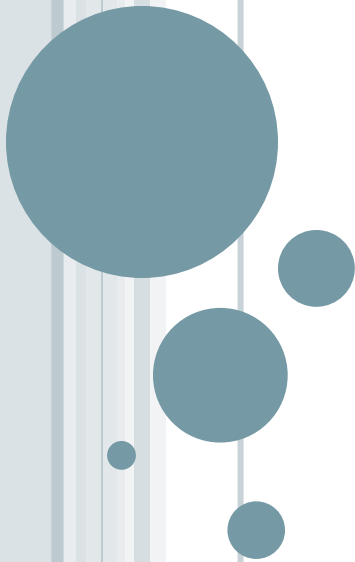


# **SWITCHGRASS AS BEDDING FOR CHICKENS**

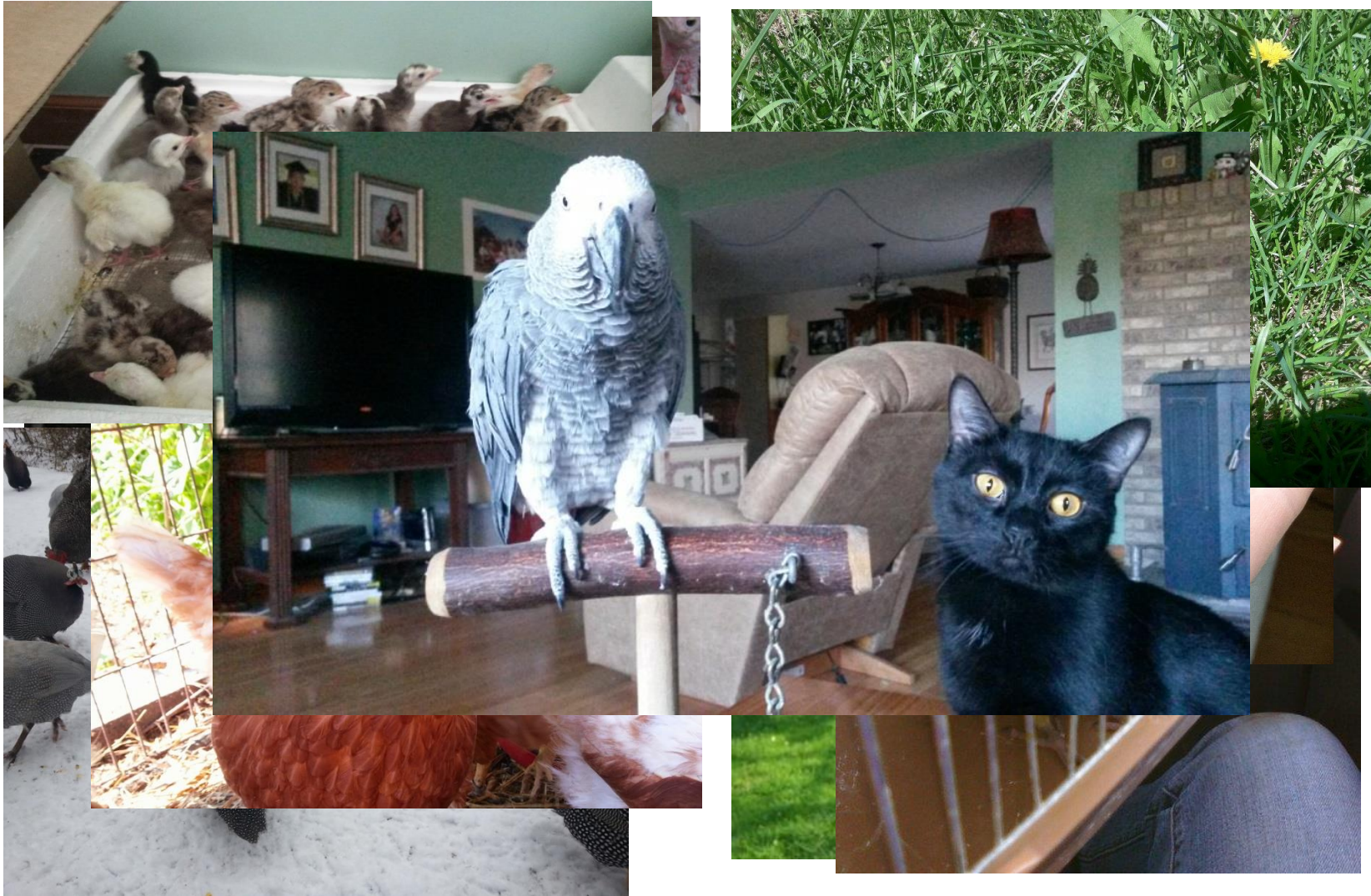
**Amy Barkley  
Penn State University**



# WHO AM I AND WHERE AM I FROM?



# BACK AT THE FARM...



# DAD'S HELPER

- Collected and washed eggs
- Fed and watered birds
- Helped hatch chicks
- Prepare birds for sale



THIS IS GETTING A LITTLE CORNY...





# TO PENN STATE!



# WHAT DID I WANT A DEGREE IN?

- Was on track to be a Biology major
- Changed major to Animal Science
- Thought I wanted to be a dairyman
- Thought I wanted to be a vet
- Wasn't 100% sure what I wanted to do
  - Poultry?

... Then I met Phil





# POULTRY SCIENCE!

- Classes about chickens
- Hands-on experience
- Worked at PERC
- Poultry Science Club!
- Undergraduate research



# UNDERGRADUATE RESEARCH

- “Popcorn Ball Project”
- Pastured hen study



# GRADUATE RESEARCH

“The Effects of Renewable, Alternative Bedding Resources on Broiler Production: An Evaluation of Performance, Welfare, and Environmental Impacts”



Thesis Title



# MATERIALS I WORK WITH



Bluestem Nursery

Miscanthus Grass



[nrcs.usda.gov](http://nrcs.usda.gov)

Switchgrass



Biomass Willow

# BIOMASS



# WHAT DO CHICKENS AND PLANTS HAVE IN COMMON?

- Bedding!
- Working with commercial broiler chickens
- Testing beddings at Penn State and beyond
  - Poultry Education and Research Center (PERC)
  - Local farms
- Question: How can we process biomass to make the best bedding for our chickens?





United States Department of Agriculture  
Natural Resources Conservation Service

Plant Materials Program

July 2011

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# Planting and Managing Giant Miscanthus as a Biomass Energy Crop



# MISCANTHUS GRASS

## Pros

LOTS of Biomass (straw)

8-12 tons/acre

Annual harvest

Dries in field

Easy to harvest

Excellent performance as a bedding

15-20 year stand

## Cons

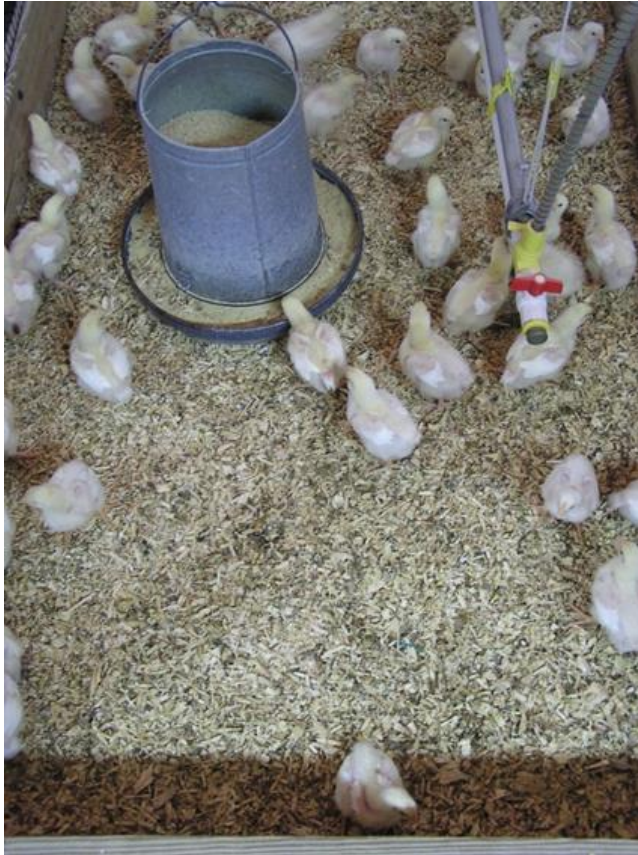
Non-native

Harvest timing

Medium to high fertile soils



# SOFTWOOD VS MISCANTHUS





# BIOMASS WILLOW



# BIOMASS WILLOW

## Pros

Renewable biomass (chips)

21 year stand

12 dry tons per harvest  
cycle

## Cons

Wet product

Harvest timing

Harvesting equipment

Untraditional bedding

3 year harvest cycle

Needs soil nutrient balance



# WILLOW VS SOFTWOOD



# WILLOW VS SOFTWOOD



# SWITCHGRASS



# SWITCHGRASS

## Pros

3.53-3.8 tons/acre

Dries in field

20 year stand

Good performance as a bedding

Low nutrient needs

Native plant

## Cons

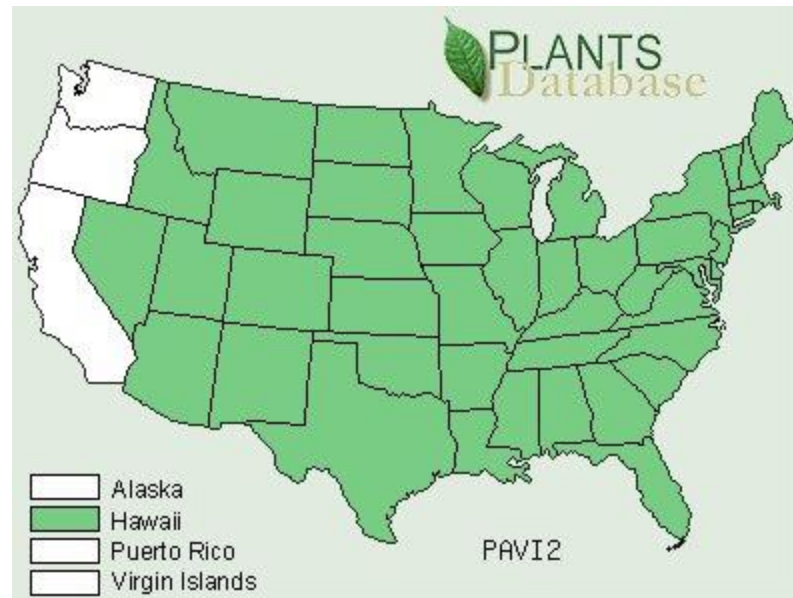
Harvest timing

1/3 biomass of miscanthus



# SWITCHGRASS AT A GLANCE

- Pasture, erosion control, biomass
- Upright growth: 3-5 feet tall
- 20 year stand
- Harvest late winter to early spring



# WHY STUDY SWITCHGRASS?

**Particle length influences  
performance!!!**

Via material, harvesting/processing equipment, and  
time of harvest





# WHY USE SWITCHGRASS AS BEDDING?

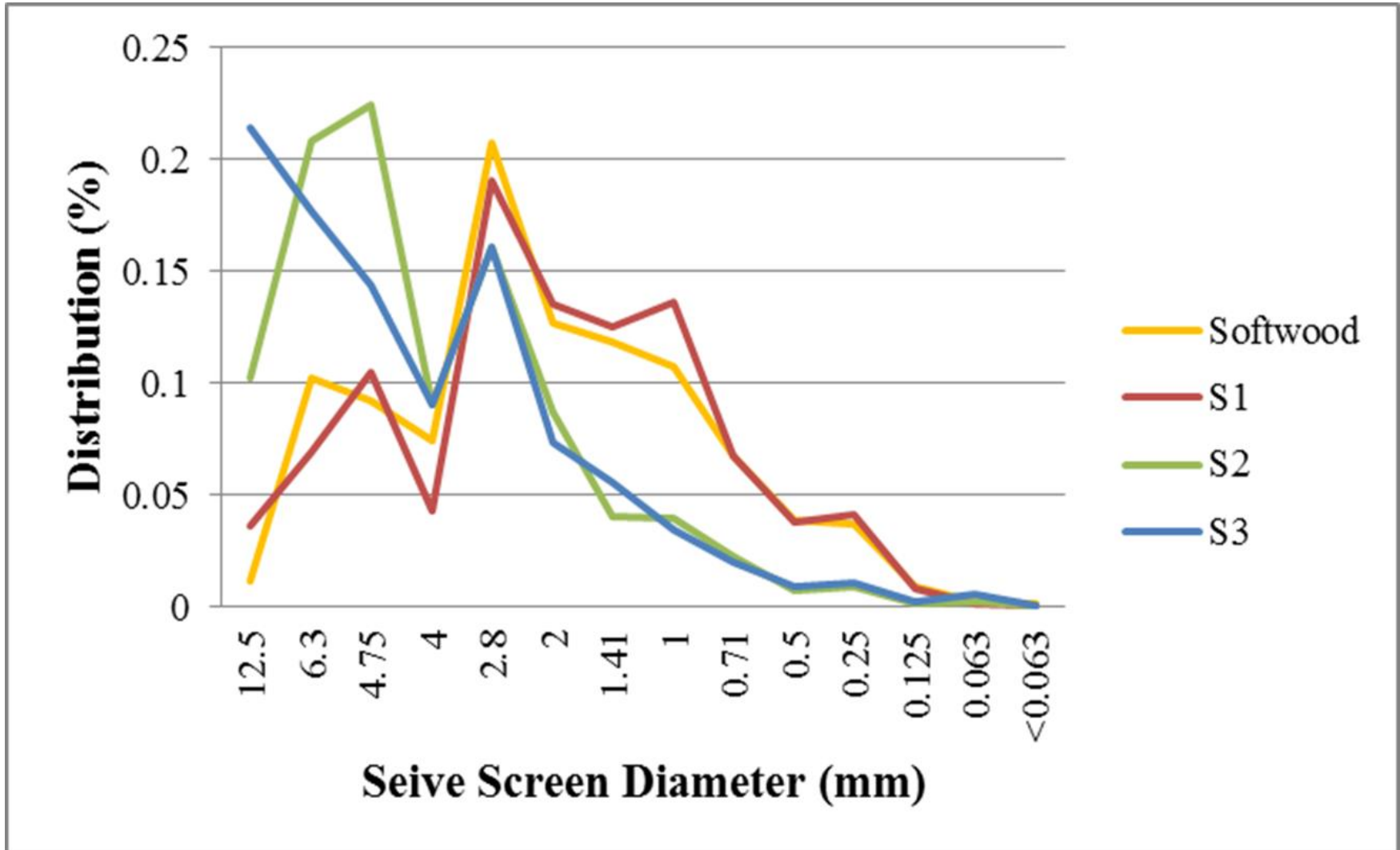
- Increase in wood shaving price
- Decrease in wood shaving availability
- Other studies note it is a good bedding
- Environmentally friendly
- Renewable resource
- Readily available- can grow on your own farm



# SWITCHGRASS WITH FIELD HARVESTER



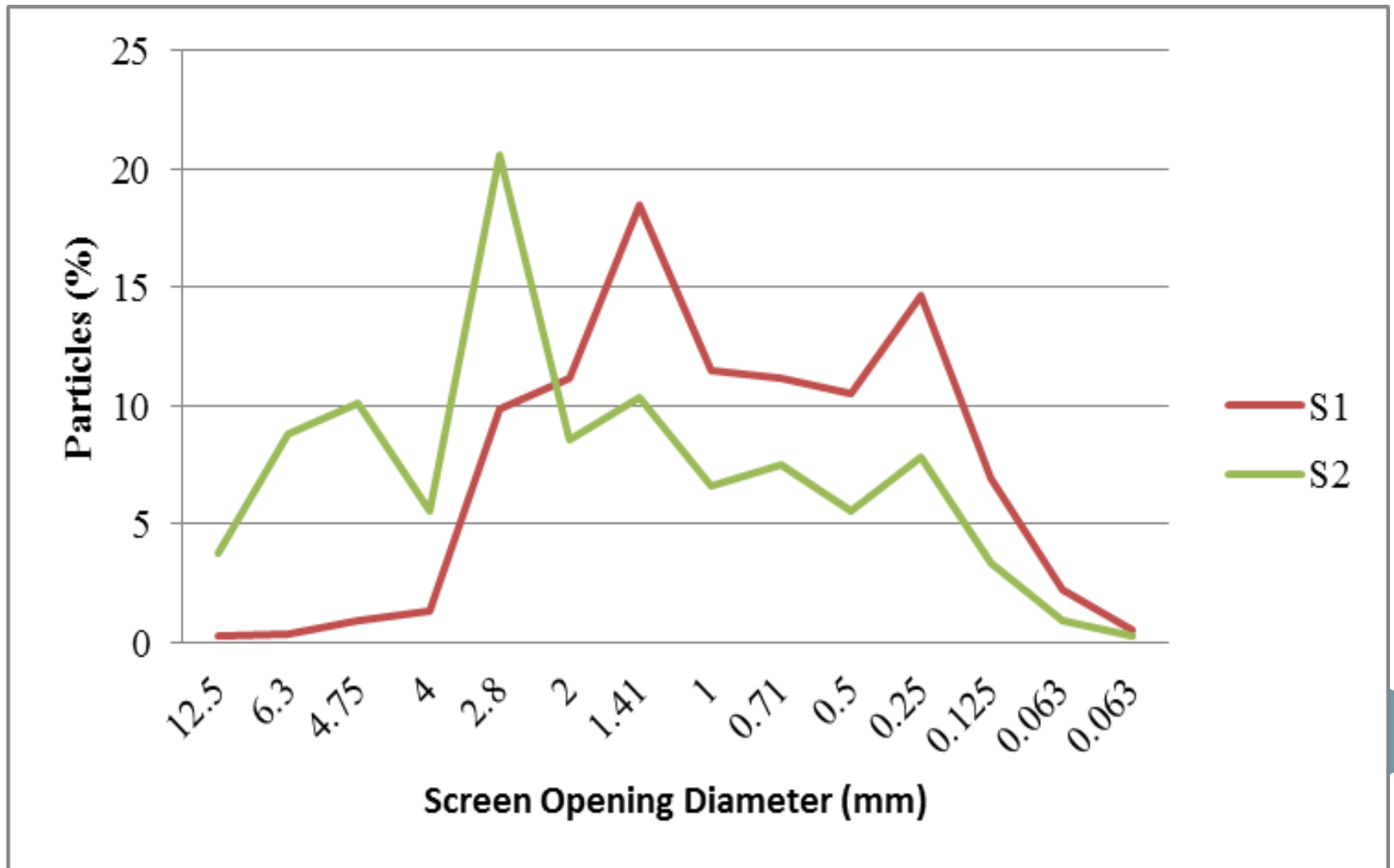
# SWITCHGRASS WITH FIELD HARVESTER



# SWITCHGRASS THROUGH TUB GRINDER



# SWITCHGRASS THROUGH TUB GRINDER



# WHAT SHOULD A GOOD BEDDING DO?

- Wick moisture away from birds and release it
  - Low moisture over growing period
- Maintain a low pH
- Minimal cake
- Does not allow for high ammonia levels
- Not carry disease
- Not decrease bird performance
- Keep foot pads clean and undamaged
- Keep feathers clean



# RED AND WHITE COMMERCIAL BROILERS



# MEASUREMENTS WE TOOK

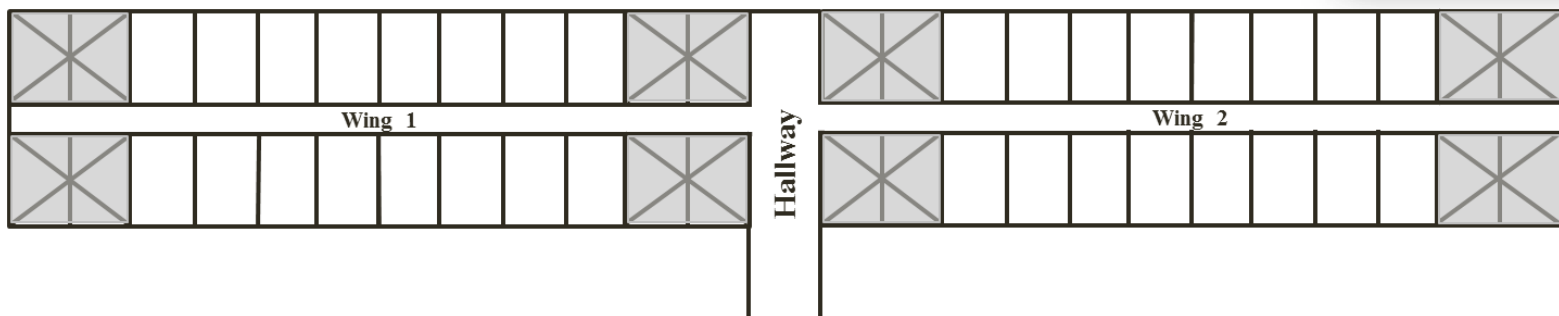
- Bedding: moisture, pH, water holding capacity, evaporative loss, density, and nutrient analyses
- Litter: moisture, pH, temperature, litter scores, d ammonia
- Birds: bodyweights, feed intake and conversion, foot pad scores, breast feather cleanliness scores














# PROJECT 1

- PSU Poultry Education and Research Center (PERC)
- Red broilers
- 8 weeks
- Organic density (1ft<sup>2</sup> per bird)
- Replicate pens



# PROJECT 1

## SHORT (.25"-.75") COMPARED TO WOOD SHAVINGS

- Held moisture 
- Released moisture quickly to air 
  - Low litter moisture over growing period 
- Maintained a low pH 
- Ammonia levels 
- Caking 
- Bird performance 
- Kept foot pads clean and undamaged 
- Kept feathers clean 

### Key:



Worse



Same















Better



# PROJECT 1

## LONG (1.5"-2.5") COMPARED TO WOOD SHAVINGS

- Held moisture  
- Released moisture quickly to air 
  - Low litter moisture over growing period  
- Maintained a low pH 
- Ammonia levels 
- Caking  
- Bird performance 
- Kept foot pads clean and undamaged 
- Kept feathers clean 

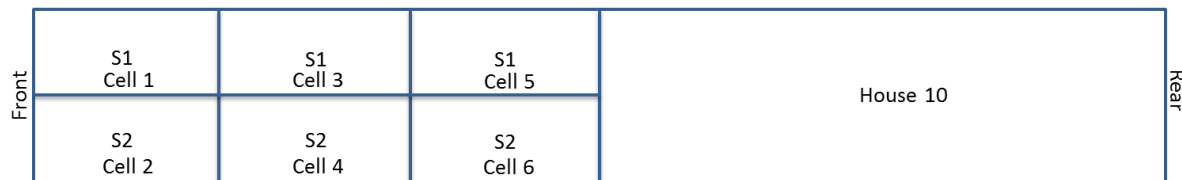
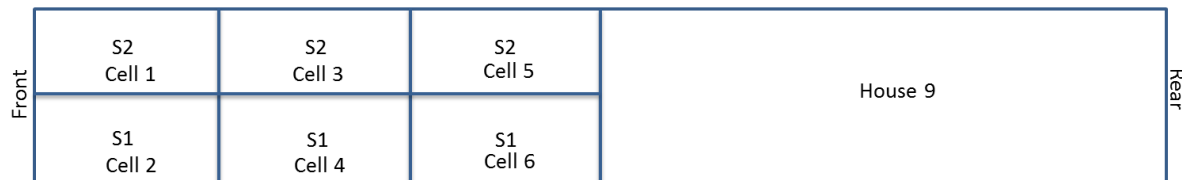
### Key:

 Worse     Same     Better



# PROJECT 2

- Cooperator's farm
- White broilers
- 7 weeks
- Organic density
- Two barns
  - Replicate pens



# PROJECT 2

Short  
(0.5"-1")

Long  
(1"-2")

- Held moisture
- Released moisture quickly to air
  - Low litter moisture over growing period
- Maintained a low pH
- Ammonia levels
- Caking
- Bird performance
- Kept foot pads clean and undamaged
- Kept feathers clean



Key:



Worse



Same



Better



## SMALL FLOCK USE

- Less dusty material easier to handle
  - Forage harvester, screen material
- Loose or baled product
  - Need to process bales- loose may be easier
- Expected to work similarly to shavings
- Long particles not as big of an issue
  - Due to lower stocking densities
  - Use under cages



# WHAT CAN I DO WITH THE LITTER?

- Compost it!
- Spread it on fields or in the garden!
  
- Can get it tested by Penn State Agricultural Analytical Services Laboratory



# THANK YOU TO...

- USDA

- United States Department of Agriculture- Conservation Innovation Grant

- NE-SARE

- Northeast Sustainable Agricultural Research and Education- Graduate Student Grant





# Questions?



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