INTERNATIONAL FRESH PRODUCE ASSOCIATION™

Global Implementation Guidance for 2D Barcodes on Fresh Produce PLU Stickers

ACKNOWLEDGEMENTS

This 2D Barcode Sunrise 2027 Implementation Guide represents the work of many individuals representing a range of companies across the produce supply chain, including growers, packers, shippers, retailers, brokers, solution providers, third-party service providers and GS1 member countries and GS1 Global.

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Revisions of this Guide will be offered periodically to correct identified errors, expand the scope of coverage, and incorporate refinements.

Note: In this document,

- *The term GS1 DataBar refers specifically to the Stacked Omnidirectional format* currently used for fresh produce sold in bulk.
- *The term 2D barcodes refers to 2D barcodes in scope for Sunrise 2027; all references to 2D barcodes in this document refer to 2D barcodes powered by GS1. If you would like to learn more about other types of 2D barcodes, contact your GS1 Member Organization.*

PURPOSE OF THE GUIDE

The International Fresh Produce Association (IFPA) has created this Guide to assist industry in adopting the 2D barcode on Price Look Up (PLU) stickers in support of Sunrise 2027, an industry supported initiative to implement 2D barcodes at point of sale. *The adoption of 2D barcodes in alignment with GS1 standards to support Sunrise is a decision you must make for your business as all GS1 standards are voluntary, not mandatory, unless otherwise specified.* We recommend working with your trading partners to understand how they are implementing or are planning to implement 2D barcodes within their business to ensure alignment across the supply chain.

It is important to understand that this guidance ONLY addresses item-level produce sold loose or bulk/variable weight and NOT prepackaged consumer items or packaged produce. Consumer prepack recommendations are included in other guidance.

Global Trade Item Numbers® (GTINs®) are required to transition to the use of 2D barcodes to support Sunrise 2027 and the migration to 2D barcodes at point of sale. Information on transitioning to 2D barcodes from PLU only or GTIN + PLU (i.e., currently using GS1 DataBar) on bulk/variable weight product is addressed in this document.

WHAT IS SUNRISE 2027?

The EAN/UPC barcode, or the one-dimensional (1D) barcode, has offered price lookup functionality for decades. However, it is no longer keeping up with today's growing demands for greater product information transparency, traceability, and authentication. In response, the global supply chain is moving toward two-dimensional (2D) barcodes that can carry more information.

The retail industry has set a date to make the transition to accepting 2D barcodes at point-of-sale (POS) - this milestone is referred to as Sunrise 2027. By the end of 2027, retailers' POS systems should be capable of reading both traditional barcodes and 2D barcodes. The shift has already begun with the new technology being tested in 48 countries across the world, representing 88% of the world's GDP.

You can access the global joint industry statement here.

2D barcodes allow for a single, standardized way to meet both supply chain needs and evolving consumer requirements. The information carried by 2D barcodes can also help enable:

- Improved inventory management
- Enhanced recall readiness
- Greater sustainability and ethical sourcing transparency
- Better product authentication
- Greater brand trust

As Sunrise 2027 approaches, the 2D barcode could be able to be scanned at point of sale for price lookup. Leveraging 2D barcodes provides the ability to share additional product information, enabling the automation of other business processes in store or even in the supply chain.

GS1 is helping both supply- and demand-side organizations and solution providers get started with a migration path toward the "next dimension" of barcodes. Learn more about how you can prepare your organization and your scanning systems to accept 2D barcodes to help streamline your operations.

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1 Introduction: Sunrise 2027 and the Adoption of 2D Barcodes

Scope of this document

Adding a 2D barcode to a PLU sticker may require significant change to processes across the supply chain. This Guide will highlight the challenges and opportunities and make recommendations to support implementation, which include

- Two-way communication with buyers to understand current requirements and future intent (e.g., what data retailers intend to integrate into their systems, timing, etc.)
- Impact of data volume on barcode dimensions and, consequently, on label size
- Target market requirements

Evolution of label guidance for fresh produce at point of sale

Traditionally fresh produce identification was managed by the numeric human readable PLU (Price Look Up) for ease of use in the retail grocery space. As the need to know more detailed product information increased, so did the adoption of identifying fresh produce with the GTIN (Global Trade Item Number), which contains the GS1 company prefix that identifies the brand

owner. Prior to Sunrise 2027 in fresh produce, GTIN's were primarily carried in a GS1 DataBar. Having that information available on the product is useful as it provides accurate product information linked to the brand owner.

If assistance is needed to identify your product with a GTIN (a critical step for the adoption of 2D barcodes), your GS1 member organization can help support this transition; the Transition from Generic UPC's and Owner Specific UPC's guidance can also assist in getting started. GTIN adoption is required to migrate to 2D barcodes in support of Sunrise 2027.

What is the 2D barcode?

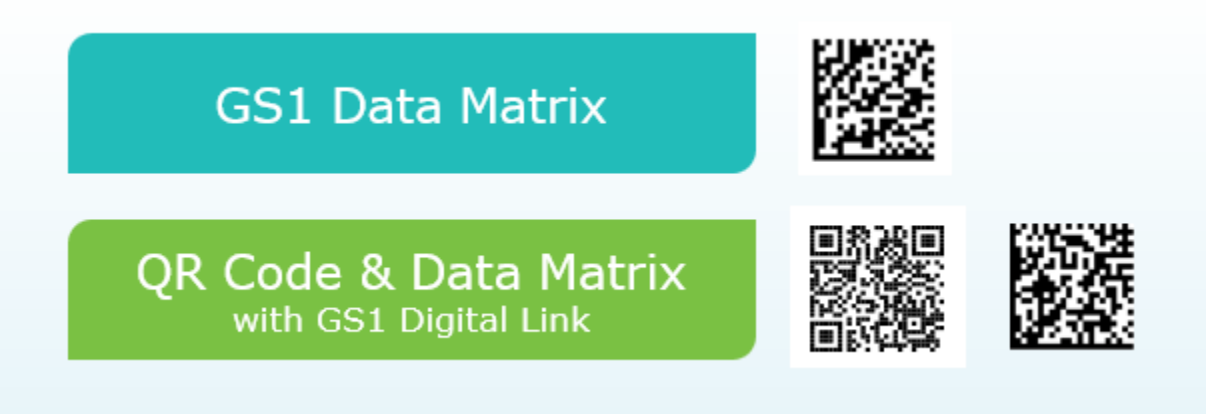
A 2D barcode, or two-dimensional barcode, is a graphical representation of data that encodes information across both the horizontal and vertical axes. Unlike traditional linear (i.e., UPC-A, EAN-13) or one-dimensional (1D) barcodes—which consist of a series of parallel lines and spaces and store data in a single line from left to right—2D barcodes use geometric patterns, such as squares, dots, or hexagons, arranged in a grid or matrix to encode data in two directions. This structure allows 2D barcodes to hold significantly more information than linear or stacked barcodes within a much smaller space.

There are several types of 2D barcodes, each with a specific visual style and data structure. As Sunrise 2027 approaches, the recommended data carriers to implement are GS1 DataMatrix or QR Code with GS1 Digital Link.

QR Codes can be scanned by a consumer to deliver a web-enabled consumer experience as well as relevant data for POS

DataMatrix can scan at POS, but it cannot be scanned by consumers. DataMatrix can be read with or without a web resolver. Without the need for web engagement, the data carrier has fewer characters, leading to a potentially smaller barcode.

The current 2D barcodes in scope for Sunrise 2027 are:



For more information, see GS1 2D Barcodes at Retail Point-of-Sale Implementation Guideline – specifically section 4, which covers general guidance for retail compliant POS barcodes.

Anatomy of the 2D barcode

The physical structure of a 2D barcode includes several key components. The smallest visual units in the symbol are called **modules**, typically tiny black and white squares or dots, which collectively represent the encoded data. Surrounding the barcode is a **quiet zone**, a blank margin that helps scanners clearly distinguish the code from nearby text or graphics. Most 2D barcodes also contain **finder or positioning patterns**, which are distinctive arrangements that allow scanners to detect the barcode's position, orientation, and alignment. In addition, 2D barcodes incorporate **error correction features**, which are mathematical redundancies built into the code. **These allow a scanner to reconstruct the data even if the symbol is partially damaged, smudged, or obscured.**

Adopting a 2D barcode for Sunrise 2027

GS1 has provided resources for retailers and brands to support the transition to 2D barcodes with data carrier options, including those with and without web enablement. Leveraging a 2D barcode for Sunrise 2027 modernizes retail point of sale to read and process at least the GTIN from a 2D barcode along with any 1D barcodes. Current linear barcodes (UPC/EAN) carry only the identification of the product.

The adoption of 2D barcodes allows for additional data to be captured in the barcode.

2 Benefits of 2D Barcode Adoption on Consumer Goods

Both GS1 DataBar and 2D barcodes leverage the GTIN to identify products. In addition, the GTIN benefits business processes beyond point of sale, such as:

- **Category management**
    - Like GS1 DataBar, the GTIN that is encoded in the 2D barcode enables buyers to track product sales to consumers by supplier.
    - This product movement data by grower/shipper can facilitate category management by supplier. Verify with your trading partners how they are utilizing 2D barcodes and their expectations about this use.
- **Accurate pricing at retail and checkout**
    - Human error can lead to negative financial impact when an item is incorrectly identified or when the conventional PLU code is used rather than the organic PLU code. By assigning a GTIN to each product, the GTIN acts as a primary identifier. With the use of 2D barcodes, the manual entry of the PLU is no longer needed, as GTIN is another level of granularity, minimizing keying errors at POS (i.e., it will specify the variety and distinguish between a conventional item versus

an organic item). When the GTIN is scanned at POS (via the 2D barcode), the corresponding data is detected and the correct price is charged to the consumer.

- **Consumer scanning (e.g., self-checkout)**
    - Consumers will be able to scan their own produce in self-scan environments without having to navigate numerous screens.

Additional Benefits to Consider for Adopting 2D Barcodes in Retail

Sunrise 2027 is the start of 2D barcode adoption in retail. The additional data that can be embedded along with the GTIN enables many expanded advantages, while still enabling retail scanning, including

- **Expanded data capacity**
    - Linear barcodes carry only the product identification while GS1 DataBar carries the product identification plus minimal additional data. A 2D barcode can hold as much additional data as you wish. This enables the opportunity for additional product information to travel with each individual item.
    - The amount of data included in the 2D barcode will determine the size of the label. *The more data carried, the larger the barcode required*. It is recommended to review data requirements *with your trading partners to ensure your label supplier can meet all marketing and other requirements*. This ultimately impacts the size and cost of your label.
- **More efficient labeling**
    - 2D barcodes have the capability to carry large volumes of data in a smaller footprint, making them ideal for small produce items like apples, kiwis, or tomatoes where space is limited. This allows suppliers to include brand identity, country of origin, and necessary compliance data.
- **Consumer engagement**
    - Some 2D barcodes are web enabled, meaning they can deliver a consumer experience online.

- **2D barcode error correction = greater reliability**
    - Unlike traditional barcodes, 2D barcodes include built-in error correction algorithms (such as Reed–Solomon coding). If part of the barcode is minimally damaged, wrinkled, or dirty, it can often still be scanned accurately. In the fresh produce supply chain this could occur due to high-humidity or high-handling environments like grocery stores and packing sheds.
- **Increases checkout speed**
    - The 2D barcode scanned at point-of-sale (POS) cuts transaction time from four seconds to manually key in the 4- or 5-digit PLU Code down to one second to scan.
- **Differentiates product/brand**
    - Buyers and sellers will have product movement and shrink data to support the item's performance. This includes quality, consumer preference, and actual movement to the consumer. Thus, growers/shippers can brand their products more effectively and accurately. This could allow for brand differentiation and pricing according to brand, rather than pricing by commodity.
- **Supports traceability**
    - GTIN adoption sets the foundation for traceability back to the brand owner, providing insights to the product in question, which can significantly limit the scope of product implicated in the event of a recall or traceback investigation via the additional data carried by a 2D barcode. Additional data which may be carried by a 2D barcode can further streamline those efforts by providing another level of granularity, providing insights to a subsect of that product.
    - If retailers have a frequent shopper program, the retailer can proactively contact the consumer who purchased the product in question.
    - The retailer can stop the sale of an affected produce item by GTIN, thereby ensuring that consumers cannot purchase recalled produce.

See GS1 DataBar Stacked Omnidirectional vs. 2D Barcode in the Appendix for additional information.

3 Labeling Challenges for Bulk Produce Sold at POS

- **Limited physical space on produce stickers**
  - Fresh produce items like apples, kiwis, or plums have very small surfaces for labels.
  - 2D barcodes must respect the minimum size and dimensions to be scannable by retailers' point-of-sale systems and by smartphones. (See Section 5 for additional information.)
  - To estimate the size of your 2D barcode, see GS1 Retail 2D barcode size estimator.

- **Print quality and resolution**
  - 2D barcodes rely on sharp contrast, high quality, and data accuracy. On produce, ink bleeding, low-resolution printing, or adhesive curling can distort the code. Blurred or misprinted 2D barcodes may not scan at all, especially with lower-quality label printers or inconsistent substrates.
  - For print–on-demand applications, ensure your equipment, process, and software is capable of meeting the 2D barcode print standards and print speed required.
  - Click here for a resource for different print technology depending on application.

- **Data management complexity**
  - If companies have not yet transitioned to using GTINs on PLUs (I.e., via GS1 DataBar barcodes), it is recommended that companies assigning GTINs for their items use the same granularity that is used when assigning PLU codes: commodity, variety, size group. This will allow for an easy transition from PLU codes to GTINs used in the 2D barcode. As an example, if you are currently using four (4) PLU codes, then you will create four (4) GTINs.

    Simply put, there will be a one-to-one relationship of PLU codes to GTINs for each brand. It is crucial that the GTINs and data associated with the GTIN (e.g., PLU code) are provided to retail customers and loaded into their master data system for point of sale (POS) before the stickered item arrives in store. Otherwise, when scanned, the item reads as 'Not on File' and prevents the item from being identified and sold as intended.
  - If buyers have not yet transitioned to integrating consumer item GTINs in their POS systems (i.e., have not already implemented GS1 DataBar for produce), the move to

do so will require changes in how they list items and enable POS scanning. A retailer's POS system will have to store multiple GTINs rather than a single PLU code for all growers of that commodity as each GTIN is unique by grower/shipper.

- The *GS1 Fruit & Vegetable GTIN Assignment Implementation Guide* provides assistance to those assigning GTINs for the first time.

- **2D barcode integration with other labeling requirements**
  - A 2D barcode must often share space on a small label with other elements like:
    - PLU code
    - Product name/variety
    - Country of origin
    - Branding or logos
    - Certification logos (e.g., Organic, Fair Trade)
  - Incremental costs for PLU code stickers
    - There may be a difference in cost due to equipment changes/upgrades, new (larger) labels, printing changes/artwork.

- **Point of sale scanning**
  - In general, 2D barcodes are a proven method to process point-of-sale operations when systems are configured to do so. Retailers are encouraged to test retail scan environments to support 2D barcode adoption.
  - Read rates will be dependent on adherence to GS1 Standards, including retail environment factors.
  - Scannability has not yet been reviewed or verified for scanning 2D barcodes through various produce bags (e.g., compostable bags, etc.).

4 GS1 Application Identifiers

As 2D barcode adoption progresses, the use of additional data within 2D barcodes may evolve, depending on your target market. It is important to remain in communication with your trading partners on the adoption of 2D barcodes, including what is required and what is recommended for your supply chain. Data is incorporated in the barcode via GS1 Application Identifiers (AIs).

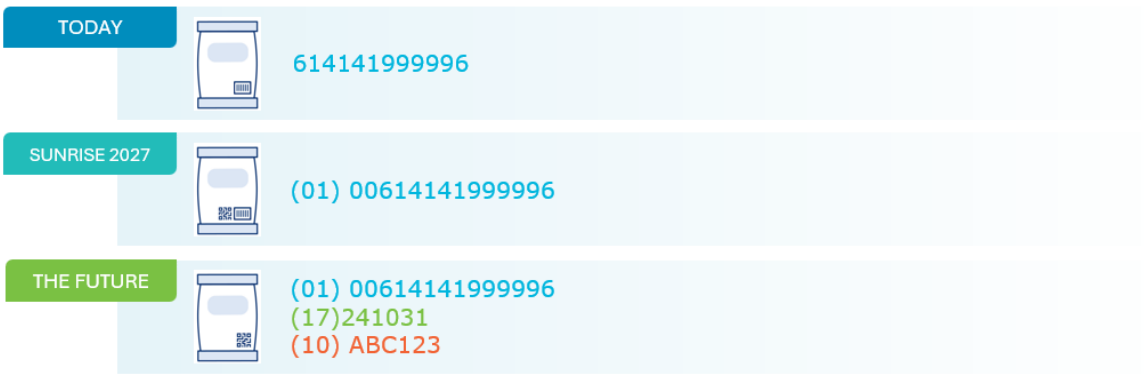
A GS1 Application Identifier (AI) is a numeric code of two or more digits that uniquely defines the format and meaning of the information that follows the AI. AIs enable several pieces of data to be encoded in one barcode so the information can be interpreted and processed correctly and consistently. GS1 element string or GS1 Digital Link URI syntaxes enable the use of GTIN and additional data in barcodes. Which AIs to use will be determined based on the targeted use case.

Sunrise 2027 refers to the use of AI (01) to identify the product in a 2D barcode to scan at retail point of sale. Additional data CAN be added with the use of other application identifiers for various applications (i.e., recall management, marketing/promotions, loyalty programs, recyclability information). To find additional information around GS1 Application Identifiers, reference section 3 of the General Specification**.** Any additional questions about the use of AIs should be directed to your GS1 member organization or solution provider.

Note: As additional information is added to the barcode syntax (data in the barcode), the size of the data carrier will increase for readability.

2D Barcode Syntax Options

Element string syntax refers to data expressing GS1 identifier keys and attributes in a format using GS1 Application Identifiers and GS1 Application Identifier data fields.



GS1 Digital Link Syntax refers to a Web URI expressing GS1 identifier keys and attributes in a format using GS1 Application Identifiers and GS1 Application Identifier data fields as specified in the GS1 Digital Link standard.

5 Produce PLU Label Requirements and Minimum Specifications

Introduction

Because of a compact, multi-directional format, 2D barcodes can encode a wide range of data types and is not limited to product numbers (GTIN) or prices, but may also include attribute data including numeric, alphabetic, and even full web URLs. This data is not limited to product numbers or prices, but may also include batch numbers, expiration dates, serial numbers, and detailed product information. 2D barcodes/data carriers can encode anywhere from a few dozen to several thousand characters; however, the more data included, the larger the barcode becomes.

Reading a 2D barcode requires an optical or image-based scanner, rather than laser scanners typically used for 1D barcodes. These scanners capture an image of the barcode in its entirety and decode the information using software that interprets the patterns of light and dark areas.

In summary, a 2D barcode is a compact, two-dimensional symbol capable of storing large volumes of data in a small physical area. Its structure, which combines dense encoding, orientation detection, and error correction, makes it highly reliable and versatile across a wide range of industries and applications.

The 2D barcode, when used in the global fresh produce industry, can be used on PLU stickers that are affixed to loose/bulk items. It enables scanning of loose/bulk produce rather than manually keying the 4- or 5-digit PLU code. The PLU code is placed on the sticker as the human readable portion. As always, it is important that shippers understand the specific market requirements of their target market.

Minimal Mandatory Information

This section includes information on what data should be included on the label, including the 2D barcode. The more data included, the larger your barcode will become, aiding the decision on what information to include. Your label size, and therefore cost, may be impacted based on the amount of data carried. It is important to work with your trading partners to provide the necessary data without potential impact on current business practices.

Currently, the GTIN will be the only mandatory set of data to be included in the 2D barcode for Sunrise 2027. When working with a QR Code with GS1 Digital Link, the syntax will require a web URL. When working with a GS1 DataMatrix, the web URL will not be needed. GS1 DataMatrix supports the GS1 Element String syntax. Additional data (e.g., expiration or batch/lot information) may be requested in the future from your trading partners.

The minimal mandatory information needed on a PLU label is as follows:

- PLU Number (Human readable only – (i.e., printed on label)
- GTIN – Included in the barcode – this is the only required (AI) for Sunrise 2027

If you are currently using GS1 DataBar on your PLU label, there should not be any changes to label size when implementing with GTIN as the only data point (AI) included.

Labeling Considerations for 2D Barcodes

Contact your label supplier at the beginning of your decision-making process when transitioning to 2D barcodes. They can help and advise on how to most effectively transition equipment and label inventories.

For additional support on 2D barcode migration, contact your GS1 Member Organization.

- **Label artwork**
    - Generated based on artwork objectives and GTIN provided by the packer/shipper.

- Ensure the PLU code is included on the label (*the human readable PLU code enables manual entry* [*e.g., POS] if the scan fails and accommodates retailers who have updated their systems to read 2D and those who have not yet made this transition.*)

- **Barcode print quality guidance**
  - X-dimension relates to the size (square) of 1 module in a 2D barcode data carrier.
    - The minimum X-dimension for loose produce is 0.396 mm (0.0150 inch).
    - The Target X-dimension for loose produce is 0.495 mm (0.0195 inch).
    - The maximum X-dimension is 0.990 mm (0.0390 inch).

a. b. c.

GS1 DataMatrix with GTIN only (01)00825670123459 **a.** minimum size 0.396 mm (0.0150 inch), **b.** target size 0.495 mm (0.0195 inch), and **c.** maximum size 0.990 mm (0.0390 inch).

a. b. c.

QR Code with GS1 Digital Link using sample URL – https://www.demo.com and GTIN 00825670123459 **a.** minimum size 0.396 mm (0.0150 inch), **b.** target size 0.495 mm (0.0195 inch), and **c.** maximum size 0.990 mm (0.0390 inch).

  - **Quite zone**: 2D quiet zones are critical, empty areas surrounding a 2D barcode that enable scanners to distinguish the symbol from text, graphics, and edge-of-label contaminants. 2D barcodes require a minimum quiet zone of 4x the X-dimension on all four sides of the barcode.

- **Barcode color and background**: Typically, it is recommended that the barcode be black with a white background. If an alternative color is requested, make sure suppliers check with their label supplier to ensure that this will scan at POS.
- Minimum ISO Symbol Grade 1.5
- ISO grades are determined through a process called *verification.* Barcode verifiers grade 2D barcodes based on standardized parameters to determine if they will perform as expected throughout the supply chain. Barcode verifications services are offered by solution providers/label printers.

- **Determine what label size to use**
  - Typically, the smallest sized label a 2D barcode fits on is an oval shape 21 X 17 mm (0.83 X 0.67 inches).
  - A larger size may be necessary to accommodate branding, graphics, and the 2D barcode, etc.
- **Assess machinery and cassette needs**
  - Cassettes are label-size specific.
  - Labeling applicators may be modified to run more than one size label, and the vendor's technical service can adjust the applicators to run the new label size.
  - Cassettes will be changed to run the new size.

Note: For more details on 2D barcode size and quality recommendations for retail point of sale, refer to the GS1 2D Barcode Colour & Quality Guide.

Globally standardized information is available here:

https://www.gs1.org/docs/freshfood/GS1_Fresh_Fruit_Vegetable_Labelling_Guideline.pdf

Optional PLU Label Application Identifiers

There are numerous AIs available for use; however, many are not applicable for inclusion on PLU stickers. In addition, as noted, the GS1 Sunrise 2027 adoption only includes GTIN in the

barcode and a human readable PLU. As implementation occurs, other AIs may eventually be used including the following:

AI	Data Title	Description
10	BATCH/LOT	Batch or lot number
13	PACK DATE	Packaging date (YYMMDD)
21	SERIAL	Serial number

Batch/Lot Number: This information can be very useful for growers and packers to provide additional traceability data. Because this data will likely change frequently during packing, 2D barcode generation on the PLU label with this information will require a print-on-demand system. It is recommended that suppliers consult with their label supplier to ensure that the labeling system and label size can be accommodated.

Pack Date: Retailers and consumers may find this information useful for managing inventories. Similar to the Batch/Lot Number, this will also require a print-on-demand system for 2D barcode generation.

Serial Number: This information can be another useful traceability data option. This AI data can be either preprinted by the label supplier or printed at point of application with a print-on-demand system.

6 Next Steps to Transition from GS1 DataBar to 2D Barcodes

The following actions outline practical next steps to support a smooth transition from GS1 DataBar to 2D barcodes in alignment with 2D Barcode Sunrise 2027. These steps are intended to help marketers and buyer organizations coordinate with trading partners; align on barcode symbology and data structure; and ensure systems, labels, and processes are ready to support scanning environments as adoption progresses across the produce supply chain.

It should be noted that the transition to 2D barcode implementation will be a phased approach. Sunrise 2027 is the first milestone of 2D adoption—being read at point of sale to trigger price look up and check out. To enable this, the GTIN is the only required data point. As adoption progresses, it is anticipated that industry will leverage the additional data capacity enabled by 2D at the item level as well as future advancements in the supply chain to support regulatory and data sharing needs.

Brands can make the decision to further leverage the 2D barcode on their product to support other areas of their business operations. Adopting a GS1 digital link 2D approach enables online engagement opportunities with the consumer. As additional data is added to the QR code on packaging, the more tailored the web engagement can become. For example, adding a lot code to the product will further enable traceability efforts, providing a more granular point of data while also adding a transparency lens for the consumer scanning at home or while shopping.

Next Steps for Marketers

- Speak to your trading partners to determine their implementation strategy (e.g., do they have expectation to scan 2D barcodes for loose produce. If so, when?) Private label would follow the same recommendation.
- Speak with label manufacturers to agree on the symbology of the 2D barcode with your label manufacturer.
- Speak with your label manufacturer to ensure printed barcodes are verified based on recommended GS1 General Specifications.
- If you choose a QR symbology, ensure that your URL is resolvable (i.e., when scanned, it links to the website and manages the data encoded in the 2D barcode).
- If you do not plan to direct to a website when scanned, it is recommended that you use the GS1 DataMatrix with GS1 element string syntax.
- If a marketer currently uses a QR code for consumer engagement and wants to continue to do so, the URL should be updated to GS1 Digital Link, to enable both point-of-sale scanning and consumer engagement.

Next Steps for Buyer Organizations

- Ensure you are able to scan and process both 2D barcodes and the 1D barcodes by the end of 2027
- Test and validate that the 2D barcode scans correctly
- Update supplier requirements documentation to reflect your organizations 2D barcode specifications and Sunrise 2027 policies
- Communicate with your trading partners on timelines, expectations, resources, etc.

7 Appendix

GS1 DataBar Stacked Omnidirectional vs. 2D Barcodes Powered by GS1

Category	GS1 DataBar Stacked Omnidirectional	2D Barcodes Powered by GS1
Barcode Format	1D symbology in stacked format (two rows of bars and spaces)	2D matrix of squares or dots in a grid
Read Direction	Horizontal scanning only; omnidirectional due to stacked design	Multi-directional; readable from any angle
Data Capacity	Low to moderate (GTIN)	High (can encode GTIN plus extensive attributes and metadata)
Data Types	Numeric only	Alphanumeric, numeric, binary, special characters
Label Size Efficiency	Compact for 1D, but larger than 2D for similar data	Extremely compact; small symbols hold large amounts of data
Supported Data Elements	GTIN only	GTIN, batch/lot, expiration, location, grower ID, URLs, etc.
Error Correction	None or minimal	Built-in error correction (e.g., Reed–Solomon)
Read Technology	Laser or omnidirectional linear imagers	Image-based scanners or cameras
Use in Retail Scanners	Supported by most POS systems	Increasingly supported, but not yet universal at POS
Traceability Level	Basic (product-level, no lot-level granularity)	Potential for full traceability to item/lot/grower/harvest date
Consumer Engagement	Not scannable by consumer phones	Scannable by phones; can link to product info, origin, videos
Labeling Feasibility on Produce	Acceptable for medium-size items	Better for small or irregularly shaped produce
Compliance	GS1-compliant	Also GS1-compliant
Adoption Curve	Well-established in retail POS	Rapidly growing in supply chain and potential for full traceability applications

Frequently Asked Questions

Who is GS1?

GS1® is a neutral, not-for-profit, global organization that develops and maintains the most widely used supply chain standards system in the world. GS1 Standards improve the efficiency, safety, and visibility of supply chains across multiple sectors. With local Member Organizations in over 110 countries, GS1 engages with communities of trading partners, industry organizations,

governments, and technology providers to understand and respond to their business needs through the adoption and implementation of global standards. GS1 is driven by over a million user companies, which execute more than six billion transactions daily in 150 countries using GS1 Standards.

What is a PLU code?

A PLU (Price Look-Up) code is a 4- or 5-digit number, which is used by retailers to identify loose/bulk produce. It makes checkout and inventory control easier, faster, and more accurate. It ensures that consumers pay the correct price by removing the need for cashiers to identify the product (e.g., whether it is conventionally or organically grown). *If the item is to be exported, a global PLU code needs to be used and not the National Retailer Assigned PLU codes.* (The International Federation for Produce Standards [IFPS] is the official governing body for PLU codes. For more information, visit www.ifpsglobal.com.)

Note: *Valid 4-digit PLUs always begin with 3 or 4; Valid 5-digit PLUs always begin with 9.*

Who is the IFPS?

The International Federation for Produce Standards (IFPS) is composed of national produce associations from around the globe.

The long-term objective of the federation is to improve the supply chain efficiency of the fresh produce industry through developing, implementing, and managing harmonized international standards.

What is a GS1 Company Prefix?

A GS1 Company Prefix is a unique number that identifies the owner of the brand. It is a building block for every GTIN created. Licensing a GS1 Company Prefix from a GS1 MO (Member Organization) is an important first step toward barcoding your products, and it can lead to a wide variety of other supply chain benefits in the future.

What is a GTIN?

A GTIN (Global Trade Item Number) is used to identify items, packages, and cases of produce. A GTIN can be used to identify any items or service that will be priced, ordered, or invoiced throughout the supply chain.

Who is responsible for creating GTINs?

The brand owner, the organization that owns the specifications of the trade item regardless of where and by whom it is manufactured, is normally responsible for the assignment of the Global Trade Item Number (GTIN). On joining a GS1 Member Organization, the brand owner receives a GS1 Company Prefix for the sole use of the company to which it is assigned. The GS1 Company Prefix cannot be sold, leased, or given, in whole or in part, for use by any other company.

For additional see Section 4.2.3 Responsibility for Allocating the Global Trade Item Number.

Whose GTINs are used for private labeled product?

The brand owner that owns the private label should provide GTINs for use to the party producing the item.

What attributes of the item should be considered when creating GTINs for my items?

It is recommended that you assign GTINs that are encoded in the 2D barcode at the same granularity as your PLU codes are assigned (e.g., commodity, variety, size group).

Can I use the generic company prefix '033383' obtained from IFPA as my company prefix for the GTIN?

No, the prefix '033383', used in both the U.S. and Canada, is for pre-packed items only, not for loose/bulk items. It is not a company-specific prefix and thus cannot be used. A company specific prefix is needed to ensure a link is established between the brand owner and the item, thereby differentiating one brand owner's product from another.

Can the PLU code be used for the item reference within my GTIN?

It is recommended to create your own numbering system that works best with your database, data retrieval, and/or inventory system. No intelligence should be considered when assigning item reference numbers to your items. Regardless of the numbering system used, the PLU code must always be included in human readable format on the PLU code sticker.

How do I calculate the Check Digit?

Access the Check Digit Calculator, which will then automatically calculate the check digit. Each GTIN will need a calculated check digit.

Will the 2D barcode replace the EAN-13 or UPC-A? What about the PLU?

When coding an item, if you are already using an EAN-13 or UPC-A on the item, there is no need to replace it. For those items that have a PLU sticker, the 2D barcode will be the barcode that is printed on the sticker with the PLU code shown in human readable form as a backup. Since there is not enough room for the 14-digit number to show underneath the barcode in the event the 2D barcode does not scan, the PLU code will remain.

Why are retailers using 2D barcodes to mark loose produce?

Retailers leveraging advanced data carriers, such as 2D barcodes on loose produce, see increased benefits in category management, checkout accuracy, in-store experience, and a reduction in shrink as well as some measure of traceability. These benefits are the driving force behind the industry's 2027 sunrise for 2D barcode adoption.

Will all retailers require 2D barcodes on produce at Sunrise 2027?

Sunrise 2027 marks a milestone in the transition to 2D barcodes. Retailers will likely possess the ability to read 2D barcodes at point of sale by the end of 2027. You will need to work with your buyer to understand their requirements. This Guide is designed to assist you as you make implementation decisions.

Is the produce industry the only fresh food sector that is changing how a product is marked (identified)?

No, many categories in the retail industry (in fresh food and beyond) have migrated to the 2D barcode in support of Sunrise 2027. Categories in the food space outside produce that have begun this migration include meat and poultry, seafood, dairy, deli, and bakery. Contact GS1 for more information.

Are all retailers able to scan and process the 2D barcode?

To make this transition, retailers may need to upgrade POS systems to be able to scan 2D barcodes powered by GS1. Check expectations and readiness with your trading partners on 2D barcode scanning capability.

What will happen if the scanner is not capable of scanning a 2D barcode? Will they reject the scan?

Yes, they will essentially get a 'not on file' read.

Does a 2D barcode enable traceability?

The recommendation in this document for implementation of 2D barcodes for Sunrise 2027 includes the encoding of GTIN as the primary data point. This provides the same level of traceability as the current implementation of DataBar (i.e., brand owner and item identification but not lot or batch information).

The additional benefit of 2D barcodes is the ability to encode additional data to support another level of granularity, such as lot/batch code, which may be part of future implementation.

The recommended guidance to begin the migration to 2D for Sunrise 2027 focuses on the GTIN as the only mandatory point of data to implement. This does not change traceability efforts already identified by GTIN adoption. The additional benefit of 2D barcodes is the ability to encode additional data to support another level of granularity, such as lot code or best by dates.

When scanning the 2D barcode, are some plastic produce bags better than others?

When there is a need to put an item into a bag, using clear, transparent bags provides a more reliable scan of the 2D barcode, reducing errors.

How do I find a company to make my 2D barcode labels?

A list of label manufacturers is available here. However, you are not restricted to this list.

Will barcoding affect my label lead time?

Printing 2D barcode labels is not expected to increase delivery times. The requirement for higher data integrity may affect label production quality control (QC) and through-put. Check with your label manufacturer on specific turnaround times.

Can I print my 2D barcode in different colors?

While most of today's barcode scanners have advanced technology, using other colors for barcodes aside from the normal black bar on a white background is highly discouraged. It is also not recommended to use high gloss label stock or metallic colors. Though they may work when you test them with your scanner, other scanners may not be able to pick up the color variations, especially lower end CCD and laser scanners. It is best to stick with the standard black print on a white barcode label. Colors may be used elsewhere on the sticker. See section 8.1 of the 2D Barcodes at Retail Point-of-Sale Implementation Guide and also the GS1 2D Barcode Colour & Quality Guide. Users are encouraged to discuss label design with their label manufacturer.

Can I blend artistic elements such as color, images, logos or custom shapes in my 2D barcode?

It is not advised to incorporate any artistic elements in your 2D barcode. For more information, see GS1 2D Barcode Colour & Quality Guide.

How do I communicate my 2D barcode GTINs to my retailers?

There are many means of communicating your data to your retailers. It is suggested to contact your retailer to identify the preferred means to provide the data.

Why is the transition to 2D barcodes occurring?

Many categories in the global fresh food industry use the 2D barcode to mark goods. These categories include meat and poultry, seafood, dairy, deli, and bakery. Retailers using a 2D barcode on loose fresh produce yield benefits including unique identification in the supply chain, improved category management, increased check-out accuracy, a reduction in shrink, and increased speed and experience at self-checkout.

Who needs to obtain a GS1 Company Prefix?

Should a brand want to identify products with a GS1 identification key, the brand owner will need to license a prefix from their GS1 Member Organization, including:

- Growers/Shippers who wish to maintain their own brand
- Buyers requiring private labeled product
- Growers/Shippers who do business with those buyers requesting company specific identification through GTIN

Where do I go to get my GS1 Company Prefix?

An application is made through the GS1 MO (Member Organization) to license a GS1 Company Prefix. Go to www.gs1.org to locate the correct MO.

How long will it take to get a GS1 Company Prefix?

After you have completed the application for your GS1 Company Prefix on GS1's website and they have received payment, you may receive your GS1 Company Prefix immediately or, generally, within one to two business days. The time to receive your GS1 Company Prefix will vary between GS1 MOs. Please validate the timing with your GS1 MO. The GS1 prefix will be located on a company prefix certificate/letter.

How much does it cost to get my GS1 Company Prefix?

This will vary company by company, and country by country. Every GS1 MO has a different pricing model. Check with your GS1 MO to validate pricing.

What determines the length of my GS1 Company Prefix?

As countries' requirements vary, this should be discussed with your GS1 MO. The length of the GS1 Company Prefix will vary depending on the number of items your company has. Be sure to consider future growth when determining the number of items you might need.

Resources

Fruit and Vegetable Master Data Attribute Implementation Guide
Fresh Fruit and Vegetable Traceability Guide
Produce Traceability Initiative (PTI) Resources and Tools
GS1 Fresh Foods Labeling Consumer Units Guidelines
GS1 General Specifications - The foundational GS1 standard that defines how identification keys, data attributes and barcodes must be used in business applications.

- 2.1.3.6 Fixed measure fresh food trade items scanned at retail POS
- 2.1.12.1 Variable measure fresh food trade items scanned at retail POS using GTIN
- 5.10.3.1 Symbol specification table 1 - Trade items scanned in general retail POS and not general distribution

Find your GS1 Member Organization (MO)
An Introduction to the Global Trade Identification Number (GTIN)
IFPS PLU Database Search Tool
GS1 Fruit and Vegetable GTIN Assignment Guide
GS1 2D Barcode Colour and Quality Guide
2D Barcode Size Estimator
2D Barcode Demo Tool