memory, timing circuits and interface circuits as shown in Figure 1. The microprocessor is where all the "action" takes place. It receives data, performs mathematical operations, and routes the data to memory or other devices such as video terminals, printers or disks.

Figure 1. Microcomputer Design



A very important part of the microcomputer is the memory. This is used to store data and programs. The memories are divided into Read only Memories (ROM) and Random Access Memories (RAM). The ROM can only be read from and its contents cannot be altered. Data are permanently "burned" into the ROM and do not disappear when power is turned off. The RAM can be read from, or data written into it can



be altered by the user. Programs being written and subject to change may be put in RAM. RAM is used as a "scratch pad" for calculations and will lose all of its data if power is turned off.

The size or capability of a computer to manipulate and store data is frequently associated with the amount of storage space in the memory of the computer. This storage space is often specified or measured by the number of "bytes" it contains. The terms "byte" and "word" are often used interchangeably and should be defined carefully.

One "byte" is required to store one character of data, such as the letter "A" or the numeral "1". A "word" in memory refers to the data stored at each memory location. A word may be comprised of several characters requiring several "bytes" of storage for each word. However, the most common word size in microcomputers is one "byte" of information and therefore one byte is equivalent to one word of storage space. More detailed information on this may be obtained by writing to the Economics Department and asking for Research Report 80-1.

Normally, a microcomputer for farm use should have 32 thousand (32K) bytes of storage space in order to develop and store useful programs. Only in rare instances is more than 64K needed. A word of caution, however, some of this memory space is used by the computer to run itself. It is, therefore, advisable to check on what is left as usable space for running your program.

External Devices

External devices refer to terminals, cassette tapes, disks, printers, etc. Data may be stored on either a tape or a disk. However, the time required to read or record large programs on tape discourages their use. The processing speed of a disk system makes it a very desirable addition. A tape system is useful for storing data that are not frequently used.

Data output may be read on either a cathode ray terminal (CRT) or a hard copy printer. A functional system

should consist of a CRT terminal, a disk memory, a cassette tape memory, and a page printer. A printer is necessary to document farm business reports and transactions. Many printers use an eighty character line as standard, but for farm accounting 132 characters is desirable. If one expects to do a lot of printing, a printer output of at least 100 characters per second (CPS) would also be recommended. Some printers require a special "thermal" paper. The keeping quality of documents printed on the thermal paper is inferior to that which is printed on regular paper. Thermal paper is usually more expensive than regular paper.

An acoustic coupler is another device that will make the microcomputer more versatile. The coupler permits the use of the telephone line to connect with larger computer systems. The telephone receiver is inserted into the coupler and data are transmitted by high frequency audio signals.

Programming

A computer can be useful only if it is programmed to do desired tasks. A program is a step by step set of detailed instructions telling the computer what to do with data it has been given.

The programming may be done by someone who sells programs or by the computer owner. It usually requires considerable time and effort to develop a worthwhile program. Many computer companies provide computer programs to do specific tasks. Most microcomputer programs are written in a language called BASIC. This language is employed at various levels of sophistication, and can vary from one computer to another depending upon the compiler used by the manufacturer. This is why a program acquired from someone else may not be immediately usable in one's own computer.

Also, purchased programs may not conform to the methodology, printing format, or other specifications desired by an individual user. While some

programs can be modified to meet one's personal preferences, making such modifications usually requires some advanced programming knowledge and considerable time.

Other, more powerful languages, such as FORTRAN, are used on large computers like the IBM/370 on the SDSU campus. Microcomputers with FORTRAN capability cost more but provide added flexibility to the user.

Conclusion

Before a microcomputer is purchased it is important to determine what services and functions one wants the computer to perform.

A microcomputer with at least 32K bytes of memory and magnetic disk storage is recommended for efficient data processing. Provisions for use of a tape recorder should also be available. A printer with at least an 80 character line is essential. The computer should have the capability of connecting to larger computer systems. If a computer with limited capacity is being considered, it would be desirable to determine whether or not the system has the capability for expansion. One may wish to consider the capabilities of the system for serving as a monitor to other on-farm activities, such as building temperature control, monitoring irrigation systems, etc. It is estimated that systems with the features recommended in this newsletter may fall in the \$3,000 to \$5,000 range of investment.