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## Information Technology Adoption in Agricultural Operations: A Progression Path

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## Information Technology Adoption in Agricultural Operations: A Progression Path

### Abstract

Agricultural operations are not taking advantage of the Information Technology (IT) tools that exist today. As the agricultural industry continues to evolve, IT utilization is critical to the continued competitiveness/survival of individual operations. A progression path for IT adoption is defined that takes into account IT tools utilized along with impacts to operational processes. This path can be used as a tool to ease farmers into the IT world without introducing excessive change all at once. Application of this path in Extension educational programs could increase IT adoption and retention in agricultural operations.

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### Technology Utilization: Current State and Future Need

The U.S. Agriculture Industry has not been left out of the "information revolution" that has been taking place over the past 20 years. For example, a cursory search of the Internet yields a long list of software companies that produce sophisticated software to assist agricultural producers in managing the farm (e.g., herd management, financial/accounting). Research (Findlay, Zabawa, Morris, & Oben, 1993; Schmidt, Rockwell, Bitney, & Sarno, 1994) indicates that during the 1980s and early 1990s, farmers largely were not taking advantage of information technology (IT). Blezinger's (2001) experience with cattle operations showed that many operations are not keeping good records, which suggests the operations are not utilizing IT.

Discussions at the 1999 EFITA (European Federation for Information Technology in Agriculture) Conference (Gelb, Schiefer, Parker, & Rosskopf, 2000), suggest that, while many factors impact IT adoption, it is critical, both now and in the future, that IT be utilized in agricultural operations. One speaker at the conference used the word "dictate" to indicate the criticality of IT adoption.

While the concept of IT can represent many different functions, most agricultural operators will, arguably, maximize utility from record-keeping functionality to support strategic, tactical, and operational management of the farm.

### A Progression Path for Technology Adoption

The fact is that many agricultural operations are short on information technology. Leaping into new technologies can have substantial impact on productivity, both positive and negative. The right choices taken at the right time are crucial. So a question is raised: How can we help a farmer adopt IT tools that will assist in the management of the agricultural operation?

### Progression Path Definition

This article proposes that a "Progression Path" framework can be defined as an evaluation tool to assist with IT adoption in agricultural operations. This framework could be used to:

- Determine the current level of IT utilization for a particular farmer,
- Determine the next step on the path, and
- Develop a specific "step migration plan" that addresses operational processes along with IT components.

The basic stepping stones for this path cover a wide spectrum, ranging from no IT to a networked, multi-user IT environment. The five steps are defined as follows.

- I. "Intra-Cranial" ("I-C"). This step is the absence of IT, with "record keeping" done in the farmer's memory and perceptions;
- II. Paper/Pencil. Capturing farm data in a notebook, journal, or accounting-type ledger is a vast IT improvement over "I-C";
- III. Single Machine/Generic Tools. This includes Personal Computers (PCs) or Personal Digital Assistants (PDAs) using "standard-load" tools such as word-processing, spreadsheet, database applications, and Internet browsers;
- IV. Single Machine/Specific Tools. This includes PCs or PDAs using specific tools such as herd-management, accounting/financial or Internet-based applications;
- V. Networked Machines. This includes client/server implementations of either generic or specific tools. This step would likely only be taken by large operations that need concurrent support for multiple system users. This step will likely require an IT management function.

### **Why a Progression Path?**

There are at least three reasons why this concept of a "Progression Path" can be used to assist a farmer in realizing the benefits of IT.

#### ***Incremental Change***

Given that humans resist change, especially when the level of change is significant, this progression path allows for small steps as opposed to giant leaps. For example, it is unlikely that a Step I farmer with no PC experience will purchase a PC with herd-management software and use it to manage the herd. It is more likely that such a farmer would begin the record-keeping journey by writing information on paper.

#### ***Incremental Expenditures***

Each step along the path requires expenditures for equipment and tools. Skipping steps will stack expenditures all at once.

The expenditures at the lower steps will likely focus on operational equipment and tools that will be needed to produce the data required at later steps. For example, the Step I farmer likely does not weigh calves or yearlings because he is not keeping up with that data. Knowing that Step IV tools can maintain such information, the farmer can purchase scales at Step II, where IT expenditures are virtually nonexistent, to allow for weighing animals and institute that process on his farm.

Expenditures at the higher steps will shift towards IT equipment and tools. For example, Step III calls for a PC to be purchased while Step IV calls for extra software.

#### ***Incremental Build***

Most of the expenditures and operational processes adopted at a given step will not be lost with migration to the next step. In fact, most of the operational processes adopted in a particular step are actually in preparation for the next step. Similarly, records kept at a given step can be expanded upon in later steps.

### **Migration Process**

When using the Progression Path framework to assist with IT adoption, a migration process is needed to guide the development and execution of the farmer-specific "step migration plan." As intimated above, the basic migration process would be:

- Determine current step using the Progression Path definitions;
- Maximize IT utilization at the current step;
- Learn about available IT and necessary operational change at the next step;
- Develop and institute appropriate operational changes; and

- Purchase, install, and use new IT.

During the migration process, time spent in a given step should be long enough to ensure that both operational processes and IT tools are used consistently and effectively. It is suggested that a farmer stay in each step for at least 2 years. This allows a year for adoption of the current step's technology and operations, followed by a year of planning to take the next step. That means that at least a 5-year commitment is needed to move from Step I to Step IV.

### Implications for Extension

Extension professionals can use this Progression Path in at least two ways, as an evaluation tool and in program development.

Individual agents can use an understanding of this framework when working with a farmer to quickly assess the step on the path that best represents his/her IT utilization and associated operational processes. The agent can then counsel the producer on preparing to move to the next step in the path. The agent can also target producers for the appropriate level of step-based training or educational sessions.

The aforementioned training or educational programs can be developed based on the framework. These programs would seek to increase both IT adoption and retention. Alternatively, the framework could be used as supplemental information in existing programs that deal with operational processes and technologies.

It should be noted that, while this research was focused specifically on beef cattle operations, the stepping-stones of the "Path" represent a framework that could easily be applied to other agricultural operations, including crop production operations. Obviously, the details could vary greatly between particular operations' migration paths in terms of software tools and supporting operational process but the framework would still apply.

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