Identification and traceability in swine: business opportunities or cost of business?

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Abstract

The evolving "food transparency" demands in the protein business is creating new ways to think about producing and processing pork. High volume, least cost commodity production has been the driving force behind most innovations in the pork business. These systems create massive volumes of "homogenized pork meat" and offer very little, if any information about the life events of the animals produced for pork. Technologies adaptable to pork commerce are emerging that offer tools to record, collect and coordinate information and data about the life cycle of the pig. These emerging technologies and tools are being adapted and incorporated into pork commerce and offer business options not previously available. This paper describes some of these evolving developments.

Introduction

The Swine Industry has made tremendous progress through the years in terms of genetics, nutrition, husbandry and health. Advances in swine production and management have provided the market place with a high volume, low cost protein alternative to other competitive meat products. A developing paradox for the swine industry is, "Will the participants continue to "raise hogs" in high volume, low cost mentality or shift towards a "value added" manufacturing model? A value added manufacturing model is generally very close to their customers, produce products their customers really want and are constantly looking for ways to innovate their product to capture a greater share of market and earn higher margins. Consolidation and concentration in the industry has generated a plethora of public issues (e.g. anti-corporate agriculture initiatives). Efficiency of production, however, has continued to rapidly evolve. The consumer's ability to source inexpensive, high quality pork is better today than it ever has been but, do customer segments exist with unmet needs? As consumer's become more and more affluent and have the luxury of more than enough food and more than enough choices of their food, their hierarchy of basic needs tend to change. Buying decisions are increasingly being made with ideas linking to "all natural foods", "animal rearing with less antibiotics", "husbandry management issues" and "food transparency demands".

The recent animal disease problems faced by the European community dramatize the growing concern over food safety. Historically the theater of food production has been mostly about commodity production that works best in a least cost, most efficient manufacturing model. This model encourages a highly competitive, fragmented, dislocated, and guarded business with elements in the production, processing and purveying segments of the chain. These competing segments of the chain do not work in harmony, to the contrary, the chain works today by intense bartering with one segment negotiating the other out of margin. The evolving events surrounding grains and genetic engineering and the consumption of foods manufactured from these tagged grains has created new pressures within the least cost manufacturing model. The true commodity model that creates a "mountain of product" with massive homogenization of end product demonstrates weaknesses in the production chain with no one in the chain really taking unequivocal responsibility of product problems. As retailers demand more specifications and control of their ingredients new information logistic businesses will evolve. Some European communities are moving rapidly toward a food chain that has a complete linked history of origin and life cycle activities of purchased product mapped for the buying consumer. Further, in the demanding business strategy of risk management, companies need to protect a valued "brand" by using more and more information about their purchased raw materials. We are increasingly seeing other global economies fund local programs to enhance export opportunities in their growing meat industries. These programs are using more and more individual animal ID and traceability as bargaining advantages. These issues and others bring us to the discussion about identification and traceability of pork and pork products.

State of the art

Certainly, individual animal identification is not new to the swine industry. Individual ear tags, skin tatoos, ear notching, and other individual identifying markers have been used for decades. All of these systems tend to be parochial by design and provide pertinent information for the production systems locally and in some instances the packing system (when coordinated). At no time has anyone designed unique identification numbers for their swine that didn't have the chance to be repeated somewhere in the pork production schema.

Other industries have unique identifying technologies that provide some insights into possibilities for the swine business. The meat industry, when applying these technologies, has certain challenges that other industries usually do not face; "fabrication" or sometimes called disassembly, is one that needs a great deal of thought and problem solving. What technologies exist then that might have application to the swine industry?

Group vs. individual animal technologies

Group identification

Tracking technologies involve identifying the subject in question and then designing and executing systems that allow the subject to have information logistics attached to its production process and movement. If the subject is too small to effectively maintain unique identity then group tracking is best. The grain systems today have this challenge. No one thought tracking commodity grain was feasible or advisable until "Star Link" issues made headlines. Once it was determined that commerce was being changed by the lack of tracking and that the commodity was losing market share, new "identity preservation" methods were employed in the marketplace. In general, these new methods were assigned segregated handling, storing and marketing schemes to facilitate tracking of groups of grains. The product being tracked had to have validation of tracking movements and ownership management of the product to fully realize the market value of the product. Most assuredly, this meant that "massive homogenization" of the product was no longer acceptable to commerce. Literally overnight, new schemes of validation and tracking of segregated grain products were born.

In the pork business these segregation technologies are partially practiced today. Consolidation of the swine production business has encouraged large groups (similar life cycle histories) of slaughter eligible pigs to be delivered to the packinghouse with owner identity of the group attached. There are however, pigs in the US that trade to new owners and lose their ability to track back to the original farm of origin. A monitoring system in North America for tracing and tracking pigs (and eventually pork) will likely begin with unique premise identification of farms producing pigs. At some point, the swine industry may elect to create systems that can track and manage ownership changes and extensive regional movements (these systems may have to use unique individual animal identification devices to be fully operational). Much discussion about developing the appropriate policy for this unique premise ID system is ongoing.

It is possible to segregate these animals in the slaughter process as they can go to the kill chamber as a group and further, go to the fabrication area as a group. In the very fast paced slaughter practices of the North American meat plants, any focus (or mandate) on maintaining segregation integrity in the plants will mean added cost to the final meat products. There is some evidence that some sectors of consumers will pay more for a product or products they believe are safer and of higher quality. Europe has some systems tracking pork (in some of their plants) as it comes off the hanging carcass. The European packing systems, in general, are far slower and therefore more amenable to tracking in the plants. Today, once the pig is killed, it is generally not a practice to track individuals or groups in any way as they become pork meat in the North American packing systems. While it is manageable to maintain tracking to the intact carcass level at most plants it is very, very difficult (at high-speed plants) to track pork meat once it comes off the hanging carcass. Application technologies designed for tracking of pork meat in the fabrication process is very early in the development cycle but new companies engineering this strategy are emerging quickly.

There are business plans in place (usually niche programs) that pay the extra monies necessary to segregate pigs and maintain some group identity throughout the slaughter process until the final (consumer ready) pork product. In addition, there are export contracts in place that use some form of tracking of pigs to pork to comply with specifications within the export business contact. The newly passed "Country of Origin Labeling" mandate by the US Congress suggests some of these technologies be adopted as a cost of doing business by September 2004. Having said all that, however,

tracking of pigs (even by groups) from the farm to the plate in North America is extremely rare and generally thought to not be necessary for consumer acceptance of pork. As a reminder, the grain industry had the same notion until "Star Link".

Individual identification

Other specie industries

Technologies to identify individuals either animal or man are exploding. Simple technologies like bar coding is evolving into complicated information platforms to enable business and government to ask for more on the label and get it. Using bar codes for individual animal identification is being tried in regions and countries. Canada recently began an individual ID program in cattle and approved individual bar coded visual tags as an option. Even before bar codes, there were some localized areas using visual ear tags as a means of individually identifying an animal. It has become apparent, however, that for individual animal ID to be effective across all industry needs (commerce, foreign animal disease monitoring, zoonotic disease issues, consumer concerns, etc.) the individual ID system must have unique numbers for each and every animal in the plan. Further, the reading of the individual ID needs to be automated to handle the volumes of livestock that will be enrolled. Visual and bar coded tags have severe limitations with accurate reading via automation in the current livestock environments. Much has been discussed concerning visual and bar coded tags before. Discussion here will be about application of technologies for efficient automation of individual animal ids at the pork production kill, fabrication, and finished product level.

Other industries have turned to Radio Frequency Identification Devices (RFID), as the answer to their business needs. Staying only in the animal world businesses, we can discuss several specie applications. The Department of Energy (DOE) in the early 1990's had a problem with criticism concerning the hydroelectric dams of the Northwest US. The critics believed that the many dams were adversely affecting the salmon industry. These dams were in effect, the critics claimed, reducing the natural spawning patterns of the salmon. The DOE turned to a "fish tracking" system to identify fingerling salmon (small ~ 5inch salmon fish) with microchip implants that when excited by appropriate readers emit a unique 15 character identification number. In essence this "fish tracking" system allowed the fish to swim through readers on their way up stream and downstream depending on the travel patterns and each fish could be identified using their unique 15 digit number. Once they had this information, real time information about fish movements could be studied by biologists to determine the actual effect of the dams on the salmon industry.

In the last 10–15 years the pet industry had some issues with lost and misidentified pets. RFID microchips were used to identify enrolled pets in a database that for the first time used the internet to access pertinent histories of the pet in question. Veterinarians and animal shelters used this technology to enroll millions of pets (both in Europe and North America) in databases that allowed people to "link into" information allowing the safe return of pets to their rightful owners. Once "chipped" by the attending animal caretaker and appropriately registered in the database, the pet now had a unique identifying number that when read and queued into the database could link to the information necessary to track down the owner. This technology is being further developed to allow for temperatures of the animal to be read by the same device that reads the unique ID number. This advancing technology enables the RFID device to have multiple applications for the pet and its owner.

The cattle industries around the world are looking at RFID to manage their in-country animal inventories. Several countries have also begun funding of individual ID projects for their cattle species. These countries include but are not limited to Canada, Australia, New Zealand, Brazil, and France. The cattle are generally tagged with an ear tag that is RFID enabled. This uniquely numbered tag is used to link information about the animal to a database(s) that can be used for enhancing commerce options (e.g. export specifications), tracking animal movements across owners and regions, accessing more information about life cycle opportunities in meat characteristics and other regulatory issues surrounding meat product validation. There are some implanted microchips being used in cattle, as well. These microchips include RFID microchips under the skin (there are several sizes of microchips) as well as rumen boluses with RFID technologies.

The European experience, following the BSE and Foot and Mouth incidents, has proven to the European Union that food animals for human consumption need almost complete tracking of life history and meat fabrication of each animal. Most of the new regulations there are directed toward more transparency in the food

chain. This trend is gaining more and more momentum in the business of world meat production. Pigs, as the number one source of protein worldwide, are getting some attention with these transparency demands. Pigs are somewhat unique in that they are bigger than poultry but smaller than cattle. Therefore, the need and/or economies of individual identification must be studied and understood as the traceability process unfolds.

Swine

Most discussions in North America regarding traceability in the food animal meat chain have focused on cattle. There are reports discussing projects in pigs that have only recently been completed[1], looking at using individual identification tools. Other projects are beginning to be discussed openly[2] at swine informational forums. Conferences, planned and executed, within the last 18-24 months, have included the topics of identification and traceability in nearly all of their agendas[3]. There are many signs in the swine business that transparency in the development of pork meat is gaining more and more interest.

Historically, it has been assumed that raising pigs for meat production was clearly a least cost, most efficient manufacturing model. Better, more innovative group husbandry and group disease management education was the absolute mandate to succeed in the very competitive swine production systems. As pure commodity production became the norm, the economies of scale for manufacturing pork was the edict. Few players in the business looked at managing pigs individually or for that matter identifying pigs with systems that allowed for individual assessments. The lone exception to these ideals were the breeding pig companies, who would use very parochial data and identification systems to look at how genetics played a role in meat attributes. Even these breeding companies used group efficiency parameters in many of their projects.

The basic industry infrastructure and cost effective technological tools to identify pigs individually and then collect data on those pigs (as they grow) has been slow to evolve. Ancillary technologies in other industries have made new technology adaptable and affordable. Discussions about the available technologies for application in the pig industry have been ongoing for several years[4]. As tools (that have application for the pig industry), became more affordable and user adaptable, development of projects to investigate practicality and efficiency of data collection began to intensify. For 2–3 years now, RFID identification devices specifically appropriate for pigs have been continually engineered. Software specifically designed to electronically capture life cycle information on pigs has been written and installed in complementary hardware devices[5]. Data coordination tools for managing data and allowing stratified firewall access to that data have been engineered[6]. Internet accessible software and tools to query the available data has been developed. Individual carcass summaries (at line speeds in a US swine packing plant) linking back to the individual life cycle summaries has been accomplished[7]. These adaptive technologies have been engineered to best fit the needs of swine production systems. It brings new ways to collect data and access data in real time. It also allows swine systems to have more accurate data capture without the hassle of paper data records (at the farm) and data entry by employees elsewhere on the farm facility. It also allows for farm to farm linking of data through networking, either locally or if needed, through the Internet.

Business opportunity?

These tools, of individual animal identification and data capture and coordination, have some issues. The estimated cost for these systems in pigs is around $0.01/pound live-weight delivered into the hanging carcass. As with any new electronic device the cost over time will likely come down, but for now this seems to be a working number. This cost seems reasonable if you consider the many ways it might be cost justified. Recent feasibility studies have shown added operational efficiencies on farms utilizing this kind of technology[8]. I have outlined a few of the opportunities that individual identification and tracking would empower to the producer, retailer and consumer.

Some thoughts about evolving needs for this type of system are:

1. On farm assessments of individual profitability's of pigs and sow production.
2. On farm paperless record keeping with locally available real time reporting.
3. Comparisons of different genetic lines within the same system without changing the movement patterns of production.
4. Carcass evaluations linked to life cycle events for predictive patterns of management.
5. Transparency at the farm level that could bring validation of husbandry practices to the hanging carcass.

6. Could build pork to specifications that were driven by retail needs without converting the entire pork system to the new specifications. Niche marketing options.
7. On farm trials comparing products without segregating the pigs to different feeding and/or growth environments.
8. Comparisons, of sibling differences, to product or management changes using individual carcass summaries as the decision tool.
9. Validation of uses or non-uses of antibiotics at certain stages of growth.
10. Retail options to get certain specified validated pork meat characteristics.

It is probable there are other options not mentioned.

Other businesses in the pork chain

It needs to be pointed out that the packing industry probably has some retrofitting of plants to fully facilitate these options. This system can only be fully automated with some method of a trolley tracking system. A few packing plants have already installed such systems or plan to do so for group carcass tracking purposes. Most of the plants would need this added equipment to be fully capable to read and coordinate individual identification systems. That is assuming that RFID is the candidate technology best suited for large numbers of food animal livestock[9].

The retailer has a lot to gain if full transparency and/or validated meat characteristics in the pork meat chain evolves to a major consumer demand. As retail "brands" grow and become a larger and larger part of the value of the business, the need for more control of their purchased products will be obvious. They will be able, using systems like this, to specify different product specifics and then have them delivered into their commerce with more coordinated information about what they are buying. This in turn allows them to better capture "niche opportunities" and further allows them more control of product issues that arise with the customer. These retail linked concepts gives a "story" to the product that when researched and marketed appropriately allows them more margin from the sale of the product. It also allows for the first time, the producer of the live pig to share in the production value opportunities of building a specific product for the retail trade. With continued consolidation and vertical integration, direct business contracts between retail and production are emerging and will continue to evolve.

Summary

In the ever-competitive business of growing pigs for pork meat, there will be innovative ways created to manage this changing business. It is interesting to note that as more and more consolidation occurs in this industry, the margins on each live, marketed pig, continues to go down. At some point in the business cycle, innovative thoughts turn to ways of getting more for the product than just settling for the "commodity price". This industry can put out more pigs than it can consume and has been able to do so for some time. Entrepreneurial players in this business will look at changing demands of the consumer and find ways to increase margin on their pig product. There are many reasons that individual identification will play a role in this changing business environment. Identification and traceability systems will enhance the opportunity of some to better survive in the commerce of pork production. It means thinking bigger than least cost, most efficient manufacturing. It means doing things that accept responsibility of production and using pride and latitude of ownership as a marketing tool to the retailer.

Finally, however the technology adds to the business of pork commerce, it will not be a pure commodity model. These food safety enhancements, "story pork" information links, and transparency systems will add some new cost to the business. The identification strategy involved for pork production will unfold best if the margins paid by the affluent consumer for "high information pork" is shared between the businesses in the chain. Hiding behind the old idea "that it has never been before" will only give more opportunity to those whom are not afraid of trying, failing and trying again!

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