

# Data Reconciliation and Estimation in an Agricultural Survey

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## Disclaimer

The findings and conclusions in this presentation are those of the authors and should not be construed to represent any official USDA or U.S. Government determination or policy.

# Background

- ▶ NASS conducts the Puerto Rico Census of Agriculture
  - ▶ A complete count of Puerto Rico farms and the people who operate them
- ▶ Farm - at least \$500 in agricultural products
- ▶ Census Mailing List (CML) - sampling frame for the census
  - ▶ A list of farms and potential farms in Puerto Rico
- ▶ The CML does not cover all farms - undercoverage
- ▶ The Agricultural Coverage Evaluation Survey (ACES)
- ▶ Census estimation

## Background

- ▶ The Puerto Rico Census was to be conducted in 2017
- ▶ Data were collected for the 2017 ACES
- ▶ Then came Hurricane Maria in September 2017
  - ▶ Many farms destroyed
  - ▶ Infrastructure damaged
- ▶ The 2017 Census was delayed by one year, conducted in 2018
- ▶ The ACES was repeated in 2018 using the same sample

An area in PR before (left) and after (right) Hurricane Maria



# Challenges and Goals

- ▶ Data collection procedures were different in the two years
- ▶ Difficulty to apply record linkage

## Goals:

- ▶ Reviewing the 2017 and 2018 ACES records
- ▶ Estimating the number of farms and land in farms before and after Hurricane Maria

# The Agricultural Coverage Evaluation Survey (ACES)

- ▶ To provide a measure of undercoverage of the CML
- ▶ Based on an area frame, which covers all land in Puerto Rico
- ▶ Primary sampling units (PSU) are drawn using stratified random sampling
- ▶ A segment of land is randomly selected from each PSU

# The Agricultural Coverage Evaluation Survey (ACES)

## Tracts in a segment



## Review of the 2017 and 2018 ACES records

- ▶ The 2017 and 2018 ACES data were collected from the same segments
- ▶ Not all tract delineations from 2017 were available for 2018
- ▶ So, the same tract number may represent different tracts in the 2017 and 2018 surveys
- ▶ Automated record linkage not possible



# FEITH images

- ▶ Images of completed questionnaires (FEITH images) available for both 2017 and 2018 ACES

[Complete esta lista cuando termine de enumerar el segmento.]

- Total de letras de tracto listadas en la columna 5, página 2.
- Número de letras de tracto listadas en la foto o en el mapa.  [Partida 1 debe ser igual a la partida 2.]
- Número de Cuestionarios de Área completados.
- Número de tractos con cuerdas en la columna 18, página 3.
- Total de las partidas 3 + 4.  [Partida 5 debe ser igual a las partidas 1 y 2.]

Hoja de cálculo

Cuerdas en Tractos Agrícola	Cuerdas en Tractos No-agrícola
300,000	300,000

[Comentarios sobre problemas de enumeración causados por los límites del segmento, terrenos divididos, cobertura de fotografía aérea, etc.]

Actividad	Fecha	Iniciales
Recibo	1/2/18	ALM
Edicaje Preliminar	1/2/18	ALM
Cotejo OLMO		

## 2018 Encuesta de Evaluación de Cobertura Agrícola Formulario de Enumeración de Área - versión D

OMB 0505-0013  
Aprobación expira: 30/09/2020  
Código del proyecto: 655 OJD: 173942  
SitemapKey: 2042



USDA/NASS  
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72 000970299 00 00 003950 000303322 0

Estado	Estrato	Segmento
1	1	1

Parte 1 de 1  
Municipio BOCOW13  
107

### INTRODUCCIÓN

[Preséntese y pida hablar con el operador de la finca. Reformular con sus propias palabras.]

Estoy trabajando en la encuesta de evaluación de cobertura agrícola de 2018. En esta encuesta le pedimos a los productores agrícolas que provean información sobre sus fincas.

La información provista será utilizada únicamente con fines estadísticos. Sus respuestas se mantendrán confidenciales y cualquier persona que voluntariamente revele cualquier información identificable acerca de usted o su operación está sujeta a pena de cárcel, multa o ambas. Esta encuesta se lleva a cabo según las disposiciones de Protección de Información Confidencial del Título V, Subtítulo A, Ley Pública 107-347 y otras leyes federales aplicables. Para obtener más información sobre cómo protegemos su información por favor visite: <https://www.nass.usda.gov/confidentiality>. Su



# Comparing address and name information; 2017 and 2018 ACES

- ▶ The FEITH images contain addresses and operator names
- ▶ Manually compared names/addresses on the images for all tracts in each segment
- ▶ Linked many of the 2017 and 2018 tracts
- ▶ Some of the tracts could not be linked
  - ▶ No data available for a tract (i.e., No-Link)
  - ▶ Differences in names and addresses (i.e., Uncertain-Link)

# Census Estimation: Capture-recapture approach

- ▶ Capture-recapture method
- ▶ Two sources of data
  - ▶ Census
  - ▶ ACES
- ▶ Probabilistic record linkage
- ▶ Independent sources of data
- ▶ Census weights
  - ▶ Undercoverage
  - ▶ Non-response
  - ▶ Misclassification
    - ▶ Classifying farms as non-farms
    - ▶ Classifying non-farms as-farms

# ACES Estimation

- ▶ ACES - can be used for the estimation of the number of farms, land in farms and other commodities
- ▶ A stratified random sample drawn from an area-frame
- ▶ Final weights are estimated using an expression of the form

$$W_j = b_j c_j, \quad (1)$$

Where,  $b_j$  is the sampling weight for tract  $j$ , and  $c_j$  is the tract-to-farm ratio

# Manual Record Linkage Results

Table: 2017 and 2018 Record Linkage Results: Numbers of Records

	Year 2017	Year 2018
Linked Farms	219	198
Not Linked Farms	72	134
Linked Non-Farms	702	723
Not Linked Non-Farms	338	2,115
Total	1,331	3,170

# Manual Record Linkage Results

- ▶ Tracts that were not linked
  - ▶ No-link
  - ▶ Uncertain-link
- ▶ 'Not-Linked' tracts - all tracts with no links or uncertain links

Table: 2017 and 2018 - Numbers of Farm Records Not Linked

	Year 2017	Year 2018
No link	31	95
Uncertain link	41	39
Total	72	134

# Manual Record Linkage Results

Table: Year of Establishment for 2018 Farm Records Not Linked

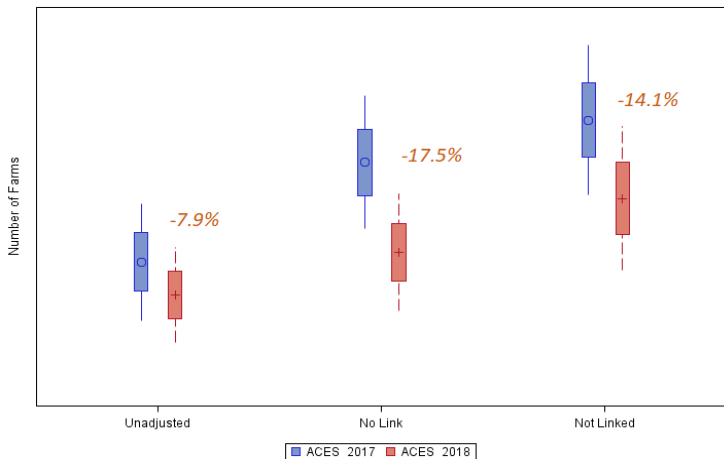
		Count
Farms Prior to 2017	No-Link	87
	Uncertain Link	35
New Farms Since 2017	No-Link	8
	Uncertain Link	4
Total		134

# Adjustment Estimation

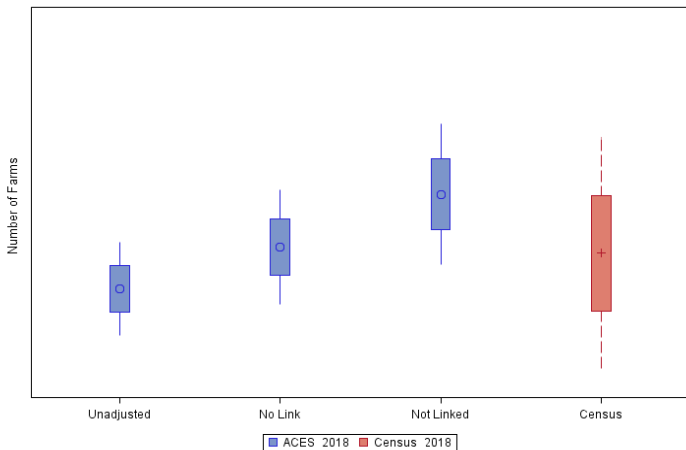
- ▶ Unadjusted estimates were produced using original ACES data
- ▶ Tracts with no links and uncertain links were considered to produce adjusted estimates
- ▶ Two sets of adjusted estimates
  - ▶ Tracts with no links were added to the original ACES data to produce the first set of adjusted estimates
  - ▶ Tracts that were not linked (i.e., tracts with no links and uncertain links) were added to the original ACES data to produce a second set of adjusted estimates
- ▶ Not all tracts with no links or uncertain links may be operational



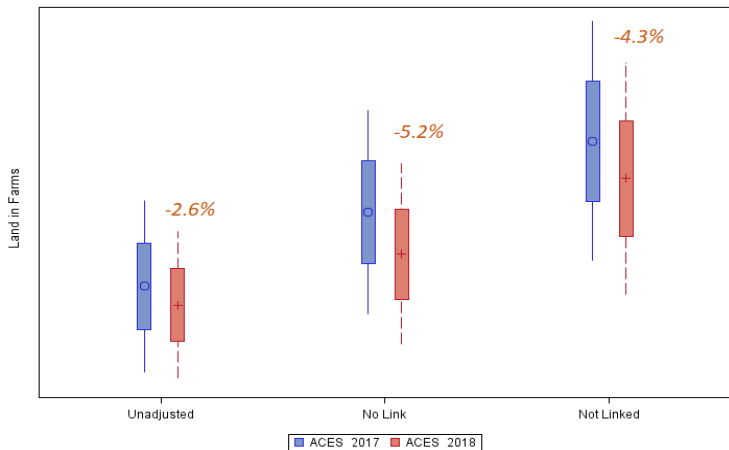
## Number of Farms Estimates: 2017 and 2018 ACES



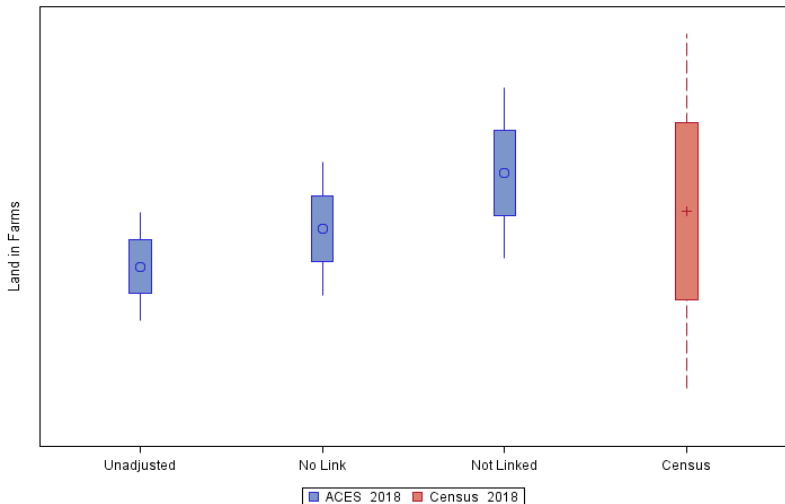
## Number of Farms Estimates: ACES 2018 vs Census 2018



## Land in Farms Estimates: 2017 and 2018 ACES



## Land in Farms Estimates: ACES 2018 vs Census 2018



## Summary

- ▶ Number of farms and land in farms before and after Hurricane Maria
- ▶ Both the unadjusted and adjusted estimates showed overall decreases in the number of farms and land in farms from 2017 to 2018
- ▶ The number of farms established after Hurricane Maria
- ▶ Farms that survived the hurricane but not captured in the ACES
- ▶ ACES helped validate the 2018 Census results
- ▶ Future work: applying a capture-recapture approach for estimation from the ACES

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# Thank You!

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