

# New Technologies for Managing Cotton Modules

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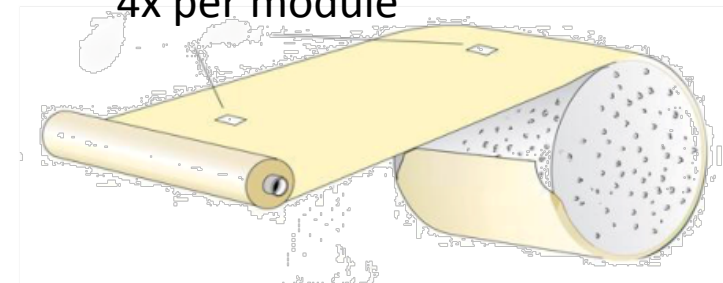


# New Seed Cotton Handling and Storage Technology

- New harvesters which form cotton modules onboard have revolutionized the storage and handling of cotton after harvest. RFID tags imbedded in plastic module wrap used on cylindrical or “round” modules contain a serial number unique to each module.
- The use of RFID technology to identify cotton modules has enabled new methods for tracking and managing seed cotton from the field to the gin.
  - Asset tracking
  - Logistical management
  - Product traceability
  - Precision Agriculture



RFID Tags  
4x per module



# John Deere - Harvest ID Cotton Pro

A database of information generated on the harvester for each round module formed.

Data can be downloaded to a USB drive by the operator or wirelessly uploaded to MyJohnDeere.com

Data can be manually retrieved from MyJohnDeere.com or through the use of the John Deere API.



- Module ID
- Module SN
- Latitude
- Longitude
- GMT Date/Time
- Tag Count
- Client
- Farm
- Field
- Variety
- Machine PIN
- Operator
- Gin ID
- Producer ID
- Local Time
- Field Area
- Season Total
- Diameter

## New in MY 2017

- Module Weight
- Seed Cotton Moisture Content



# How Do We Maximize Value in the New Module ID System?

- Systems are needed that incorporate module information from the harvester and other scanning locations between the field and module feeder.
  - Bread crumb trail of module location from formation to ginning
- RFID Module Management System Tasks
  - Compile harvest information in database using module SN as the primary key
  - Compile GPS position and time/date data for each time the RFID tag is scanned
    - Harvester – in the field
    - Hand Held Scanner – modules staged in the field for transport
    - Module Truck – loading in the field/unloading at gin yard
    - Yard Truck – loading in the gin yard/unloading at feeder
  - Assign gin “load number” to a group of modules and record associated load weight
  - Produce reports which list the modules and GPS locations for:
    - Modules Harvested
    - Modules ready for transport
    - Modules delivered to gin yard
    - Gin yard inventory
    - Gin Orders – Modules to be Ginned
    - Modules ginned



# Electronic Module Management System

Handheld RFID scanner with tablet/phone app. for logging and wireless communication



Scanning staged modules in the field or on the gin yard



Module Truck automated RFID scanning system with wireless communication

Modules scanned during loading in field and unloading at the gin yard



Data on MyJohnDeere.com automatically retrieved over internet by gin using API

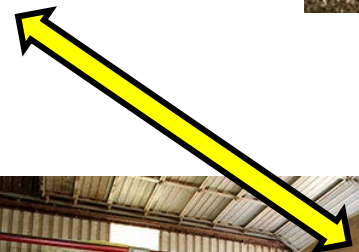
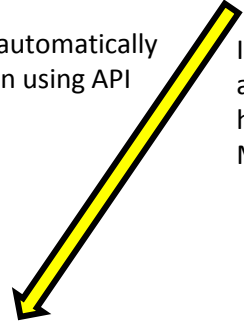


Initial harvester scan of RFID tag and association with other data collected by harvester. Wireless transmission to MyJohnDeere.com.



Module Truck automated RFID scanning system with wireless communication

Scanning at Module Feeder



# Objective of this Work

- Develop a mobile application for use in scanning RFID or 1D/2D module tags and associating GPS position, scan time, and cotton ownership information
  - Can be used after modules are dropped by the harvester or after staging
    - Staging location is useful for transportation logistics
  - Can assign module serial numbers to a “Load” number for use in gin book keeping software



RFID Module Scan



- Bohn Technology Solutions LLC.
- C# Code
- Developed in Xamarin to allow deployment on Android, iOS, and Windows platforms
- App deployed in Android
- Tested on:
  - Samsung Tab A Tablets - 10.1 and 8 in screens
  - LG smart phone - 5.5 in screen
- Hand-held RFID/Barcode Scanner (Bluetooth)
  - TSL 1128 UHF RFID
- 1D/2D barcode scanning using device camera
- Open-source code for free integration into other software
  - MIT License agreement



## RFID Module Scan







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## TSL 1128 Bluetooth UHF RFID Reader

Bluetooth UHF RFID Reader with 2D Imager, UHF antenna, Trigger Handle, Battery, Battery Cover, Micro USB Cable, USB Charger (FCC). Works with Apple iOS (iPad, iPhone, iPod). These units are non-returnable.

**\$1,119.36**

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Continue Load Scan

New Load Scan

Module Inventory List

Settings

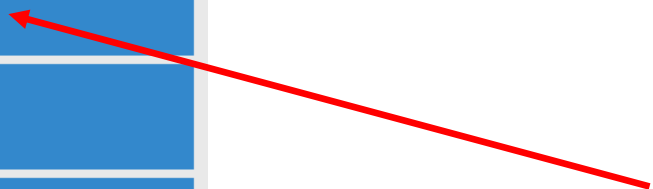
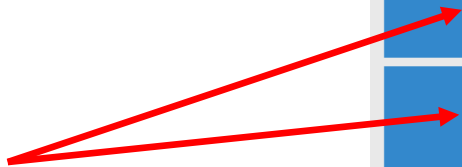
Backup Data

Clear Data

About

Load  
Scanning  
Tool

Inventory  
List Tool





Field Settings

Grower:

required

Farm:

required

Field:

required

Start Load#:

Auto load assign  ON

Max SNs/Load

Save

Cancel

Continue Load Scan

**Grower:** usda gin lab **Loads:** 9  
**Farm:** vardeman **Modules:** 36  
**Field:** project 068 **Last scan:** 11/23/2016 10:36 AM

**Grower:** Mike Henson **Loads:** 7  
**Farm:** Drip **Modules:** 28  
**Field:** Deere Test Project 077 **Last scan:** 12/14/2016 05:53 PM  
**SENT:** 12/16/2016 12:12 PM

**Grower:** Vardeman **Loads:** 9  
**Farm:** Drip **Modules:** 36  
**Field:** Project 068 **Last scan:** 11/17/2016 03:52 PM  
**SENT:** 12/16/2016 01:42 PM

**Grower:** Joe Farmer **Loads:** 13  
**Farm:** Parker **Modules:** 52  
**Field:** South Pivot **Last scan:** 10/24/2016 06:27 PM

**Grower:** usda **Loads:** 1  
**Farm:** HALL CO **Modules:** 36  
**Field:** 1 **Last scan:** 01/17/2017 09:42 AM  
**SENT:** 01/17/2017 09:44 AM

**Grower:** Mitchell co **Loads:** 1  
**Farm:** usda **Modules:** 36  
**Field:** 1 **Last scan:** 01/17/2017 09:49 AM  
**SENT:** 01/17/2017 11:17 AM

**Grower:** usda **Loads:** 1  
**Farm:** Bailey co **Modules:** 36  
**Field:** 1 **Last scan:** 01/17/2017 09:58 AM

**Grower:** usda **Loads:** 1  
**Farm:** Gaines co **Modules:** 36  
**Field:** 1 **Last scan:** 01/17/2017 10:06 AM  
**SENT:** 01/17/2017 11:19 AM

**Grower:** usda **Loads:** 1  
**Farm:** Terry co **Modules:** 36  
**Field:** 1 **Last scan:** 01/17/2017 10:15 AM  
**SENT:** 01/17/2017 11:20 AM

**Grower:** usda **Loads:** 1  
**Farm:** sets of 12 **Modules:** 72  
**Field:** 1 **Last scan:** 01/17/2017 10:29 AM

Field Settings

Delete S/Ns	Move	Review
Delete All	Renumber	Camera

Modules: 52 Loads: 13

GPS: Reader: Not connected.

▲ Load 2016001	Modules: 4
▲ Load 2016002	Modules: 4
▲ Load 2016003	Modules: 4
▲ Load 2016004	Modules: 4
▲ Load 2016005	Modules: 4
▲ Load 2016006	Modules: 4
▲ Load 2016007	Modules: 4
▲ Load 2016008	Modules: 4
▲ Load 2016009	Modules: 4
▲ Load 2016010	Modules: 4
▲ Load 2016011	Modules: 4
▲ Load 2016012	Modules: 4
▼ Load 2016013	Modules: 4

Tap here to add notes...



▲ Field Settings

Delete S/Ns	Move	Review
Delete All	Renumber	Camera

**Modules: 52** **Loads: 13**

GPS: Reader: Not connected.

▲ Load 2016002	Modules: 4
▲ Load 2016003	Modules: 4
▲ Load 2016004	Modules: 4
▲ Load 2016005	Modules: 4
▲ Load 2016006	Modules: 4
▲ Load 2016007	Modules: 4
▲ Load 2016008	Modules: 4
▲ Load 2016009	Modules: 4
▲ Load 2016010	Modules: 4
▲ Load 2016011	Modules: 4
▲ Load 2016012	Modules: 4
▼ Load 2016013	Modules: 4

Tap here to add notes...

15403712856  15403712855  15403712852  15403712853

Start New Load

Last module: 15408699862

GPS: 33.69351351, -101.82004092

Loads: 1

Modules: 1

Flash Off



JOHN DEERE



ROUND MODULE



SN: 15408699862

04 768156



Joe Farmer

Parker

South Pivot

Modules: 52

Loads: 13

Modules without GPS: 0

Reader: Not connected.

Transmit Find

Find with Camera

Load 2016005 Modules: 4

14403435905 14403435908 14403435904 14403435911

Load 2016006 Modules: 4

14408571394 14408571388 14408571397 14408571395

Load 2016007 Modules: 4

14408571396 14408571398 14408571400 14408571399

Load 2016008 Modules: 4

14403435893 14403435895 14408571391 14408571393

Load 2016009 Modules: 4

15403712868 15403712867 15403712865 15403712871

Load 2016010 Modules: 4

15403712864 15403712863 15403712862 15403712870

Load 2016011 Modules: 4

15403712866 15403712858 15403712857 15403712854

Load 2016012 Modules: 4

15403712869 15403712860 15403712859 15403712861

Load 2016013 Modules: 4

15403712856 15403712855 15403712852 15403712853







Home

78% 2:15 PM

Continue Load Scan

New Load Scan

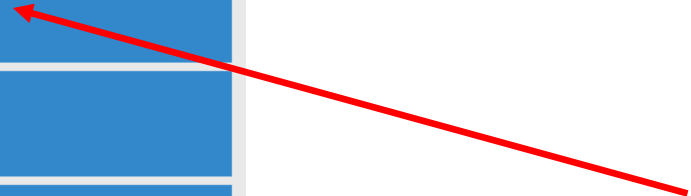
Module Inventory List

Settings

Backup Data

Clear Data

About



Inventory  
List Tool



▼ Field Settings

Grower:

Farm:

Field:

Location:

Save

Cancel

Field Settings

Delete S/Ns Transmit Delete all

Camera

Modules: 28

GPS: Reader: Not connected.

Tap here to enter notes...

- 16405947891  16405947890  16405947889  16405947888  16405947887
- 16405947886  16405947885  16405947884  16405947883  16405947882
- 16405947881  16405947880  16405947879  16405947878  16405947877
- 16405947876  16405947875  16405947874  16405947873  16407087804
- 16407087803  16407087802  16407087801  16407087800  16407088799
- 16407088798  16407088797  16407088796



Continue Load Scan

New Load Scan

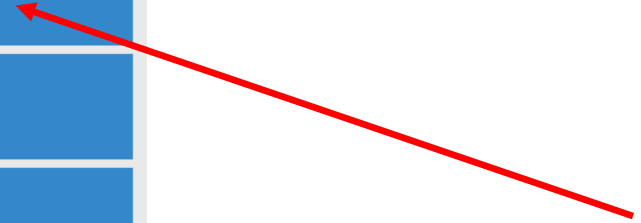
Module Inventory List

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About





## Scan Settings

Tablet ID Serial numbers per load 

## Connection Settings

Connected to: 003627-US-1128

## Available devices



Continue Load Scan

New Load Scan

Module Inventory List

Settings

Backup Data

Clear Data

About

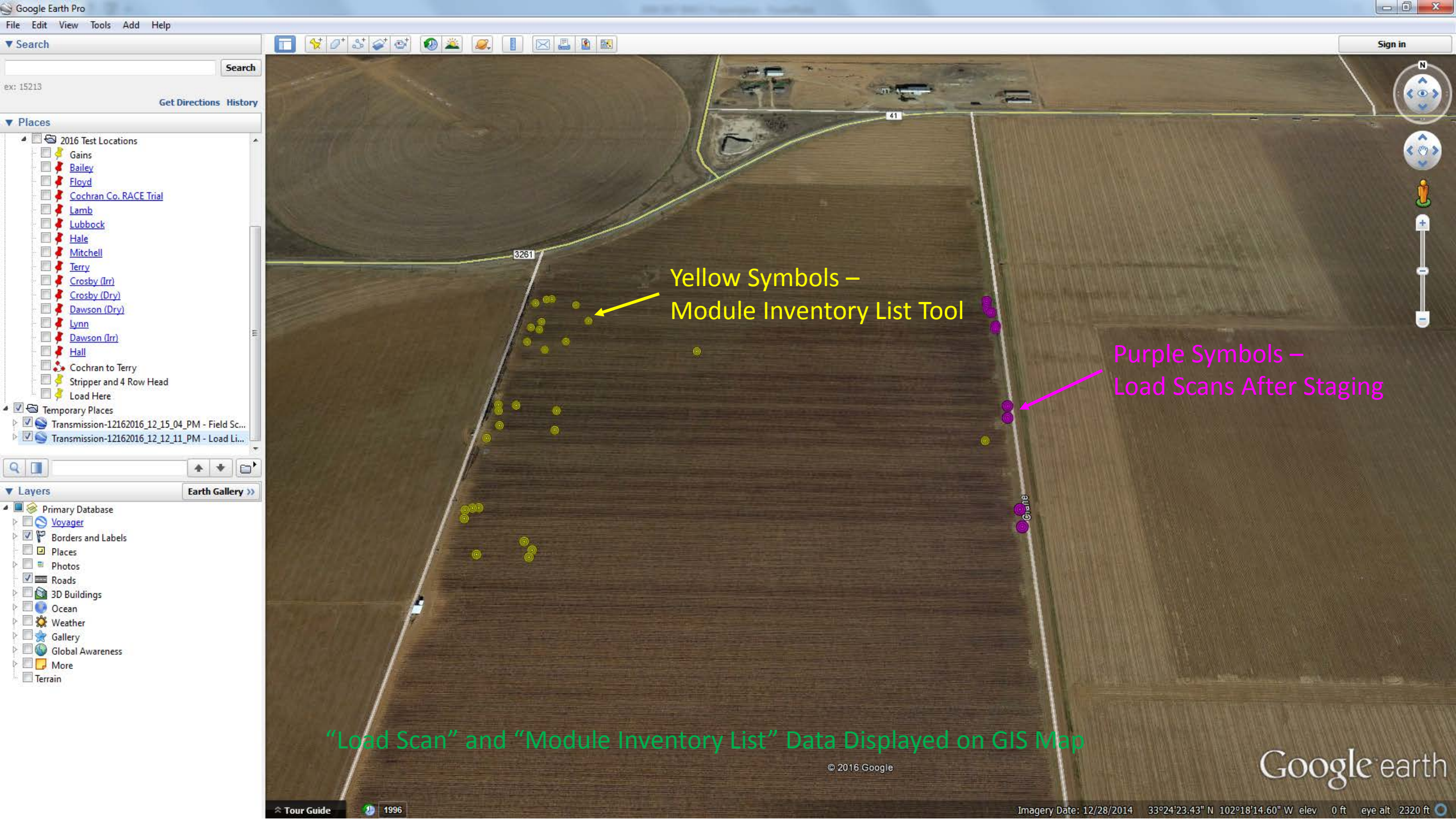


# Data in the .csv file can be easily imported into GIS software.

Grower	Farm	Field	SerialNumber	Load	ScanLocation	ScanType	Timestamp	Latitude	Longitude	TabletID	Notes
Mike Henson	Drip	Deere test project 077	16405947891	1	in field	John Deere RFID	12/14/2016 11:47	33.40917617	-102.3061323	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947890	1	in field	John Deere RFID	12/14/2016 11:49	33.40920686	-102.3066209	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947889	1	in field	John Deere RFID	12/14/2016 11:59	33.40926947	-102.3064416	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947888	1	in field	John Deere RFID	12/14/2016 12:00	33.4092627	-102.3065044	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947887	1	in field	John Deere RFID	12/14/2016 12:23	33.40772	-102.3059991	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947886	1	in field	John Deere RFID	12/14/2016 12:26	33.40771921	-102.3066154	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947885	1	in field	John Deere RFID	12/14/2016 12:46	33.40778688	-102.3064478	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947884	1	in field	John Deere RFID	12/14/2016 12:47	33.40779577	-102.3066403	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947883	1	in field	John Deere RFID	12/14/2016 13:03	33.40659441	-102.306607	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947882	1	in field	John Deere RFID	12/14/2016 13:03	33.40650776	-102.306587	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947881	1	in field	John Deere RFID	12/14/2016 13:19	33.40661841	-102.3064808	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947880	1	in field	John Deere RFID	12/14/2016 13:20	33.40661542	-102.3065423	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947879	1	in field	John Deere RFID	12/14/2016 13:45	33.40893816	-102.3059308	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947878	1	in field	John Deere RFID	12/14/2016 13:46	33.40892473	-102.3064739	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947877	1	in field	John Deere RFID	12/14/2016 14:05	33.40880998	-102.3064691	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947876	1	in field	John Deere RFID	12/14/2016 14:05	33.40884247	-102.3065752	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947875	1	in field	John Deere RFID	12/14/2016 14:17	33.40748352	-102.3059575	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947874	1	in field	John Deere RFID	12/14/2016 14:18	33.40753994	-102.3065528	tablet-1	
Mike Henson	Drip	Deere test project 077	16405947873	1	in field	John Deere RFID	12/14/2016 14:29	33.40735798	-102.3014717	tablet-1	
Mike Henson	Drip	Deere test project 077	16407087804	1	in field	John Deere RFID	12/14/2016 14:42	33.40738853	-102.306642	tablet-1	
Mike Henson	Drip	Deere test project 077	16407087803	1	in field	John Deere RFID	12/14/2016 15:00	33.40627853	-102.3059452	tablet-1	
Mike Henson	Drip	Deere test project 077	16407087802	1	in field	John Deere RFID	12/14/2016 15:04	33.40619442	-102.3058476	tablet-1	
Mike Henson	Drip	Deere test project 077	16407087801	1	in field	John Deere RFID	12/14/2016 15:22	33.40612623	-102.3058583	tablet-1	
Mike Henson	Drip	Deere test project 077	16407087800	1	in field	John Deere RFID	12/14/2016 15:23	33.40615247	-102.3063559	tablet-1	
Mike Henson	Drip	Deere test project 077	16407088799	1	in field	John Deere RFID	12/14/2016 16:47	33.40863918	-102.3061208	tablet-1	
Mike Henson	Drip	Deere test project 077	16407088798	1	in field	John Deere RFID	12/14/2016 16:47	33.40863365	-102.3065614	tablet-1	
Mike Henson	Drip	Deere test project 077	16407088797	1	in field	John Deere RFID	12/14/2016 16:58	33.4085007	-102.30461	tablet-1	
Mike Henson	Drip	Deere test project 077	16407088796	1	in field	John Deere RFID	12/14/2016 17:08	33.40852087	-102.3063316	tablet-1	

The same data structure is used for both scanning tools.

\*Data from Scan in Field tool



▼ Search  
Search  
ex: 15213  
Get Directions History

▼ Places

- 2016 Test Locations
  - Gains
  - Bailey
  - Floyd
  - Cochran Co. RACE Trial
  - Lamb
  - Lubbock
  - Hale
  - Mitchell
  - Terry
  - Crosby (Irr)
  - Crosby (Dry)
  - Dawson (Dry)
  - Lynn
  - Dawson (Irr)
  - Hall
  - Cochran to Terry
  - Stripper and 4 Row Head
  - Load Here
- Temporary Places
  - Transmission-12162016\_12\_15\_04\_PM - Field Sc...
  - Transmission-12162016\_12\_12\_11\_PM - Load Li...

▼ Layers

Earth Gallery >>

- Primary Database
  - Voyager
  - Borders and Labels
  - Places
  - Photos
  - Roads
  - 3D Buildings
  - Ocean
  - Weather
  - Gallery
  - Global Awareness
  - More
  - Terrain

Yellow Symbols –  
Module Inventory List Tool

Purple Symbols –  
Load Scans After Staging

“Load Scan” and “Module Inventory List” Data Displayed on GIS Map



# Current Status and Additional Development

- Tools ready for testing and use:
  - Cotton Harvest File Download Utility
    - Available from Cotton Incorporated
  - RFID Module Scan
    - GitHub: Source Code and APK File
      - <https://github.com/bohntech/RFIDModuleScan/tree/master/RFIDModuleScan/APK>
    - Google Play Store: Search “RFID Cotton Module Scan”
      - <https://play.google.com/store/apps/details?id=com.rfidmodulescan.rfidmodulescan&hl=en>
- Work in progress:
  - Additional software to facilitate scanning on module trucks during the loading and unloading processes in the field and at the gin
  - Database software to collect and manage scan data and produce reports for use by ginners and growers

# Questions?

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