

Welcome to the webinar!

- The webinar will start at the top of the hour.
- Find a handout of the slides in the "handouts" section of your gotowebinar control panel.
- To type in a question, use the question box on your control panel.
- The recording will be posted at <http://articles.extension.org/pages/60426> and on the Plant Breeding and Genomics YouTube channel
- Find all Plant Breeding and Genomics resources at http://articles.extension.org/plant_breeding_genomics



Getting Started with Barcode-based Digital Data Collection for Vegetable Breeding Programs Part 2 of 3: Planting to Field Observations

Michael Mazourek
Calvin Knoyes Keeney Associate Professor
of Vegetable Breeding
Cornell University



Genomic And Phenomic Tools To Support
Vegetable Cultivar Development:
Winter Squash As An Initial Target
USDA-AFRI 2013-67013-21232

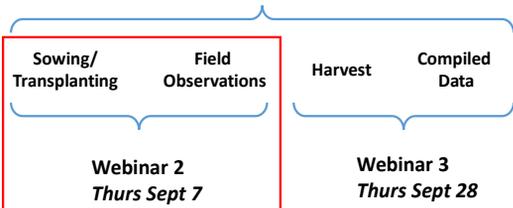


United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Three Part Webinar Series

Webinar 1: Overview



Specific examples of workflow and how we implement

Planting to Field Observations



Planting Plan Setup

Columns with single heading rows

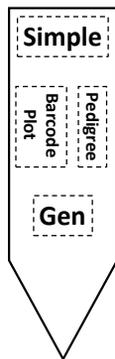
Plot	Prev #	Pedigree	Generation	Simple	Notes
17-101	16-342-1	(Wal x HN) F3	F3	101	Etc
17-102	14-754-2	(Wal x HN) F2	F2	102	Etc
17-103	15-867-8	(Wal x HN) F1	F1	103	Etc
17-104	16-317-2	(TKK x Bugle) F3	F3	104	Etc



Replace all command "17-" with nothing

Translation to Stake

- Double check longest names because characters can wrap oddly and barcodes expand
- Barcodes will jump between sizes with more incremental options available with higher resolution printers
- If nothing else, avoids writer's cramp and is legible



Translation to Stake

- Double check longest names because characters can wrap oddly and barcodes expand
- Barcodes will jump between sizes with more incremental options available with higher resolution printers
- If nothing else, avoids writer's cramp and is legible



Flat Label Printing

- 23mil plastic stakes 3/4" x 5"
 - Length will depend on printer
 - (search for horticultural pot labels)
 - \$0.02 per stake rolls of 2,000
- Thermal Transfer ribbon rolls ¼ mile long
- Printer \$3,300 (also printing services)
- Also consider stickers on flats



Seedling Flat Observations



Envelope to Greenhouse

- New seed packet created for planting
 - Protects seed stock from water in greenhouse
 - Creates internal control of seed sourcing



Choice of Field Stakes

1. **Wooden stakes**
 - 12" x 1 1/8" x 0.1" color coated
 - Short to fit under row cover and cultivation equipment
 - Staple tags with plier stapler (labor intensive)
 - \$0.20 each, start to fail after 3 months in the ground



Choice of Field Stakes

2. **Metal wire stakes with plastic card top**
 - 24", 32" or 48" tall, 1,000 stakes weigh 400 lbs
 - Above the weeds, scan standing up
 - Stickers adhere very well
 - \$1.50 each, metal lasts several years
 - Plastic card tops last 3 years, \$0.20 each



Scanners

Connectivity

- Bluetooth or USB

Scan type

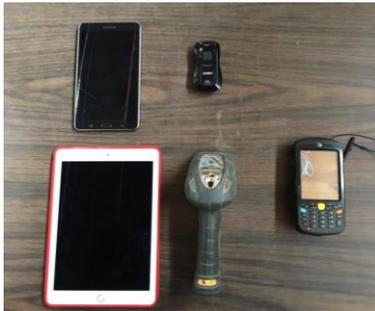
- 1D laser – use with 1D barcodes as ruler
- 2D imager – faster, read off screens

Format

- All in one PDA
- Connect to tablet



Scanners



Sending Tab Character

- Advance to next column or row automatically after scanning a barcode
- Scanner comes with a series of codes that you scan to program
- Handheld all-in-one's have settings within scanner software
- Also can set "beep!" volume
- You will probably have to do something similar to pair a Bluetooth scanner (scan barcodes to enter ID)

Carriage Return Example

	A	B	C	D	E	F
1	Plot	Stand Count	Architecture	Leaf type	Disease	
2	17-535	18	Upright	Lobed	4	
3	17-536	19	Upright	Lobed	3	
4						
5						
6						
7						
8						

Set columns to 5
Set offset to 1,-4

Carriage Return for Excel

- Automatically starts over on next row when scanned last entry
- Right click on sheet tab
 - Select "View Code"



Carriage return continued

- Paste this text into window, then close it
- ```
Private Sub Worksheet_Change(ByVal Target As Range)
If Not Application.Intersect(Target, Columns(5)) Is Nothing Then
Target.Offset(1, -4).Select
End If
End Sub
```



- After the scanner inputs a value in the fifth column, the cursor moves down one cell and left four cells

- Modify as appropriate
- Effectively ready for next plot observation

---

---

---

---

---

---

---

---

---

---

## Integrating Digital Images

Wifi camera and connect to

- Tablet
- smart phone
- your old phone?

Consider battery backup

- spare battery, car charger, portable battery



Mount a camera to a window washer pole with 1/4" x 20 bolt \$35

---

---

---

---

---

---

---

---

## Mugshots vs Glamour Photos

- Your camera will tend to automatically adjust to changing photo composition etc
- Good for individual photo, not for series of many plants
- Switch from auto to manual mode
- Or at least from multi sampling to spot sampling




---

---

---

---

---

---

---

---

## Set White Balance

- Consider time of day, cloudy or late afternoon best
- Many preset modes
- To set precisely:
  1. enter camera into white balance mode
  2. snap photo of pure white object in representative lighting
  3. details may vary




---

---

---

---

---

---

---

---

### Set Aperture and Shutter Speed

Aperture controls “depth of field” how much of your plant is in focus from near to far and depends on proximity

Shutter speed is needed to control for motion from breeze or unsteadiness of photographer

---

---

---

---

---

---

---

---

### Aperture (F stop) before shutter speed

- Small apertures (larger #) allow less light in and have a greater depth of field.
  - for overhead photo of tall plant explore F8-F16
- Larger apertures (smaller #) allow more light and have a shallower depth of field.
  - Think about your pupils after visit to eye doctor
  - For overhead photo of short plant explore F2.8-F4
- Shutter speed normally set second in response to aperture needs

---

---

---

---

---

---

---

---

### Setting Exposure

- Switch to spot metering and press shutter down partway of grey card or neutral object
- Camera will display exposure settings
- Switch to manual mode and enter settings
- Take test photo
- Adjust as necessary

---

---

---

---

---

---

---

---

## **Setting Exposure (con't)**

- If too dark, make shutter speed slower to let in more light (denominator smaller)
- If too light, make shutter speed faster (denominator larger)
- If whole plant is not in focus, switch to mode A
  - aka aperture priority mode
- Set aperture to smaller (higher #) and repeat

---

---

---

---

---

---

---

---

## **Acknowledgements**

- Lindsay Wyatt
  - Sara Shapleigh
  - Emily Rodekohr
  - Buckler group
  - Alice Formiga
- Genomic And Phenomic Tools To Support Vegetable Cultivar Development:  
Winter Squash As An Initial Target  
USDA-AFRI 2013-67013-21232**

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.



United States Department of Agriculture National Institute of Food and Agriculture

---

---

---

---

---

---

---

---

- Find all upcoming and archived webinars and additional resources at <http://articles.extension.org/pages/60426> and on the Plant Breeding and Genomics YouTube channel
- Please join us for the next 2 webinars in the series on September 7 and 28
- Please respond to an email survey after the series is over
- Thank you for coming!




---

---

---

---

---

---

---

---