

Traceability – Cost Burden or Profit Opportunity?

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Submitted as an article for the May 2002 issue of Food Traceability Report.

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Today, many agricultural producers and food processors view traceability as a cost burden. Worse, some agricultural producers are seeing traceability not only as a cost burden, but one that also adds potential liability to their operation—liability they didn't have before traceability. With this perspective, why adopt traceability?

The perspective of traceability as a cost burden comes largely because many producers and processors view only one aspect of traceability – ownership traceability. Ownership traceability is the ability, in the event of a food safety or security issue, to trace back and trace forward ownership to determine the potential source of a problem, and eliminate potentially contaminated food from the supply chain. Ownership traceability is being discussed primarily by governments through the rollout of national identification programs to help contain disease or to limit the impact of a food security issue. In some instances these programs, only capture the farm of origin. In others, they track all owners from farm(s) to consumer (paper passport systems as used in Europe).

Viewing traceability as a cost burden, though, is a profit-limiting perspective. Traceability, done right, is much more than just ownership traceability – it's also the tracing of (1) product attributes and (2) the processes through which products have undergone on each appropriately sized unit of agricultural production during the product's journey from farm(s) to consumer. A product attribute is some measured or observed characteristic of the unit of production at some point in the supply chain -- the pH of a truckload of tomatoes is an attribute for a unit of production, or a steer's color. A product process is something done to the product in the supply chain -- giving an animal a vaccination or antibiotic shot, or spraying a field with a particular chemical.

The value of tracing product attributes and processes comes from maintaining the identity of the specific product and the corresponding attributes and processes associated with that product from farm(s) to consumer over many owners and many form changes (wheat to flour to dough to buns). For example, one of the findings we've seen is that when beef cattle are treated more than two times in their life for illness with antibiotics, usually by two separate owners, they generate substantially less revenue on a grid-based pricing system than animals who haven't received two separate treatments. Without tracking this process across the multiple owners a typical head of beef cattle has in its life, this profit-limiter wouldn't be obvious to later owners. A later owner, say a feedlot, who knows this fact can slot an animal into a different marketing program to maximize quality grade.

Determining the association between specific attributes and processes from an earlier, upstream owner that impact the outcome attribute of a downstream owner can add value to each link of the chain. And you don't necessarily need visibility over the entire chain.

Experience has shown that quite a bit of value can be added by tracking individual units of production within a single chain segment, or by connecting only two or more links in the chain. Each link adds more value.

During the past four plus years, eFarm, AgInfoLink Global, and teams at John Deere have been working together to determine how the tracing of product attributes and processes can add value to producers and processors at all stages of the food supply chain. The experience from pilot projects in the beef cattle industry, the baking industry and the processed tomato industry have shown us that traceability can add profit – sometimes substantial profit. And, by the way, ownership traceability comes along nearly for free, providing protection against potentially major loss from food safety or food security problems, whether natural or intentional.

What type of profit-enhancement are we talking about? The experience so far has shown that when members of the chain invest approximately 0.5% (half a percent) of the cost of the raw product paid by the first stage processor for each unit of production, they are reaping better than 2.0% to 5.0% increased profit – again based upon the revenue generated by the last agricultural producer who sells to the first food processor. In the beef cattle industry, for example, investing about \$5 per head of cattle has increased profitability by somewhere between \$25/head to \$75/head. And this effect isn't just with one pilot project with one customer. The AgInfoLink experience has documented over 50 case studies spanning multiple owners and a very large number of cattle. Other cattle companies have reported similar results. John Deere and eFarm efforts have shown nearly identical results in a wide range of other food products, from hamburger buns to tomatoes processed as catsup and spaghetti sauce. Traceability, when it focuses on attribute and process tracing, adds to the bottom line.

Today, any number of attributes and processes can be captured and tracked throughout the entire chain or segments of the chain. Because we have not historically had visibility on the entire food chain, we have not been able to determine which upstream attributes and processes are going to be important to product outcomes to downstream processors, retailers and consumers. Having visibility on the any part of the chain is teaching us many new lessons, almost all of which are not intuitive.

In future issues of *FTR* we will share our real-life experiences and explore the types of profit that product-attribute and process traceability have already begun to add to many companies. We will focus on specific case studies illustrating the profit-enhancing potential of attribute and process tracking. We invite your comments, questions and experiences.

Where's the Beef? – Traceability Within a Single Operation

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Last month, we wrote that tracing attribute, process and ownership/location information on appropriately sized units of production across multiple owners in the supply chain adds value. Tracing is not a cost adder – it can add substantial profit. And the more segments of the supply chain you can include in the information sharing, the more benefit to every member of the supply chain. So where's the proof?

John Deere, AgInfoLink Global Inc., and eFarm have all generated a number of real-world customer examples of how companies have increased their profits by knowing information on appropriately sized units of production from one or more segments in their supply chain – information these companies previously didn't have. As we share some of these success stories, please remember that almost all of these companies have used these techniques to gain competitive advantage in their industry. Consequently, we haven't been able to share all their secrets. Only those that have agreed we can share. And only if we make them a bit general. With that said, this month we'll focus on examples from the beef cattle industry where AgInfoLink has been operating for over four years.

Within the beef cattle industry, as in every other agri-food industry with which we've become involved, the real innovation is the tool kit allowing management of individual units of production, rather than management of the blended group. Managing by the group is today's usual practice. Tomorrow's practice will be to manage by the appropriately sized unit of production. For beef cattle, the appropriately sized unit of production is the individual animal. Managing by the individual animal generates the value. Understanding this fact is important because companies that adopt these tools solely in their own operation are able to see quite a few benefits, even when the information is not shared with a single other participant in their supply chain. Without connecting to a single other member of their supply chain, companies can improve the bottom line. How can this be?

When beef cattle are managed as a large, blended group, say 100 to 250 head, there is relatively little variation from one group to another. In terms of revenue generated in the feedyard, there may be only about \$10/head difference between one pen of 250 head and another. This perceived lack of variability has led some cattle operators to assume that there is little benefit to be gained by managing at a smaller granularity unit. Nothing could be further from the truth.

If one looks at the revenue variability among individual animals in a feedlot pen when they are sold on a value-based grid, there can easily be between \$300 and \$500 a head spread from the best revenue generating animal to the worst! And these extremes are not

aberrations. The average standard deviation for revenue within a pen of cattle can easily be \$100 or more per head which means that nearly 20% of the cattle will generate at least \$100 per head more than the average, and 20% will generate at least \$100 per head less than the average. And within the 60% that cluster around the average, there's quite a bit of variation.

Profitability variation is equally broad within a feedyard. Using data from the Texas A&M "Ranch to Rail" project where they generated a profit and loss statement on each animal, the tale of two steers tells the complete story. These were relatively equivalent animals when they entered the feedlot but produced very different results. One animal was a white-faced, black animal (Certified Angus Beef candidate) weighing a hefty 590 pounds when it entered the feedyard and costing the feedyard \$61.00 per hundredweight. The other animal was a lighter (508 pounds), yellow animal costing the yard \$62.00 per hundredweight. Which was the better investment? Conventional wisdom would suggest the black animal would generate the most profit because it could qualify for the CAB premium. Again, the obvious conclusion led to disaster. The black steer, when all was said and done, lost \$15.56 for the yard because it's daily gain rate was only 2.4 pounds per day. The yellow steer gained at a 4.3 pounds per day and produced a profit for the yard of \$322.93. That's a spread of almost \$340. And these two animals were chosen AT RANDOM from a set of incoming animals.

So, the trick a feedyard needs to do is to determine how to get more of the higher revenue and higher profitability cattle.

Our customers have used a number of different applications to improve their bottom line. For example, a Canadian feedyard developed a theory about why some animals performed better than others did, and utilized the AgInfoLink system to manage improved performance. This operator noticed that when a group of animals are assembled in a feedyard pen, there is a very definite social pecking order. Animals lower in social status were not getting as much time at the feed trough, and they clearly won't perform well if they don't get enough access to food. They further noticed that approximately 15% of all animals in a pen were likely to have poor gain due to pecking order problems. By identifying these poor-doers (animals gaining less than 1.75 lb/day) at re-implant time (approximately 45 days into a 160-180 day feeding cycle) and segregating them into their own pen, the poor-doers increased their gain from less than 1.75 lb/day to over 3.0 lb/day.

Segregating the poor-doers into their own pens, required reordering of about six pens to ensure that pens remained full, but operators found this resorting to be well worth their effort. If one assumes that the improvement only affects about 50% of the poor-doers, and the benefits are averaged over EVERY animal in the feedlot, not just the poor-doers, the yard saw an increase in revenue of about **US \$8.65/head** on every animal in the yard on a total cost of about US \$5.00 for the complete system and the labor to do the resorting. If more than 50% of the poor-doers see improvement, the US \$8.65 can climb pretty substantially. The net profit increase is about US \$3.65 per head, and that is a 7% increase on the typical feedlot profit of \$50 per head.

Because the complete system enabled more than just the poor-doer application, other applications within the feedyard can increase the return on the \$5.00 investment. Another application that several feedyards have employed is to sort pens, commingling ownership, to avoid the discounts from the packinghouse for animals that are either too light or too heavy. These penalties are pretty harsh. Depending on the packinghouse, they may be as much as 40% to 50% of the average revenue if the animal is either too large or too small. If we assume that within a pen of 250 head, 1% of the animals would typically be subject to discounts and by using the individual management at re-implant time to resort these animals, we can easily see a 50% reduction in discounts. While this might seem to be a small reduction, eliminating 50% of the discount can add **another \$US \$5.65/head** on every animal in the feedyard. Adding this to the \$8.65/head improvement takes us to \$14.30 increased revenue on a \$5.00 investment. Now the net profit increase is about \$9.30/head or an increase of about 18.6% over the typical feedlot profit.

These are only two examples of traceability applications within a single company that have been used by feedlot operators to improve their bottom line. The moral of the story is that using the traceability tools within a single company's operation allows the company to begin reaping the traceability benefit, even when this information is not shared with another member of their supply chain. Profit increases, as these examples have shown, can be realized by managing your operation based on appropriately sized units of production. Beginning to connect the chain, as we'll see next month, only adds to the potential additional profits you can add to your operation.

Overcoming hurdles to traceability profits

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Many companies are overwhelmed when they begin to think about traceability. They know that traceability is the wave of the future and they need to ride it, but they just don't know where to start.

During the past four years, we've seen companies offer various rationalizations to explain why they are doing nothing and aren't yet ready to begin tracing:

- Companies think they need to do it all at once. The perceived complexity of inter-connecting all their upstream suppliers and downstream customers paralyzes them into inaction and procrastination.
- Companies want to move toward traceability, but only after they've "upgraded their current information systems"
- Profits are tight right now, and companies prefer to wait until the financial picture is a bit brighter before beginning.

Each of these rationalizations is a dead end that limits a company's ability to evolve profitably in today's challenging economic times. Tracing is a somewhat new discipline, and having the right assistance with the right experience and the right perspective on these issues can make all the difference.

Let's take a look at these rationalizations one by one:

When a company thinks it can't afford adding traceability, leaders are usually viewing traceability only as a cost, not a potential profit enhancer--either cost reduction or revenue enhancement. A dollar invested with the right traceability focus generates a large return across multiple companies in many different agri-food chain segments. We've seen 0.5% of a company's revenue invested in tracing having a 1.5% to a 5.0% return. Five dollars invested in tracking a beef cattle animal returns \$25 per head, \$55 per head or more at slaughter (see FTR, May, Page 24).

When we begin talking with clients, executives will usually say their company is different in this respect, but we have yet to see much difference. What we do see when the projects are actually pilot tested is a three to ten times return on investment. In tough economic times, few companies can ignore this opportunity. Tracing provides a powerful tool to trim costs and add value to products.

Even if a company understands the profits to be gained from tracing, they are likely to think that the practice is still pretty expensive. A company that looked at the field a couple of years ago may have concluded the costs are just too high. It's true that some tracing systems -- especially manual, paper-based systems used by smaller companies in the United States and their counterparts in the European Union--are not cost-effective.

These manual systems are also inaccurate; there's a 10%+ error rate on manually copying or manually keying identification numbers over nine digits long. However, electronic systems that electronically store identification numbers are highly accurate, and the cost has dramatically fallen in recent years.

In beef cattle, for example, the computer chip tag used to identify individual animals has fallen in five years from more than \$12 per animal to \$1.50. Continued price drops can be expected, but it is unlikely we'll see another order of magnitude drop. For other commodities, where less rugged equipment can survive, the cost has fallen to just a few pennies per appropriately sized individual unit of production.

Again, modest cost drops per identifier can be expected, but much of the major cost has already been driven out of the system. The software technology for securely collecting, processing and sharing this information has also fallen in price so that the overall cost, including cost of implementation, falls well within the 0.5% formula used above. When company leaders say they will think about traceability after they have upgraded their current information systems, they are likely missing a huge opportunity. As mentioned above, the cost of adding electronic traceability technology has rapidly dropped in recent years. And the capability has substantially increased.

This evolution in traceability can strongly influence how current information systems are upgraded, not vice-versa. Applications that were not technically or economically possible just a few years ago (e.g., determining which upstream product attributes really make a difference in optimizing production and/or consumer acceptance or providing near-real-time inventory status of upstream raw materials) are now both technically possible and affordable.

The falling cost of hardware and software to track product attributes, processes and location/ownership on appropriately sized individual units of production opens the door to management at a lower granularity level--the appropriately sized individual unit of production. Today, most information systems don't go down to this level of granularity. Tomorrow's systems will require this level of detail. Companies that are looking to upgrade their internal information systems will do well to take a close look at how their operations could change if they were able to manage their processes at this richer, lower detail level rather than today's blended group.

Such analysis requires close focus on the traceability technology appropriate to a business. Only then can executives determine what changes need to be made in their existing information structure to take the company through the next five to ten years. Companies don't want to be optimizing their horse-and-buggy designs when the gasoline engine is right around the corner.

Finally, many companies have the misconception that they need to link all their upstream suppliers and downstream customers before they can begin to consider a traceability project. Nothing could be further from the truth. As with all complex problems, the best way to tackle them is by breaking them down into smaller parts.

Working with our customers, we've found that one can typically find one or more bite-sized projects that have both a manageable scope and a very quick and sizeable payback. Identifying such projects allows the company to begin moving towards traceability while solving an immediate company problem and saves the company immediate operating dollars. The system put in to solve the immediate problem uses the appropriately sized unit of production architecture and lays the foundation for reaping additional benefits from the same basic data flow.

We haven't seen many similarities among the initial projects companies have undertaken to begin traceability. One company chose to look first at automating its payroll process for piece-rate employees. Another company wanted only to begin tracking by bar-coded lot number the physical movement of a small number of products from a limited sub-set of suppliers, through the company's distribution/warehouse process to the company's retail stores.

In each instance, the company began with a well-defined, small-scope project that had a very high financial payback in less than nine months. In each case, the chosen solution laid the foundation for later traceability projects that could be added at only a small incremental cost and still more than pay for themselves. In one of the examples above, automating piece-rate payroll ultimately ended up paying for the source verification certification required by certain high-value, geographic markets. Rationalization leads to inaction. In today's economic and security climate, delay is deadly.

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Traceability – Start Small and Then Expand

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You know you want your company to begin a traceability project, but you don't know where to start.

Our experience over the past four years has shown that the right way is to start small and then expand. Begin with a relatively simple problem that appears to have a high return on investment, and then use this foundation as the basis for expansion to reap the other traceability benefits.

So, what problem to solve? Some companies have begun by looking at a part of their operation they believe is inefficient. One of the agricultural companies with which we work identified their piece-rate field harvesting payroll system as an area they wanted to make more efficient.

The project they contemplated would automate the payroll picking process in such a way that the basic attribute information on each appropriately sized unit of production was collected simultaneously with the payroll event when the employee completed each harvest load. Automating the payroll system generates the savings, and the attribute information on each harvest load comes along for the ride.

In later projects with this company, this attribute information will be linked to downstream processing performance to help improve their production quality. For the moment, however, the focus is just on making the payroll system more efficient. Beginning a traceability project by focusing on increasing efficiency, productivity and improving gross margins isn't limited to agricultural producers. Processors, distributors, and retail organizations can each use the traceability tools to help them become more efficient.

Some companies have begun by wanting to provide visibility and transparency on a part of their operation to downstream buyers. These companies feel that providing their downstream customers with a window on their growing and harvesting activities provides them a competitive advantage, because the downstream processor can get an early look at both the progress of the growing product as well as the attribute qualities of that product. As in just-in-time manufacturing, time is one of the most important value drivers. The earlier processors can obtain information about when the raw product will arrive and the characteristics of that product, the better they can fine-tune their processes to be more efficient. One of our operations began providing this visibility to their community of participating growers and processors by making the grading information of each truckload of product available via the Internet.

From this simple beginning, the company has expanded the project to deliver additional traceability value by providing earlier visibility on the product during the growing phase, and by collecting more agronomic attributes about each growing unit – especially the chemicals in use. Other companies have begun their traceability journey by focusing on areas of their operation that they feel expose them to too much potential risk. While this approach doesn't generate an immediate cost savings, it does provide an important insurance policy in this era of highly visible and costly product recalls. One company with whom we've worked began their traceability project by picking a relatively small number of high-risk product codes (SKUs) used in their final product and tracking the lot numbers from the various suppliers of those products. Managers chose eight SKUs with about three or four suppliers apiece. By tracking the lot number of the upstream ingredient and pairing that information with the lot number of the finished product, they created the basis of a traceback and trace-forward system that would allow the company to quickly generate traceability maps of potentially affected product in a matter of minutes.

The company ensured that this insurance investment was expandable by also collecting some very basic performance data on each lot of produced product. Later, managers will be able to compare the variability of product output with the source of the various ingredients. From experience with other customers, we believe this analysis will provide very useful product improvement information.

Probably the most ambitious way to begin is to try using a traceability project to improve the company's product immediately. Some companies have begun this way, and they have been successful.

One of our processing customers was approached by its downstream customer to provide a product that had a specific characteristic for the consumer. Our processor customer didn't have that product, and the firm wanted to be able to provide it to remain competitive.

Company executives had heard us talk about the benefits of managing by the product attribute of the appropriately sized unit of product instead of managing by groups of blended product. They asked a member of our group to run a pilot project delivering different loads of raw product (wheat), each with different specific attributes. Even though our processor customer was predisposed to believe attribute isolation would yield an improved product, executives expressed astonishment at the results. First, the raw product that ultimately generated the desired consumer characteristic would normally have been rejected at their receiving dock. The raw product didn't have the appearance the processor customer thought was important to their final product. After a bit of discussion, they agreed to manufacture it.

Second, the results of this manufacturing run not only provided the desired consumer characteristic, but it had much higher yield and other manufacturing characteristics that saved the processor customer money. When reviewing this last example, please remember that beginning with product improvement as the traceability motivator has been the exception to the rule. Most companies don't start by focusing on product

improvement, because the key question always asked is “Who will pay?” Convincing the company’s bean counters of the merits of tracking is more quickly done by concentrating on a core function of the company’s output – one module, as we like to call it. Product enhancement is the ultimate goal, but achieving this goal is usually a massive project, because you engage your entire supply chain. It’s better to begin small, solving very finite and well-defined smaller projects, and then expand to tackle product improvement.

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How to prepare for traceability

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Regardless of the motivation for beginning a traceability project, there are some key principles you should keep in mind to maximize the probability of success.

Begin with the end in mind

Too many clients begin thinking about traceability as a fishing expedition. They don't know exactly what they will do with the product attribute, process, and ownership/location information they collect. So they collect as much data as they can, and they try to connect as many links in their food processing chain as possible. The project sometimes grows so large and unfocused that it's scrapped even before it gets off the ground. Or, if it does get started, it's scrapped before tangible results are generated. Rather than use a shotgun approach, think about a narrowly defined rifle shot for your first traceability project. Determine the specific management problem you want to solve, and then be very disciplined to avoid project creep.

You don't have to consider traceability projects for recall activities only. Use the traceability technology to solve the problems your plant faces today. Among the problems that traceability technology have helped solve finding and reducing cost inefficiencies; automating a process to generate savings, and determining the appropriate raw materials to boost bottom-line performance.

So, identify a problem you want to solve, work with traceability technology experts to determine the appropriateness of this technology on this problem,. Define the outcome you'd like to see, such as reducing the cost of generating the piece-rate worker payroll by 25% or increasing yield on this product by 3%..

Five variables are often enough

The next critical lesson is to keep the project small. There is always the tendency to add one more feature or function to the project. Resist that temptation. Also resist the temptation to expand the number of attribute variables that are collected. Sometimes five variables, accurately captured on individual units of production, are more than enough to show you the power of traceability and to demonstrate the value. We see too many companies try to capture 30, 40 or even several hundred attributes during the first project. The company's motivation is to be thorough. They believe that as long as they are collecting information, they should exhaustively collect every variable they can imagine. This type of thinking has expanded projects well beyond what's economically viable, and has delayed the company realizing an immediate payback and benefit from adopting traceability.

One of our customers collected exactly five product attribute variables about each unit of incoming supply. There was pressure to initially collect more data, but managers resisted the impulse. With a relatively small amount of data to be collected on each incoming load, and limiting the data collected through their plant to the key outcome variables for a single product – yield, the top one or two quality variables, and percent wastage, we were able to rapidly build a tracing solution that quickly pinpointed which of the incoming raw materials best optimized their plant operation.

One link is often enough

In addition to the amount of data collected, you need to discipline yourself to minimize the number of steps in the production chain you initially link. Trying to link everyone in the chain on Day One doesn't work. Agri-food supply chains are very complex. The best approach is to pick the segment of the chain that is likely to yield the highest return. In the example above, the traceability project collecting only five initial variables linked only the grower and the first stage or raw ingredient processing. And it didn't connect the grower's data from the field, only the information on each delivery truck of product as it arrived after harvest. The data from the scale ticket on each load was then compared with the first stage processing output of the load – a relatively simple two-link system. Once this two-link system was up and running and the data were providing the information to make management decisions about the appropriate variety to source, the project was expanded to extend tracing to the next downstream process – the production of the final food product. This third link added even more information for the buyers and allowed them to fine-tune their purchasing criteria. The next step in this project will be to go further upstream to collect agronomic information prior to harvest. Adding this fourth link will now allow the company to do data-mine the information to determine if there are agronomic practices that will positively affect profitability. We believe we will find such relationships for that client, as we have with other clients.

Processes are continuous

In the example above, it would be easy to conclude that once one had determined the varieties that yielded the highest profit for the processing plant, the job was done. Unfortunately, nothing could be further from the truth. Manufacturing is a process, and processes to remain stable, require continuous monitoring. Just as statistical process control has reshaped manufacturing in the automotive, aerospace, appliance and almost all heavy industries in the developed world, it can have a very positive impact on the agri-food industry when the traceability technology is used to link the various stages of production.

Think GEM

Don't fall into the trap of thinking that the answer to all agrifood problems is determining the correct variety. All the work we've collectively done has shown that the final results come from a mix of variety (Genetics), the Environment (where it is grown), and the Management practices used to grow or process the product.

Identify your target up front

One of the major innovations introduced by traceability technology is tracking each unit of production through the agrifood chain.

Determining the appropriate size to be tracked for each product state is one of the important first tasks. In the earlier example, the initial unit of production was the truckload of product. This might be a single variety from a single field from a single grower, or it might be a blended combination. For that project, the unit of production chosen was the incoming truck. The rule was that for every combination of grower, field, and variety there would be a separate incoming ticket – even if a single truck contained a mixture of product sources.

While one cannot take a single unit of final product and tie it back to a single farm field, one can prune the supply chain tree quite a bit and can zero in on the range of specific product at each stage of production that contributed to the final product. Pruning this complex supply matrix typically shows that only a small percentage of all raw, incoming product is a possible source of product in a single final product. Having this level of specificity has been quite adequate for delivering real value.

Pull the trigger

One of the saddest things we've seen is failure to act. A livestock client of ours had a system in place that clearly showed when it was time to harvest, and the system accuracy was extremely high during the trials. When the system said "harvest", there was a high probability that profit would be maximized. However, because this system was very new to the field manager, who typically made the decision by "eye," it was distrusted. The field manager continued with his past practices, and executives wondered why they weren't seeing in full production the benefits they saw during the trials.

To help avoid this pitfall, we should have asked the field manager divide his operation into two parts – one part where the system made the harvest call, and the other part where the field manager continued managing the way he had always managed. With an approach offering immediate feedback, we're confident the field manager would have been much more comfortable in the transition.

Involve your people

Successful implementation of a traceability project is ultimately dependent upon people. In the agrifood industry, many managers have been doing their jobs for many years and perceive themselves to be expert in what they do. A traceability project needs to involve as many staff critical to the project success as early in the project as possible. Ensuring that your key people are involved with project from early stages removes much of the "magic" and mystery from the traceability tools, and keeps the ultimate rollout from being seen as a contest between human and computer. Rather, your people view the new traceability technology as just one more tool to help them do a better job.

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Traceability Can Help Combat Bioterrorism

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Prior to 9/11, if airline executives had fully understood the danger their industry faced from terrorism, we're confident they would have taken steps to reduce the risk and lessen the impact. It also seems certain these steps would have been one of the airlines' highest corporate priorities.

The National Academy of Sciences has raised a clarion call to the agrifood industry. The dangers cited in a recently-released NAS report have also been underscored in government briefings and at various industry conferences and private briefings.

Just how real is the danger to the food industry? And what role, if any, can traceability play in defending ourselves?

The NAS report declared that "bioterrorism is now a reality" and concluded that the United States is vulnerable to agricultural bioterrorism and needs a comprehensive plan to defend against it. "Biological agents that could be used to harm crops or livestock are widely available and pose a major threat to U.S. agriculture," said Harley Moon, the Iowa State University veterinarian who chaired the study committee.

The report spotlighted the risk at raw material aggregation points such as grain elevators and cattle feedyards. "While a bioterrorism attack on U.S. agriculture is highly unlikely to result in famine or malnutrition, it could harm people, disrupt the economy, and cause widespread public concern and confusion," the NAS said.

How do you defend against the bioterrorist threat? The NAS study made several policy recommendations focused primarily on detection and public health response, advocating increased funding for laboratories and other public health infrastructure.

Little attention was paid to the benefits of traceability, the tracking of appropriately-sized, discrete units of production through the food chain to provide frontline containment.

While we believe that detection and response are critical, we also believe that containment reduces the impact and gives companies a way to protect consumers.

Following a foot-and-mouth disease outbreak last year, British officials concluded that identifying the location of infected animals, and others with which they had contact, within hours—or, at most, a few days—along with current downstream location of specified animal by-products, was one of the keys to successful containment.

Given that U.S. food products have even a higher transportation component in their growth and processing than their U.K. counterparts, we need to know what has come from where and has been in contact with what other product throughout its life cycle.

Traceability is critical to this process. For example, if a recently arrived feedyard animal comes down with suspicious symptoms, an eartag identifying its origins and contacts

with other animals can help pinpoint in just a few hours what other animals and locations need to be checked.

A sick animal without identifying information is like an anthrax letter without a postmark—all post offices would be suspect, and containment resources would be spread way too thin. Knowing which other animals have come in contact with the victim would be exceedingly helpful. Learning the information in a matter of minutes or hours would be critical.

It is not surprising that traceability was overlooked as a key defense factor in the NAS study. The study had been in preparation for the past three years, well before the 9/11 disaster. The technologies and costs associated with traceability have changed markedly in recent years.

Value traceability needed

Another reason the NAS did not highlight traceability is negative reactions inspired by the notion of mandatory traceability. We share that concern. We've begun calling such requirements "regulatory traceability," which typically does nothing for the agri-food industry except add costs and provide a bit of an insurance policy.

Rather than mandating traceability, the agri-food industry should voluntarily embrace "value traceability" in ways that add value across the food chain. Value traceability increases profit through increased production efficiency brought about by tracking each discrete unit of production across multiple enterprises. Improved profitability would be the focus in addition to bioterrorism insurance.

Also, because value traceability has as its goal the continuous monitoring of the units of production through the production chain, concern about testing the system would vanish—the system would be tested every day. Appropriate ownership and location information could be captured by such a voluntary system for disclosure to the appropriate government agency only in the event of an actual emergency.

Each agri-food industry participant would control its own data flow and would determine who saw what. Value traceability would be used to support branding and marketing claims. The market would be the driver, not government.

Major companies should begin factoring voluntary value traceability into their work plans. Providing a path towards increased profitability while also gaining protection against bioterrorism is an important strategic initiative food industry executives can take to protect our industry, our employees and our customers.

The following checklist, developed from government and industry sources, outlines measures you can begin taking now to reduce outside threats.

- Have you identified potential threats to your operation?
- Do you have a process for assessing risks?
- Do you know the sources and/or origin of all ingredients?
- Are your suppliers appropriately licensed or permitted? Are ingredients and raw products packaged and labeled correctly?

- ❑ Have you taken steps to ensure that suppliers and transporters practice appropriate food security measures (e.g., auditing for compliance with food security measures that are contained in purchase and shipping contracts or letters of credit)?
- ❑ Do all of your facilities inspect incoming ingredients? Do you return products when there are signs of damage or tampering?
- ❑ Do you have systems in place for evaluating and testing incoming ingredients?
- ❑ Do you request locked and sealed vehicles/containers/railcars? Do you obtain seal numbers from the supplier and verifying upon receipt?
- ❑ Can you reconcile the amount ordered and the amount listed on the invoice and shipping documents?
- ❑ Do you supervise off-loading of incoming ingredients?
- ❑ Do you investigate missing or extra stock or other irregularities outside a pre-determined normal range of variability?
- ❑ Can you track ingredients and products at the individual unit of production level?
- ❑ Can you pinpoint and isolate individual units of production and the ingredients used in that product?

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Putting the Round Peg in the Right Hole – Buying the Attribute, Not the Commodity

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Submitted as an article for the November 2002 issue of Food Traceability Report.

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“Traceability” systems are typically installed to solve a company’s immediate, specific, felt need. If the immediate need is to reduce the cost of meeting specific regulations, a regulatory tracing system is installed. Or if the immediate need is to increase yield or reduce costs, a value traceability system is installed. Installing either type of traceability system to solve an initial need, though, should not be the journey’s end. It’s only the beginning.

Once a traceability system is in place, the real benefits can begin. If a regulatory traceability system has been installed, then the company can leverage the system to add value traceability components. If a value traceability system has been installed, regulatory traceability can be a low-cost add-on. Or additional value traceability components can be added to get even more benefit.

Value traceability systems typically have one ultimate purpose -- improve your operation’s profitability. They achieve this goal through two different approaches: by reducing costs and/or increasing revenues, or by identifying “new value”. Both

approaches track the product attributes on each discrete unit of production across different enterprises.

Most companies begin their value traceability quest by improving their operational profitability. A low-hanging fruit for generating immediate bottom-line benefits is to use the value traceability system to ensure you are getting the most out of your raw materials.

All inbound products are not created equal. Inconsistency in incoming materials is a major deterrent to maximizing process efficiency. And when we look at the variability of incoming products across a wide range of product attributes, we see an enormous variability. We also see that there are some product attributes whose effects on processing efficiency have been hidden because processors historically haven't been able to reliably collect upstream information on product attributes on individual lots, and track that product through various transformations (e.g., wheat to flour to buns).

Durable goods manufacturers have long understood the need to reduce variability of key attributes in their raw products. In the food industry, though, there is a tendency to ignore the "consistency" impact on processing efficiencies. Ignoring attribute variability is dangerous.

Let's take something simple like the cattle feeding industry for example. All cattle feed is created equal, isn't it? Isn't feed corn, corn? Aren't oats, oats? Most cattle feeders understand there is some variation in the type of raw material they can buy to feed their cattle. But we're willing to bet few understand just how impactful this purchase can be on their profits. Many processors still buy primarily on price. Do you?

A recent Australian study demonstrated just how much additional profit can be created by a small variation in one or two product attributes impacts. Dr. Alan Kaiser of New South Wales Agriculture discovered that relatively small variability in two key oat attributes – lignin and carbohydrate, translated into huge differences in digestibility and weight gain. A less than 10% variation in one of the attributes, for example, across eight popular oat varieties translated into a 22% difference in digestibility of the grain. This 22% leveraged into a whopping 30 to 60 percent difference in animal productivity or weight gain! Such is the power unleashed by understanding the impact of product attributes on efficiency outcomes. We call this power -- value traceability.

We're also willing to bet that most of the cattle feeders in the Australian study bought their feed based upon price. They presume that the lower the cost, the better. However, even if the oats with the more favorable product attributes were more expensive (which at the time of the study we're told they were not), it would pay to buy the correct attributes, not the lowest priced commodity.

Many of these relationships are counter-intuitive. In prior articles we're talked about a off-grade wheat that produced a superior final product due to a specific attribute that hadn't been factored into the grading criteria. We've also seen grain attributes that can reduce milling costs by lowering the number of blends, and livestock attributes that

contribute to much higher yields. Even though processors are expert in their businesses, with decades of experience under their belts, there are still a few things to learn when new data can be brought into the equation and viewed through a new set of lenses – the attribute based focus on discrete units of production across different owners.

Another case to demonstrate the power of tracking product attributes can be seen from data General Mills has published. Using seed attributes as the value traceability departure point, General Mills has identified a specific grain variety that improves the quality of its Wheaties cereal—generating manufacturing efficiencies of over 10% while improving overall product quality. These pre-defined grain specifications are now being specified through their supply chain to secure specialized crop for General Mills and generate premium prices for the farmers growing that specific attribute.

These are not isolated examples. In the past four years, we have seen the leveraged impact of product attributes on industries that range from grains and oilseeds to meats and livestock and fruits and vegetables. In fact, everywhere we've looked, we've found profit improvement potential.

And we've also found the reverse -- potential extra cost when an inappropriate raw material is used. Any time this “square peg” raw product tries to fit in the finished good “round hole”, problems begin. Product consistency drops, customer satisfaction suffers, and costs can even increase due to high levels of sub-optimization. For example, we spoke with a mill manager who was concerned that his overall costs rose when headquarters got a “great price deal” on some wheat. Problem was that he felt most of the savings were lost in additional blending that was required at the mill to get the right final flour characteristics.

But he didn't have hard data to prove his hunch because the company's accounting system did not paint a clear profit picture for each grain lot purchased. The information system dutifully reported the purchasing group was doing a great job in buying the grain, but then it beat up the operations folks for spending way too much money in excess blending. The two events were not linked. Was the excess blending coming from the cheaper grain, or were there other factors?

This situation is a classic sub-optimization case study. To go beyond departmental sub-optimization and to enhance the entire company, senior management need dashboard instruments to help them make the right decision. These instruments will, for example, connect the purchasing information on each grain lot purchased with the costs of milling that lot to create a mini-profit and loss statement for each grain batch purchased. Such a P&L system on each grain lot purchased would tell the story. Without it, the company kept on doing it the same old sub-optimized way.

Even if this company's blending costs weren't increased by buying cheaper grain, blending *per se* is not a value-add. Customers won't pay more for bread made from flour that has had just one more blend. Blending is used by processors to generate consistency, but it is a customer transparent operation. If a processor can generate the desired

customer traits with less blending, the better will be their bottom line. Collecting information about product attributes of discrete units of upstream product can go a long way towards scheduling JIT incoming arrivals of the right products with the right attributes to reduce blending – thereby dropping costs, and leaving the customer equally satisfied.

Mini profit and loss statements on each discrete unit of incoming product, and using product attribute information from suppliers prior to the product arriving onsite are only two of the specific ways processors can use product attributes to get more value from their raw materials and boost their bottom line. The moral of the story is to buy attributes, not commodities. Each food processing segment and each processor needs to discover the product attributes that most affect their bottom line for the products they produce. From what we've seen in the past several years, the relationships will not be obvious.

So, how do you do that? Do you just buy the highest cost raw materials? Absolutely not! Again, you buy product attributes connected to your process outcomes. You don't buy the commodity. The highest cost oats in the Australian feedlot example did not generate the best results.

Ultimately, the producer marketplace will begin to change the pricing equation towards the critical attribute pricing and away from today's commodity pricing. We're already seeing that trend in the beef cattle industry. More than half of today's cattle are sold on some performance-based contract formula, a five-fold increase in the past three years. This same trend will occur in other agricultural markets. In the interim, though, there is a limited, unique window of opportunity for the processor who determines the key product attributes that benefit his operation, and can buy superior attributes at commodity prices. A longer term opportunity is to determine the producers who can consistently deliver those desired attributes, and incent them with premiums to ensure a consistent flow of the right attributes. You then define a new supplier relationship and create values for the farmer, the processor and the consumer.

Here are some simple steps that can be done to begin relating product attributes in your raw product to the output:

- implement lot-based profitability
- tie outcomes to inputs, across the longest chain possible
- start gathering attribute based data as early in the value chain as possible.

And once you think you've found the answer, you cannot stop value traceability. In the oats example above, knowing the oat variety isn't the only thing you need to know. The correct attribute level is influenced by variety, but it's also impacted by soil type, weather and cultural practices. And these will change with weather patterns, so a monitoring system needs to be in place for constant value building. Remember, you are buying the attribute, not the commodity.

