



# Harvesting for Seed & Straw

## (a Work in Progress)

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# The Opportunity: An Integrated Industry



## USES

Fuels:  
Ethanol  
Renewable Diesel

Electricity

Heat

Chemicals  
Plastics  
Solvents  
Pharmaceuticals  
Chemical Intermediates  
Phenolics  
Adhesives  
Furfural  
Fatty acids  
Acetic Acid  
Carbon black  
Paints  
Dyes, Pigments, and Ink  
Detergents

Food and Feed

**Biomass  
Feedstocks**

Trees  
Grasses  
Agricultural Crops  
Agricultural Residues  
Animal Wastes  
Municipal Solid Waste

**Bioconversion  
Biorefinings**

Enzymatic Fermentation  
Gas/liquid Fermentation  
Acid Hydrolysis/Fermentation  
Gasification  
Combustion  
Co-firing

# The Challenge

1. **Change a harvest system optimized to harvest grain, and convert it to harvest three streams:**
  - **Grain**
  - **Straw**
  - **Chaff**



# McLeod Harvest™ System

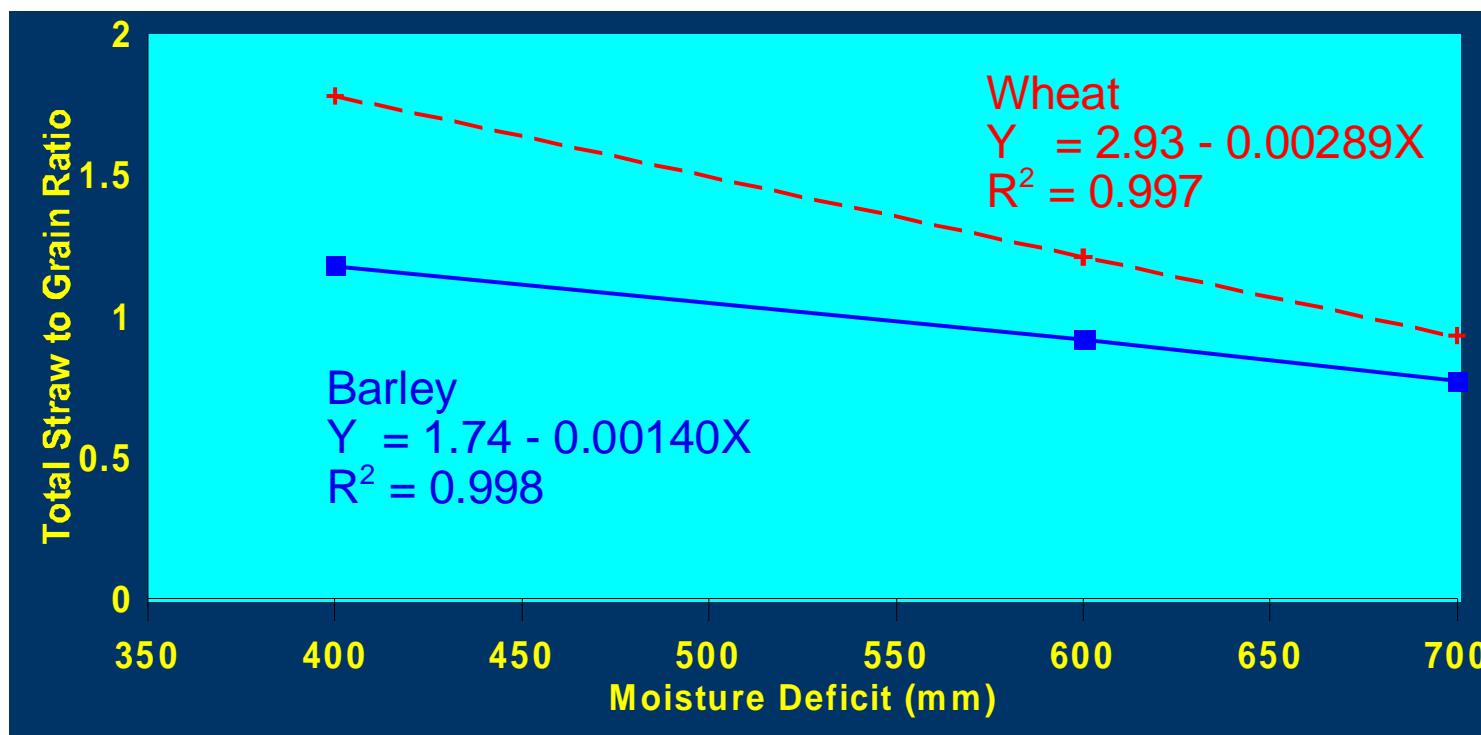
1. **Gathers grain and chaff together (Graff).**
2. **In-yard separation (central location).**
3. **Densification of material.**
4. **Suited for feed or bioconversion.**



# Harvest System Challenges

## 1. Weather:

- Poor stands: straw recovered can be near zero.
- Poor harvest weather.
- Risk factor for biomass businesses.



# Harvest System Challenges

## 2. Producer Choices:

### a. Cutting height

- **Decreasing from 20 to 10 cm could increase straw harvest by ~50% with a negative impact on fuel, time, & cost.**
- **Stubble height choice can be positive or negative for snow trapping.**

### b. **Semi-dwarf cereals may reduce biomass availability.**

# Harvest System Challenges

## c. Rotary vs. Conventional Combines:

- Rotary combine: grinding action leaves less baleable straw.
- Rotary combine: grinding action may either enhance or worsen further processing.

30' Header - Rotary



20' Header - Conventional



# Harvest Systems R&D

## 1. Use of Stripper Technology Within Existing Agronomic Systems

- Cereal Systems
- Flax Systems
- Pulse Crops
- Oilseeds

## 2. Information Collected:

- Biomass Quantity and Quality;
- Fuel Savings;
- Opportunity Cost / Benefit;
- GHG Savings;
- Capital Cost Reductions;

# Equipment: Based on Massey 550



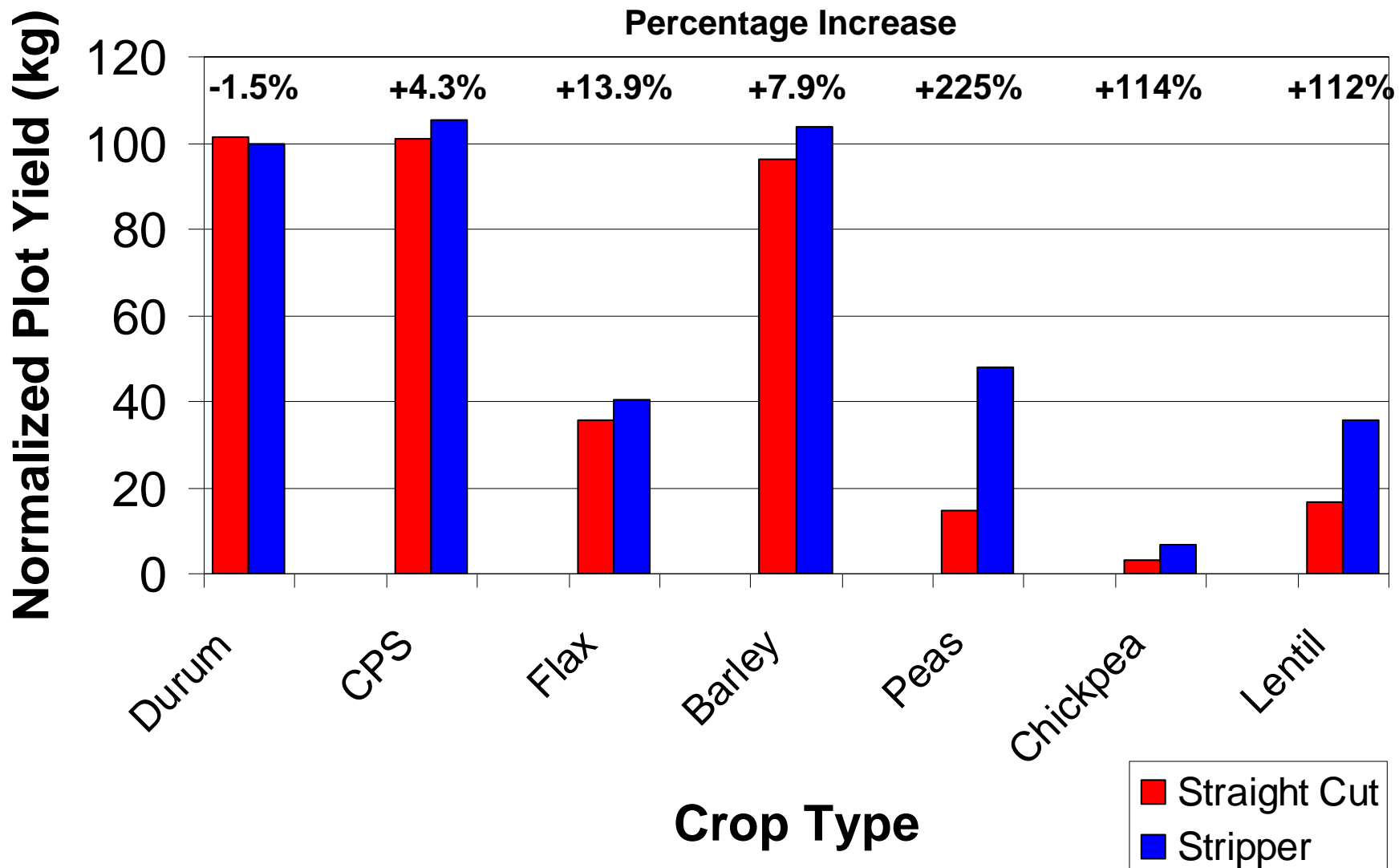
Harvest



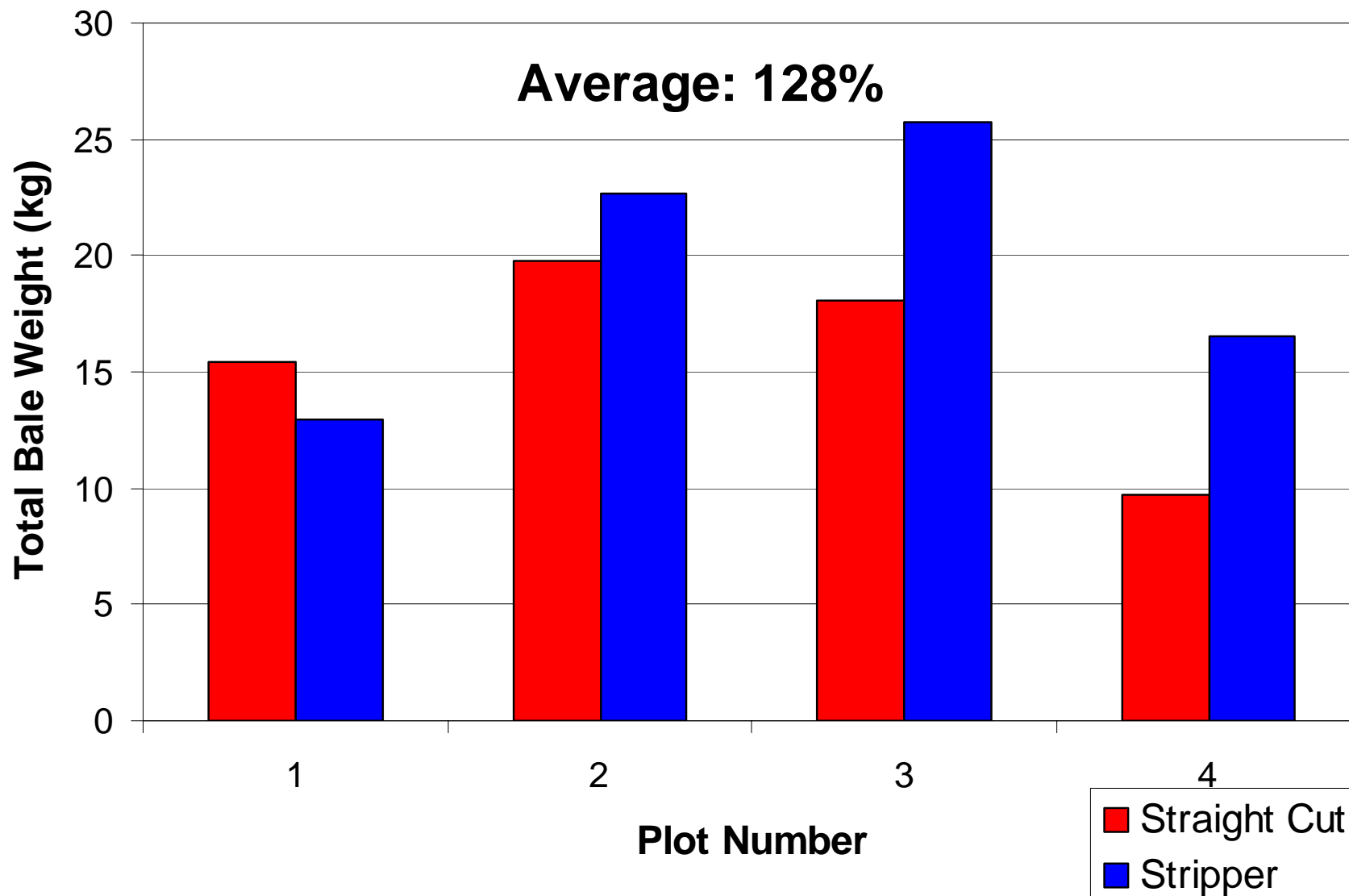
Weighing



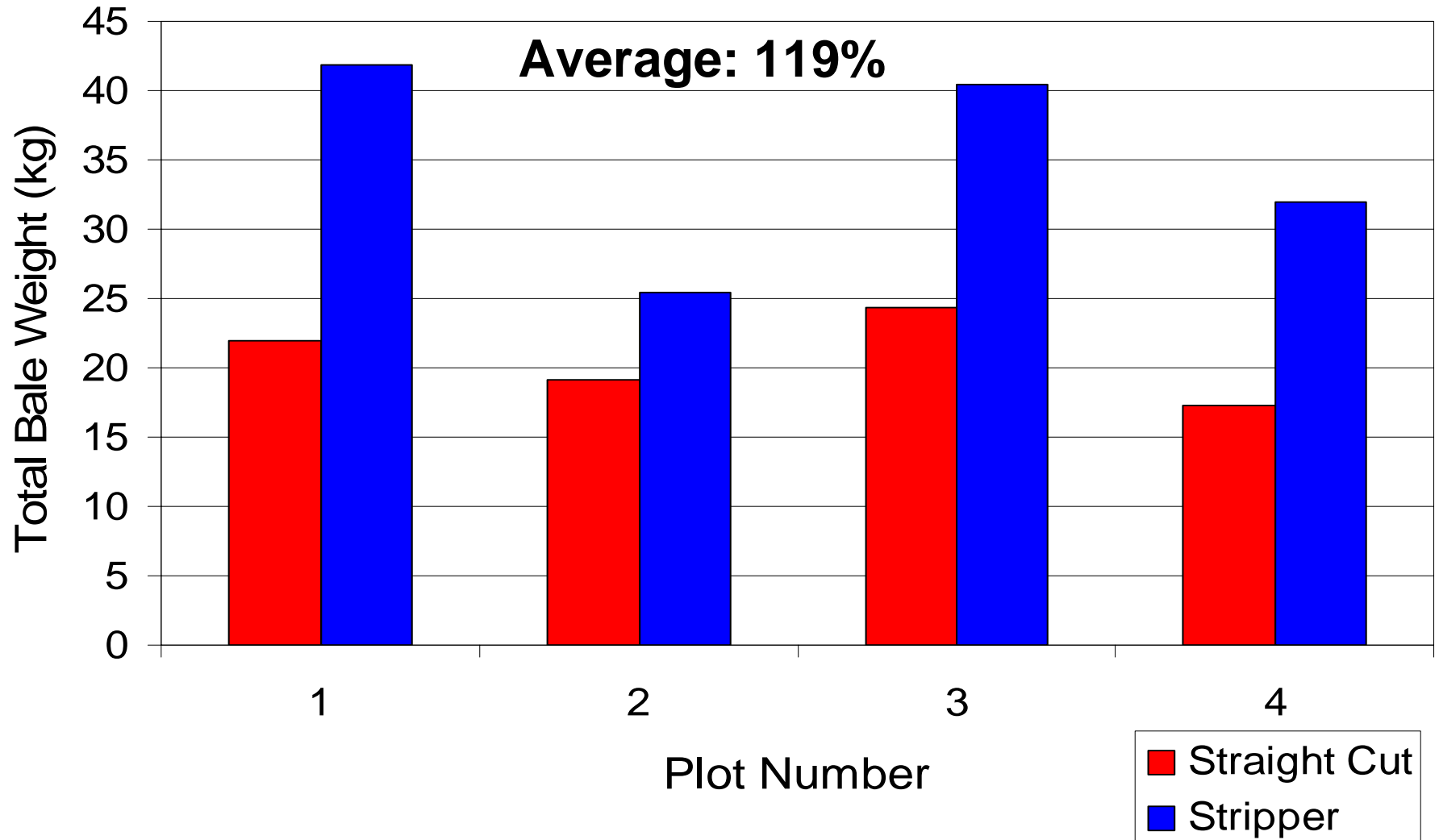
# Small Plot Grain Yields (2005)



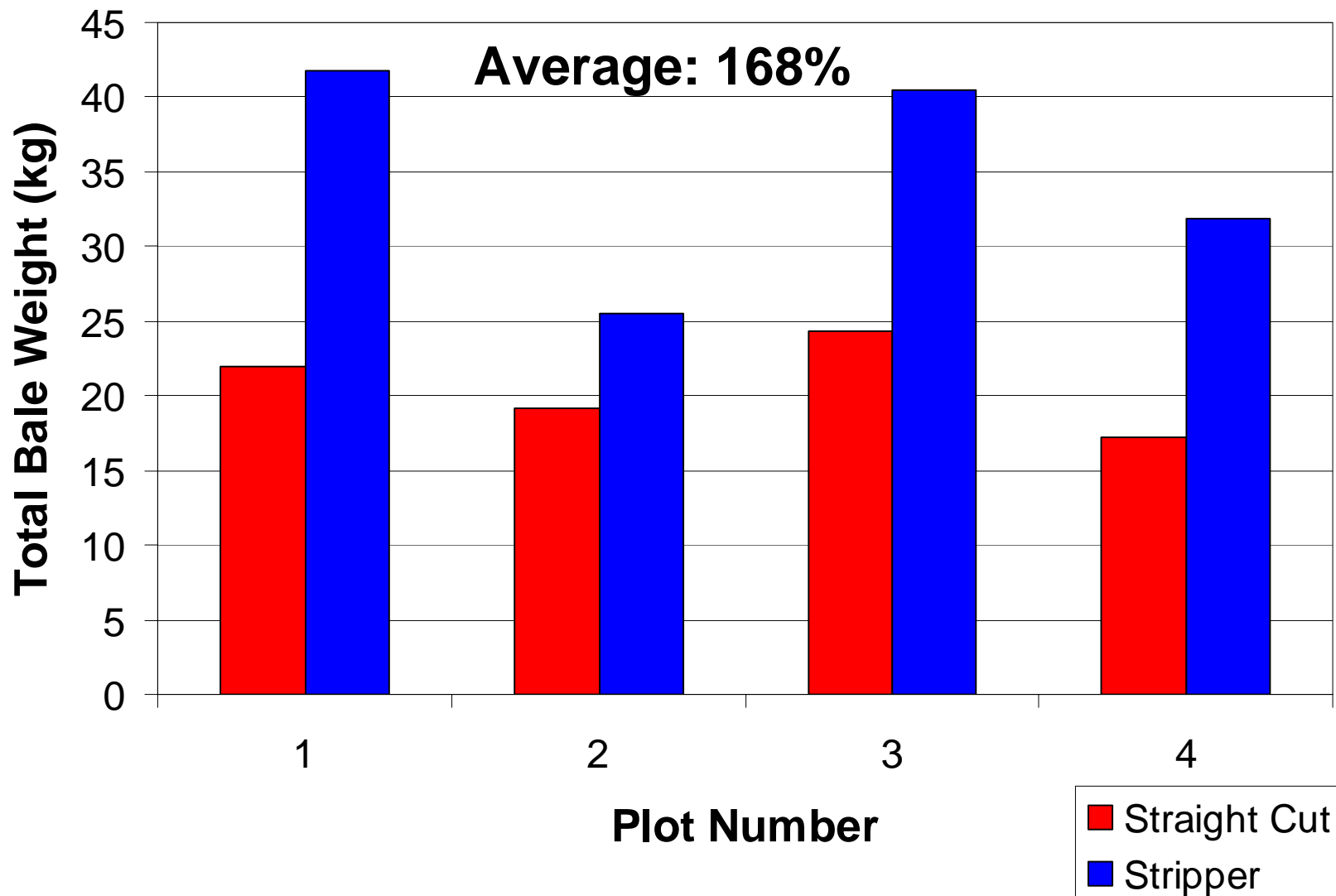
# Comparison of Flax Bale Yield



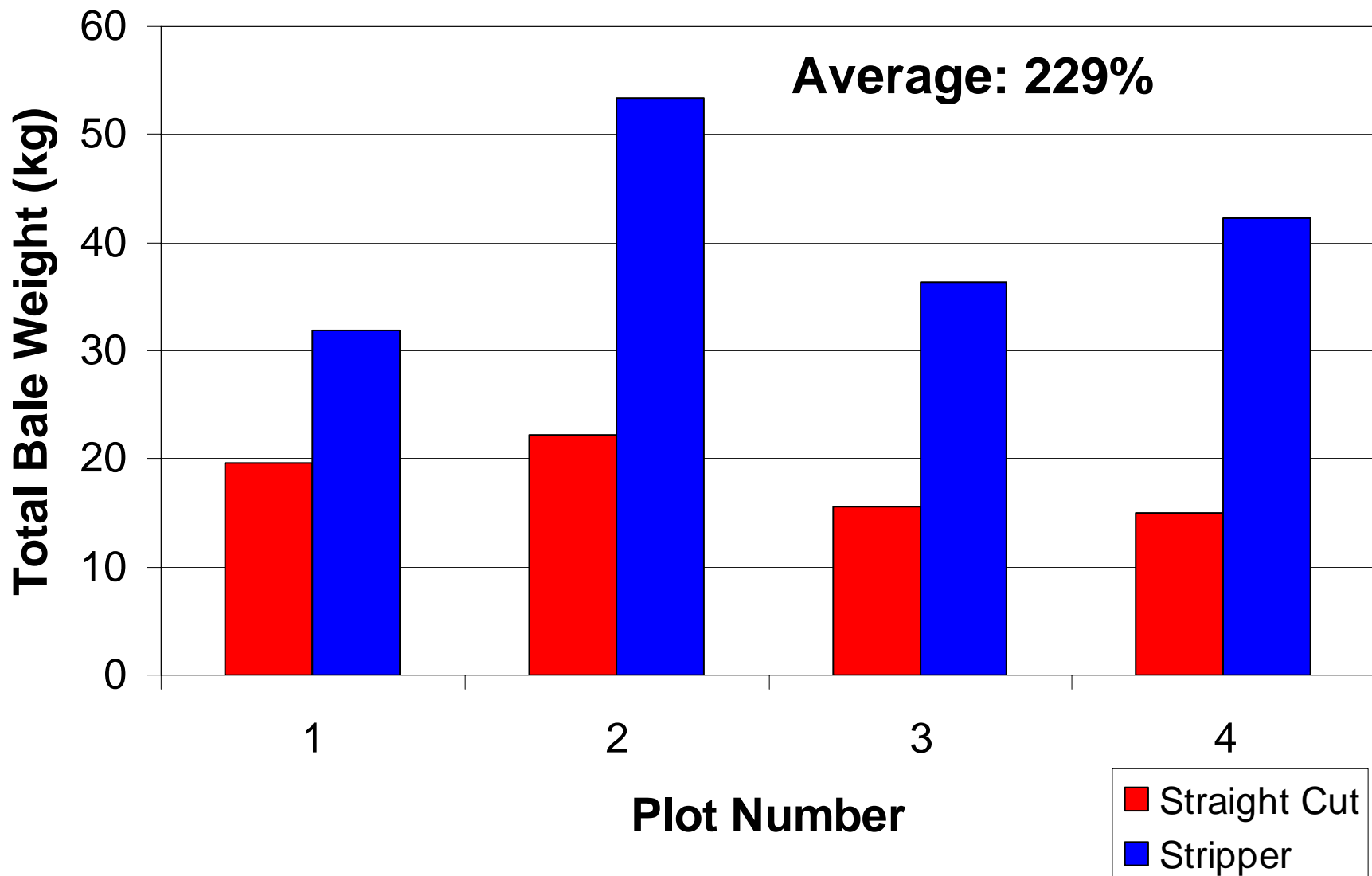
# Comparison of Durum Bale Yield



# Comparison of CPS Bale Yield

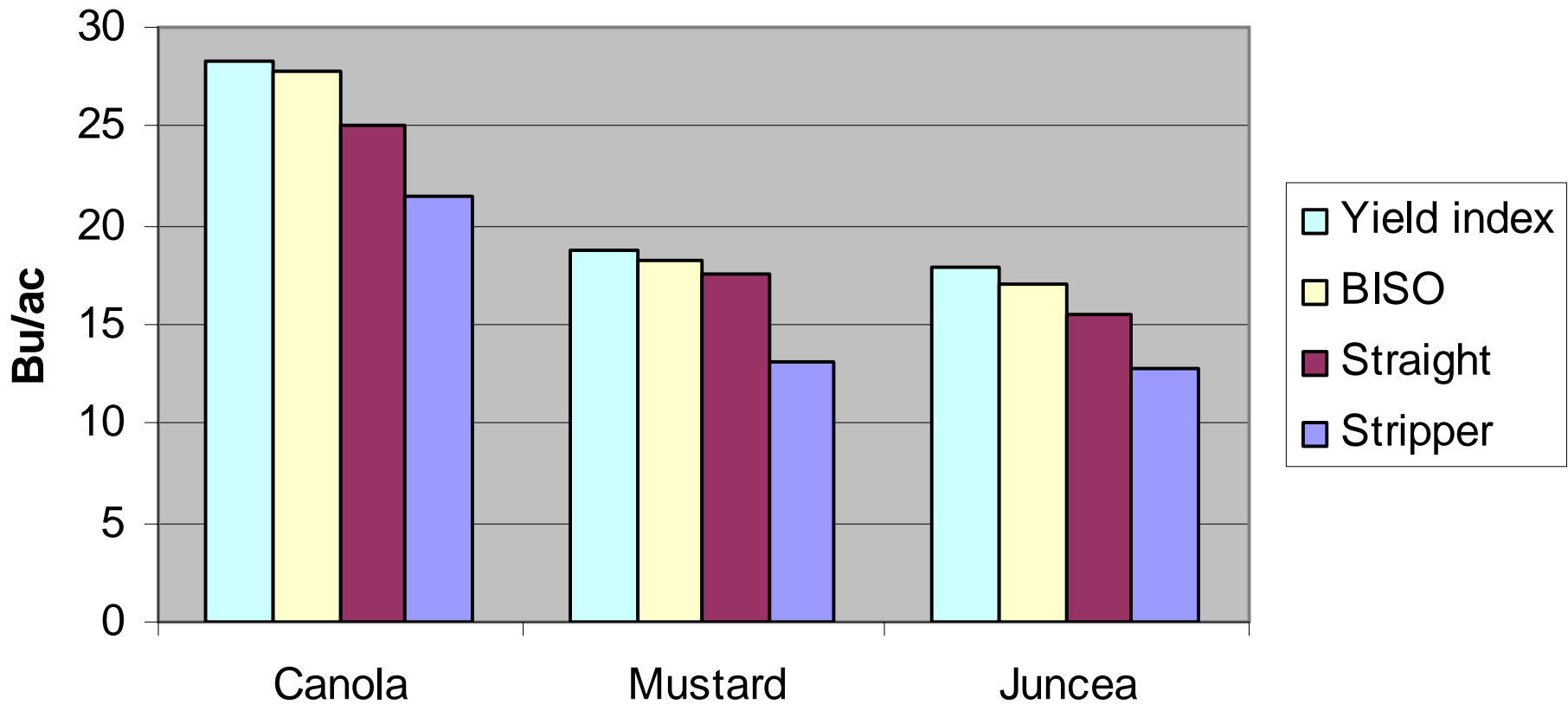


# Comparison of Barley Bale Yield



# Canola Losses

## Brassica Yields (Bu/ac)



# Flax Harvest @ Lyle Simonson Farm

## 80 Acres Split into 3 Large Plots

- Case IH = 25.7 bu ac<sup>-1</sup>
- Massey 550 & 20' header = 24.6 bu ac<sup>-1</sup>
- Massey 550 & Stripper header = 25.7 bu ac<sup>-1</sup>



# Industry Involvement

## Schweitzer-Mauduit & Simonson Farms

- Pulp fibre for fine paper.
- Harvest impact on final fibre yield.



# Stripper Header in Flax: Wright Farm



Final Straw  
Height:

24 – 26”



Gleaner  
- Hired  
Operator

Stripper



# Performance in Sawfly Wheat & Lentils



**Sawfly  
Damaged  
Wheat**



**Flax**



**Lentils    Wheat**



# Snow Trapping



# Seed Quality

## 1. Malting Barley:

- Stripper leaves many awns & cleaner sample.

## 2. Lentils:

- Leaves 10 – 12” stubble.
- No dirt & few cracks or peels.

## 3. Flax:

- Works with tough straw.
- Less overall loss

## 4. All crops: picks up down material (lodged, tracks, sawfly, etc.)



# Prairie Harvest Systems R&D

## 1. Cooperation with the Climate Change, Biomass Energy, and other agencies.

- NSERC
- Producers
- APF Flax Initiative
- Saskatchewan ADF
- USDA & USDOE

## 2. Cooperation with Industrial Partners

- Dow
- Schweitzer-Mauduit
- Iogen
- Case New Holland

# Biolin Research & Thompson Farms

- Fibre for composites, textiles & other material uses.
- Harvest impact on fibre quality.



Cutting  
Treatments



# Improving Retting

## Packing Treatments



# Future Plans

## 1. Large scale demonstrations: Straight cut vs. Stripper technology

- Straw yield;
- Straw quality;
- Energy, time, and machine depreciation impacts.
- Impact on following crop if not harvested.

## 2. Continued evaluation of biomass for thermal, physical, and biological processes.

- Industrial cooperators;
- NGO's
- Federal partners.

# Future Plans

## 3. Development of optimized harvester.

Takes advantage of:

- Energy savings of the stripper header;
- Existing equipment (forage tractor);

Producer benefits;

- Lower harvest cost
- Reduced time
- Improved seed quality
- Biomass options

# Harvest System Challenges

**Changes to the Harvest System must improve producer economic potential:**

- **Maintain or Improve grain quality;**
- **Work in a multitude of crop types;**
- **Improve the quantity and quality of MOG.**
- **Reduce time of harvest;**
- **Reduce the fuel requirement for harvest;**
- **Reduce header inventory (existing combine system);**
- **Reduce the cost of the combine;**

# Acknowledgements

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1. **Natural Resources Canada**
2. **Wheatland Conservation**
3. **Farm Cooperators**
4. **PAMI**
5. **Above Board**
6. **Schweitzer-Mauduit**
7. **Biolin Research**
8. **logen Corp.**



***Thank You for Your  
Attention !***

***Questions ?***