MANUFACTURING REPORT:
Enabling Farm-to-Table Track &
Traceability with Mobile Technologies
Executive Summary

The FDA Food Safety Modernization Act (FSMA), signed into law in 2011, is the most sweeping reform of U.S. food safety laws in more than 70 years. It aims to ensure that the U.S. food supply is safe by shifting the focus from responding to contamination to preventing it.¹ These new standards aim to help reduce the effects of foodborne illnesses, which affect 48 million Americans each year—including 3,000 deaths and 128,000 hospitalizations.² Under the FSMA, the Food and Drug Administration has new rules and oversight responsibilities for implementing the new food safety system, specifically in the areas of prevention, inspection, compliance and response.³

While the overall benefits of the FSMA are clear, the law does significantly impact the entire food supply chain, creating compliance challenges for manufacturers and their suppliers. These new regulatory challenges further compound manufacturers’ existing concerns, such as maintaining product quality, lowering costs to increase profits and meeting the distribution demands of retailers—all while satisfying consumers’ evolving tastes.

Now, the food industry is required to adopt more reliable, accurate and robust track and trace processes up and downstream—from sourcing to delivery. As a result, food producers, manufacturers and distributors are quickly working to modernize their operations and tackle the subsequent technology challenges that arise.

A critical component to achieve FSMA compliance is the integration of rugged and reliable enterprise-grade mobile devices with automatic identification and data capture (AIDC) systems, such as barcode or RFID technology. This hardware and software solution enables increased insight into the supply chain through all stages of food production—from farm to table. Once U.S. food manufacturers understand the technology considerations and how to address the challenges associated with implementing an integrated mobile data capture solution, they will be equipped with an efficient solution that not only helps to achieve regulatory compliance, but also improves other business challenges.

New data capture solutions can increase insight into the supply chain—from farm to table—helping to ease the regulatory compliance burden.
A Fully Integrated Automated Track and Trace Process

For many food producers, manufacturers and distributors, an automated track and trace process that is fully integrated with the supply chain will address existing business challenges and new FSMA regulations. Ideally, this solution will contain several key elements:

- **Automated data collection via** rugged mobile devices using barcode or RFID technology.
- **Data aggregation to provide** supply chain intelligence.
- **Integration into existing processes** or redefining processes to incorporate track and trace.

One of the major challenges for many U.S. food organizations is the lack of visibility across the supply chain. As food supply chains grow increasingly complex, it becomes more difficult for each element of the supply chain to remain visible to other elements in a single, comprehensible view.

Many agriculture and manufacturing organizations’ data collection methods rely on legacy systems and paper-based processes. While some are decades old, the industry continues to use these systems due to costs associated with developing and implementing new approaches or reluctance to change standard operating procedures. These legacy processes can contribute to inaccuracies during data transcription and make real-time auditing nearly impossible.

With the FSMA’s impending compliance deadlines, the U.S. food industry can no longer afford to delay in re-evaluating legacy systems and must modernize their technology infrastructure. While the individual regulations vary based on product category, nearly every juncture in the food supply chain—from farms to retailers—will be subject to increased and improved record-keeping standards.

Organizations implementing a fully automated track and trace process along the supply chain must be prepared to address additional complications introduced by this process.

Automating data collection will increase available data. This data overload can result in data mining issues where stakeholders cannot find, analyze or report on relevant data. An automated data management system can help address these problems. However, to be truly effective, it must meet three key requirements:

1. **Automated data capture must take place across the food supply chain in a consistent, secure and reliable manner.**
2. **Data capture and delivery must be accessible anywhere and in all conditions, from the farm field, to the factory floor, to a distribution center, retailer or corporate boardroom.**
3. **Data must be processed in real time.**

These challenges require a robust data management system consisting of rugged data capture hardware and track and traceability software. Some organizations may be forced to invest in a technology overhaul to implement an automated track and trace process, while others may need to simply upgrade pieces of their existing infrastructure.

The food industry supply chain—from farmers to retailers—must be prepared to address challenges created by data overload from new traceability systems.
For example, those using classic keyboard-based devices or Windows CE devices will want to update to touch-based hardware to increase mobility and ease of use. No matter how data collection is currently managed, electronic systems will need to be updated to integrate new technology that will better accommodate new regulations.

Mobile traceability technology sales are expected to reach $14.1 billion by 2020 with annual growth of nearly 9%.4

Mobile Solutions Enable Better Traceability

Some food producers, manufacturers and distributors may feel overwhelmed by the new traceability requirements, but understanding the possible solutions can help organizations know how to start. The concept of traceability is better understood when broken down into two parts:

- **Track** follows a specific product through the supply chain, primarily helping with logistics and inventory management.

- **Trace**, on the other hand, identifies the origin of a specific product or ingredient. This is essential for product recall and investigation.

Traceability allows organizations to consistently, accurately and quickly identify product origins in order to better manage product integrity. This ability then helps organizations identify areas to improve process quality, which in turn helps them deliver products that are both superior in quality and lower in price.

Consider the example of a batch of tomatoes contaminated with listeria.

With manual-based systems, accurately tracking if ingredients were sourced from an affected batch was difficult. Spreadsheets and other documents would have to be carefully reviewed, and the process could be so time-intensive, the tainted ingredients could have found their way onto store shelves or consumers’ kitchens. With traceability solutions, however, information on ingredient sourcing for specific lots can be instantly retrieved from a database. This data allows food manufacturers to intervene earlier on and prevent the cost and bad publicity of a recall.

A successful track and trace system for the food supply chain should consist of rugged mobile devices implemented alongside software technologies such as radio-frequency identification (RFID), barcodes and Internet of Things (IoT).

The winning combination of these technologies is proving to provide great advantage, and the food industry is rapidly integrating it. According to Allied Market Research, traceability technology sales are on pace to reach $14.1 billion by 2020 with annual growth of nearly 9%.4
**RFID**

RFID devices provide many advantages for food traceability. They can be read from a great distance and do not require a line of sight between the RFID tag and sensor. Up to 40 RFID tags can be read at once, allowing data to be gathered in bundles rather than one at a time. This speed delivers a much faster read rate than other approaches.

RFID tags can also use read/write technology, making them even more versatile. Information about an object can be stored on its RFID tag, then read later by a different user. Data can also be encrypted or erased as needed, adding extremely high security to RFID. For example, RFID tags could be used with pallets to track shipments of foodstuffs. Adding data about the ingredients’ source could be written to the RFID tag, thus enabling specific pallets to be easily located in case of recall. Because data about ingredients is tracked along the entire supply chain, only affected shipments would need recalling. This insight helps significantly minimize the total cost of recalls and can even eliminate the need to pull unaffected products from store shelves.

Finally, the physical RFID tags are quite rugged, with the result that they are far more reusable than barcodes. All these advantages mean that using RFID for traceability and data management requires only minimal human participation, resulting in less error and more real-time reporting. Like any technology, RFID does have disadvantages. Any liquid or metal between the RFID tags and the reader can weaken the signal (such as in very moist environments), making accurate readings difficult in these scenarios. A RFID system is also more expensive than some other solutions.

**Barcode**

Barcode technology brings many advantages and provides a cost-effective option for FSMA compliance. Barcodes are small, imperceptibly light and inexpensive. They are also widely used, helping to reduce implementation costs, training and the cost of cross-system integration. Barcode scanners can be built to include good ergonomics, such as angled rear scanners for easier barcode scanning at different levels and screen viewing, so long-term use by workers is comfortable. Unlike RFID, barcodes have no privacy implications due to stored data.

One way barcodes enhance food manufacturing is by improved inventory management. Whenever a product is stored, moved or shipped, a barcode scan can record storage location. This provides an accurate snapshot of current inventory data for production
and sales. This data can also be used to automatically generate manifests during shipment to customers.

Though barcodes provide many benefits, the technology also has its limitations. Barcodes are only one-way communication; they can be scanned, but additional information cannot be written into barcodes as they move along the supply chain. Another limitation is that barcodes require a direct line of sight between the code and the scanner. Scanners must be close to the barcode and they must be scanned individually. This means deploying barcode solutions requires additional human labor as compared to RFID.

**Internet of Things (IoT)**

IoT, the newest approach to traceability, offers the food industry the ability to monitor multiple information sources in real time. Handheld devices that provide IoT data enable instant logging, readings and consequently faster decision making. For example, ingredient sourcing, manufacturing and final delivery to retailers can all provide IoT data and create a real-time, holistic view of manufacturing operations. Many businesses are taking interest in this approach; Gartner reports IoT spending for vertical-specific business is expected to reach $911 billion by 2020.5

Data collected by employees through IoT devices can be combined with neural network technology, instantly providing analysis based on the most relevant data. This ability is especially useful for fresh foods and cold chain manufacturing, where real-time information about temperature and other environmental conditions can prove crucial in ensuring and documenting quality. It can also help organizations make real-time changes to help reduce spoilage or contamination.

Of course, IoT is still an evolving technology. In its current iteration, implementing IoT is too expensive to deploy for individual product tracking like RFID or barcode technology. However, it excels as a way to gather data from the devices scanning individual products. This data can then be used to create real-time dashboards and give actionable insights into the supply chain.

**Rugged Mobile Devices**

Most consumer mobile devices are not fit to be used in the field or in manufacturing. Rugged hardware purpose-built for these challenging environments is essential to enabling track and trace technologies along the entire food supply chain.

**On the Farm**

Agricultural field workers need bright devices that are visible during daylight, weather-resistant screens, long battery life, locking controls, network connectivity and the ability to physically wash off dirt, dust and grime. Devices in these settings also need security measures to prevent accidental or intentional harm. By deploying rugged devices based on enterprise versions of the Android or Windows operating systems, workers in the field could gather FSMA compliant data with minimal training. It’s also critical to use enterprise-grade mobile devices in agricultural operations where hazardous conditions are present. For example, the environment in and around grain silos is highly flammable due to the fine particles that are in the air. Having rugged mobile devices that conform to iSafe/ANSI standards provides a level of protection from sparking or electromagnetic discharge that could cause an explosive event.

**At the Plant**

Manufacturing plants, on the other hand, need devices that can be customized for line workers, operation managers and other shop floor employees. In these environments, fully-rugged tablets and handhelds, especially those with long battery life and low failure rates, can reduce costly downtime and boost efficiency. In addition, food manufacturers often need to consider sanitization requirements when selecting mobile devices. For example, a facility that produces
products with and without nut ingredients needs to be extremely diligent in sanitizing the production lines as they switch from one product to the next. Not performing this type of maintenance on the equipment can cause cross contamination issues that create potentially life-threatening allergic consequences for the consumer. This maintenance process typically involves hot water and/or additional chemicals for wipe down. Having devices that can survive repeated exposure to water and chemicals is a must for these environments.

**In the Warehouse**

In shipping and receiving or distribution centers, workers need to access critical stock and location information in real time and in the most effective way. From receiving and moving, to ordering and dispatching stock items, rugged handheld devices with an angled rear barcode reader ensure the smooth running of warehouse operations. In addition, look for mobile devices that forklift operators can use and easily detach, allowing for a single device on and off a forklift.

**At the Store**

Responding to a recall notice quickly is critical for food retailers. Not only do they need to determine whether affected shipments arrived in their stores, they need to compare what is left on the shelf with what has already been sold. Through handheld devices, food retailers can quickly scan existing stock and learn how much affected stock is in the hands of consumers. Individual recalled food items can be identified in a matter of moments, even if they are intermingled with non-affected items. This reduces the amount of time and potential risk to consumers faced during a recall.

Fortunately, rugged mobile devices are available in multiple form factors, including smartphones, laptops, tablets, 2-in-1 convertible tablets and handheld barcode scanners, so any organization requiring track and traceability can benefit from this technology. Organizations in the food industry should select a technology partner who can offer the correct form factor, level of ruggedness and associated peripherals which best suit the job and environment at hand.
The Benefits of Mobile Devices for Food Manufacturers

Rugged mobile devices that are purpose-built to withstand the specific requirements of food manufacturers offer several benefits.

1. **Production costs decrease and operational efficiencies improve when automating data collection.** Data collected from barcode and RFID technologies can be automatically used to inform supply decisions, thereby decreasing delays due to sourced material shortage. This real-time information allows food manufacturers to optimize existing processes and maximize resource allocation.

2. **Using track and traceability technologies improves safety and quality control.** Good traceability systems minimize the production of unsafe or poor quality food products, ensuring public health and decreasing liability. The systems also help maintain food authenticity by verifying ingredient sourcing.

3. **These technologies improve customer satisfaction as seen through traceability’s effect on recall management.** Because the exact source of affected ingredients can be traced during recalls, the recall accuracy, timeliness and costs are improved, helping to preserve brand perception. According to the Grocery Manufacturer’s Association, an average recall costs $10 million, takes 14 days to identify and 34 days to enact. By the time product recalls are enacted, only 40% of affected products can be collected. Enacting recalls more quickly enables organizations to improve the public perception of the brand’s responsibility and also remove more affected product. A quicker response means that fewer customers will have a low-quality experience.

Deploying purpose-built devices can benefit the entire food supply chain—from farm to table. Combining traceability technologies with rugged purpose-built mobile devices allows companies to have the exact hardware for their specific production processes, improving operations and minimizing downtime.
Panasonic Mobility and Traceability

Specializing in purpose-built devices for manufacturing needs, Panasonic delivers solutions in a variety of accessible form factors, including handheld barcode scanners, tablets, convertible 2-in-1 laptops and laptops in screen sizes ranging from 4.7 inches to 20 inches.

Whether employees collect data from a remote field or a distribution center, the rugged performance of Panasonic Toughbook devices is unmatched. According to VDC Research, the most important criterion for a manufacturer purchasing mobile devices to support their workforce is quality/reliability.

As a core manufacturer, Panasonic sets the industry standard for reliability with a less than 2% failure rate. Panasonic Toughbook computers, tablets and handheld devices remain functional and connected in the harshest environments, such as in extreme inclement weather, hostile field conditions and around heavy machinery and equipment. Loaded with enterprise versions of Windows 10 or the Android operating system, security never compromises ease-of-use.

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Food manufacturers seeking to improve track and traceability through mobile technologies should contact Panasonic today.

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Sources
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