Irrigation Technology Transfer

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It is human nature to regard Technology Transfer as an activity that we perform when we take our modern methods to someone less advanced. In fact, we begin our examination of irrigation technology transfer with an example from the Bolivian Altiplano. However, the focus of this discussion is the reverse process…when we are the *recipients* of the new technology. We will examine processes involved for successful technology transfer and discuss the irrigation technologies currently available. And prior to the question and answer period, we will provide a couple of examples for avoiding the pitfalls in applying new technologies.

We had the opportunity to study Latin American agriculture a few years ago and a portion of that time was spent on the shore of Lake Titicaca, on the Altiplano of Bolivia. Here the local population grows a single crop of potatoes each year, during the rainy season. During the six-month dry period the land remains fallow. We watched with interest as they plowed and planted their small plots (about 100 Feet Square) with man and ox. They asked if we would care to drive, which we did. Noting our obvious prowess with ox and plow, they politely asked if we grew potatoes in the United States. Of course, Pat being from Idaho explained that his State was famous for their potatoes. Next they asked if we used oxen to plow and plant. We explained that they generally use tractors instead of oxen, which resulted in perplexed looks. Although there were a few tractors in this pueblo, they couldn't seem to envision a tractor in the potato fields.

Later that day we were speaking with an extension agent who explained that their experiments with tractors were total failures. The plots are too small (having been divided between siblings for several generations) for the tractors to maneuver in and would frequently become bogged down in the deep organic soils around the lake. This required a team of oxen to drag the tractor back to high ground. Most disappointing.

When we suggested that they utilize the afternoon wind to lift water out of the lake to irrigate their fields and harvest two crops of potatoes each year, they explained that one crop was sufficient to feed their families. What would they do with all of those extra

potatoes? There was no market for them, because everyone grew enough of their own. At this point we decided to refrain from suggesting to them how to fertilize their potatoes. After all, potatoes were developed here!

The vision of our experience with these Bolivian agriculturists comes to mind frequently when we are asked to assist our clients in assimilating new technologies. Several questions come up that require careful consideration by the person requesting the change.

- Why do I want this new technology?
- Why are my current methods no longer acceptable?
- What do I expect to gain with this new method?
- Will it be worth the trouble of changing?
- Is my current system able to accept and assimilate the change?
- Will my team members be eager and able to accept this new technology?

If it is determined that the existing system is indeed lacking in some form, there are usually several alternative technologies available. Not all of them may be appropriate for any given system. In determining the suitability of any given technology for your particular farming system, the more research that can be done prior to assimilation the better the chances are for success. This research can be performed in a variety of ways.

- Speaking with salespersons is an excellent way to discover the potential of a new technology. If alternative technologies are available, it is valuable to speak with competing sales representatives to learn the disadvantages of others.
- Speaking with growers is a great way to gain first-hand experience on a new technology. Two important things to keep in mind: new purchasers may still see the technology through rose-colored glasses and one grower's management system is not necessarily a good model for yours.
- University Extension frequently has had access to the new technology for research purposes, and can provide contacts and case histories.
- Independent consultants with expertise in the given area of interest. (Be sure to pick up one of our business cards before you leave!)
- The information you need is on the World Wide Web. Your ability to find it depends on your search tools and helpful tips from the above sources.

Once you have completed your research into the different technologies available to address your given need, you can focus on the implementation of the technology. There is generally a phase-in period, where you may test the new system alongside the existing system until your team is convinced that the new technology will indeed work. As an

example, a new set of soil moisture sensing devices will be field tested for at least one season before most growers would discard their former method.

A common downfall in the success of new technologies in large-scale production agriculture is the failure to properly transfer the technology to the people in the field actually using the technology. Most growers wouldn't consider placing a hundred thousand-dollar harvester into the hands of an untrained operator, yet we find equally valued irrigation systems being managed by irrigators whose training has amounted to being shown where the START button is located. It is important that all the players in the farming system share the vision in why the new technology is being embraced and that each player has appropriate training to ensure the success of the program.

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It is not our intention to present to you everything that is new in irrigation. We recently attended the Irrigation Association's International Convention at the San Diego Convention Center. We spent three days on the floor of the Center looking at current technologies. We made a big dent in it, but we did not make it through to see everything that was offered. What we will offer to you is a broad overview of available technologies and some of their potential applications. If something catches you interest and you would like more information, please see us after the presentation and we will gladly point you in a direction that is hopefully not too tangential.

Emission Devices

- Drip emitters
- Pressure-compensating emitters
- Integral (inline) emitters
- Tape
- Micro-sprinklers
- Frost control with "directed spray"
- Sprinklers

Water Treatment Products

- Biocides
- Beneficial microbes
- Anti-scalents
- Water Penetrants

Filtration

- Pre-filters
- Hydrocyclones
- Screens

- Disks
- Sand Media
- Backflush recycling systems

Control Systems
- Valves
- Injection pumps
- Meters
- Controllers

Irrigation Scheduling
- Climate monitoring
- Remote sensing
- Soil moisture sensing
- Plant stress sensing

Avoiding the Pitfalls

We will leave you with two final considerations, both of which are common sources of challenge when applying new technologies. The first is the need to **Maintain Management Focus**. An appropriate example of this is the shift of focus we often find when growers start injecting gypsum into their drip irrigation systems. The typical goal of the injection is to maintain irrigation uniformity by increasing water penetration underneath the emitters. This is an effective practice in many areas, especially when dealing with source water that is low in total salts, such as Sierra snow melt.

However, in areas where the source water is high in calcium or alkalinity, which is common along the Central Coast of California, gypsum injections can cause the precipitation of limestone in the drip system and associated emitter plugging. Growers are often forced to inject acid to clear the drip lines and even replace plugged emitters. The overall effect of the gypsum injections is a lowering of irrigation uniformity and a high demand of management's time and labor. Management focus shifts to feeding the gypsum machine and replacing plugged emitters instead of maintaining irrigation uniformity. This is a good time to re-evaluate the focus and goals of the project.

The final consideration we will present is using care to **Match the Technology to the System.** The example we have chosen to illustrate this is Irrigation Scheduling. Irrigation scheduling has become quite fashionable these days, especially in winegrapes. With all of the high-tech tools available to the grower it is of little wonder…weather stations, soil moisture monitors, satellite imagery, 3-D glasses and sap meters! Three days in front of a computer screen and the vineyard manager emerges with an Irrigation Schedule like Moses coming down the hill!

“José, I want you to apply 1.3 inches of water to the Merlot!”

“Si, Señor.”

Fortunately, José knows how many hours it will take to apply that amount water. (This is a high-tech operation.) Unfortunately, no one realizes that the irrigation uniformity of the Merlot Block is 80%. This means that as the water is applied, half of the vines receive an average of 1.3 inches. One quarter receive an average of 1.04 inches and the other quarter receives 1.56 inches on the average. A difference of 50%! Does it make sense to spend a lot of time and money on scheduling an irrigation system that is incapable of delivering water (and nutrients) in a uniform manner? This too, is a good time to re-evaluate the focus and goals of the project.

In summary, Technology Transfer is a process of progression and change. In modern irrigation there are literally hundreds of different ways to get water to a crop. Selecting the appropriate technology becomes a matter of careful research as well as consideration of your current farming system and team players. As you begin the transfer process it is important to keep a clear focus on the management goals. Embracing an inappropriate technology is only change without the progress. Few of us would choose to maintain that course if we took the time to re-evaluate our focus and goals.

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