COMMERCIALLY AVAILABLE TECHNOLOGIES FOR HAY

Available technologies for hay

- Bale Weighing
- Moisture Measurement
- Yield Mapping
- Automated Preservative Applicators
- Continuous Round Baler

- Trimble S1100A - Bale Weighing
  - Indicator
  - Mounted in the cab to clearly display lifted weight
  - Transducer
  - Connected to the hydraulic system to measure pressure

- Onboard Scales - Bale Weighing
  - OEM Providers
    - CNH
    - Krone
    - Vermeer
  - Aftermarket kits
    - Tara Systems (Small Square Bales)
    - Scale-Tec

- AgraTronix BHT-2 - Moisture Measurement
  - Small square and round
  - Retail: $380
  - Moisture Range: 8% to 40%
AgraTronix BHT-2 - Moisture Measurement

Core Moisture: 13.5%

Harvest Tec Products (via AgCo)

- Rotating star wheels
- Measure moisture content
- Automatic preservative applicator control
- Estimate tonnage weight (large square balers only)

Retail: $4000 + $3,000

CLEMSON ROUND BALE WEIGHING SYSTEM RESEARCH & DEVELOPMENT
How the Clemson bale weighing system works

- Pressure transducer on bale kicker
- Records hydraulic pressure as bale is discharged
- Correlates peak(s) in hydraulic pressure to bale weight

Raw Kicker Data

Net Wrap Only: Kicker Predictions

Crop Yield Maps

- Yield monitoring
  - Available for cotton, corn, and grain
  - 2nd among PA technologies (Winstead et al.)
  - Can be used to define management zones
  - Evaluate achievement of yield goals
  - Adjust management strategy
- Cost-Benefit or ROI
  - Difficult to determine
  - Case-by-case basis
  - 2% profit increase reasonable

HAY YIELD MONITORING

Yield Monitor Commercial Availability by Acreage (1,000 ac)
Yield Monitor Commercial Availability by Crop Value ($1,000)

Top 6 U.S. Crops

Cotton, 5,206,928
Wheat, 61,346,924
Rice, 2,326,824
Soybeans, 25,083,774
Hay, 14,529,012
Corn for grain, 41,583,097

CLEMSON HAY YIELD MONITOR DEVELOPMENT

How the Clemson hay yield monitor works

• Tongue/throat mounted sensors measure windrow height on-the-go
• Window height multiplied by distance traveled to calculate windrow volume
• Windrow volume correlated to bale weight and/or bale count

Unique features of the Clemson hay yield monitor

• Adaptable to any baler
  – Round balers
  – Small square balers
  – Large square balers
• Multiple calibration capabilities
• Aftermarket retrofit or OEM option

Raw Sensor Data Across Bale

Window Height, in

Distance, ft
All 2014 Bales: Actual vs. Predicted Mass Flow

YIELD DATA AS FUNCTION OF IN-FIELD VARIABILITY

Bermudagrass: Actual vs. Predicted Mass Flow

Yield benefit of irrigation

Tift-85 1st Cutting: Irrigation Benefit = $22/ac
Tift-85 2nd Cutting: Irrigation Benefit = $8/ac

Age: 4.9 weeks  Rainfall: 8.3 in  Irrigation: 2.35 in

Irrigated
- 3.39 ton/ac
- Revenue: $327/ac
- Irr. Cost: $19/ac
- Returns: $318/ac

Non-Irrigated
- 3.25 ton/ac
- Revenue: $310/ac
- Returns: $310/ac

Tift-85 3rd Cutting: Irrigation Benefit = $4/ac

Age: 6.86 weeks  Rainfall: 4.28 in  Irrigation: 5 in

Irrigated
- 3.16 ton/ac
- Revenue: $421/ac
- Irr. Cost: $40/ac
- Returns: $381/ac

Non-Irrigated
- 2.83 ton/ac
- Revenue: $377/ac
- Returns: $377/ac

LESSONS LEARNED: NITROGEN TESTS
Nitrogen Strip Test Design

Yield Data from Nitrogen Test

Yield & Returns as Function of N Rate – Irrigated Only

PUTTING THE YIELD DATA TO WORK: DIRECTED PRESCRIPTION

The Clemson “Directed Prescription” System

The Clemson “Directed Prescription” System
How "Directed Prescription" Works: Idealized Concept

Returns as Function of Sand Content by N-Rate

Max Return by Sand Content Zone

N-Rate for Max Profit by Sand Content

VRA Nitrogen Directed Rx

YIELD MANAGEMENT ZONES: VARIABLE RATE NITROGEN Rx
Yield Management Zone Development

POTENTIAL FOR BENEFIT FROM VRA IN HAY

Benefit Potential from VRA-N in Hay

Questions? kirk2@Clemson.edu