Interpretation of Mill Reports

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OUTLINE

- COMPARE LOUISIANA CANE SAMPLING & PAYMENT METHOD – PAST & PRESENT
- NEEDS OF CANE SAMPLING SYSTEM
- USDA METHOD (UP TO 1974)
- ORIGINAL CORER (1975 - 1997)
- REVISED CORER (1998 – PRESENT)

OUTLINE (CONT'D.)

– LAB METHOD

– CORER PREDICTIONS

– AFFECT OF VARIABLES ON TRS

– PAYMENT METHODS

USDA METHOD (UP TO 1974)

- Based on normal juice analysis, trash and conversion to standard tons for cane payment (106 lbs sugar/standard ton to growers and remainder to mill)

- Implemented using a sample roller mill and required:
  - Sample mill sucrose factors
  - Sample mill Brix factors
  - Dilution compensation factors
  - Trash content determination
  - Factors for conversion of above to standard tons

PROBLEMS WITH USDA METHOD

1. Did not take into account fiber (i.e., juice quantity)
2. Subjective (arbitrary) sample selection
3. Overpaid for cane in wet years, underpaid for cane in dry years
4. Many grower/processor complaints

REQUIREMENTS OF A CANE SAMPLING SYSTEM

1. Obtain representative, unbiased sample
2. Prepare sample for processing
3. Process sample
4. Analyze processed sample
5. Express cane quality in terms suitable for cane payment

CANE VARIABILITY

1. Cane is a non-homogeneous material

2. Variations between cores of same load have coefficient of variation of 7% (i.e., for a load of 200 TRS cane, 95% of individual samples will be in range of 173-227)

3. However, assuming 600 samples over a crop, variation drops to 199-201

4. Core lab coefficient of variation is 1.4%

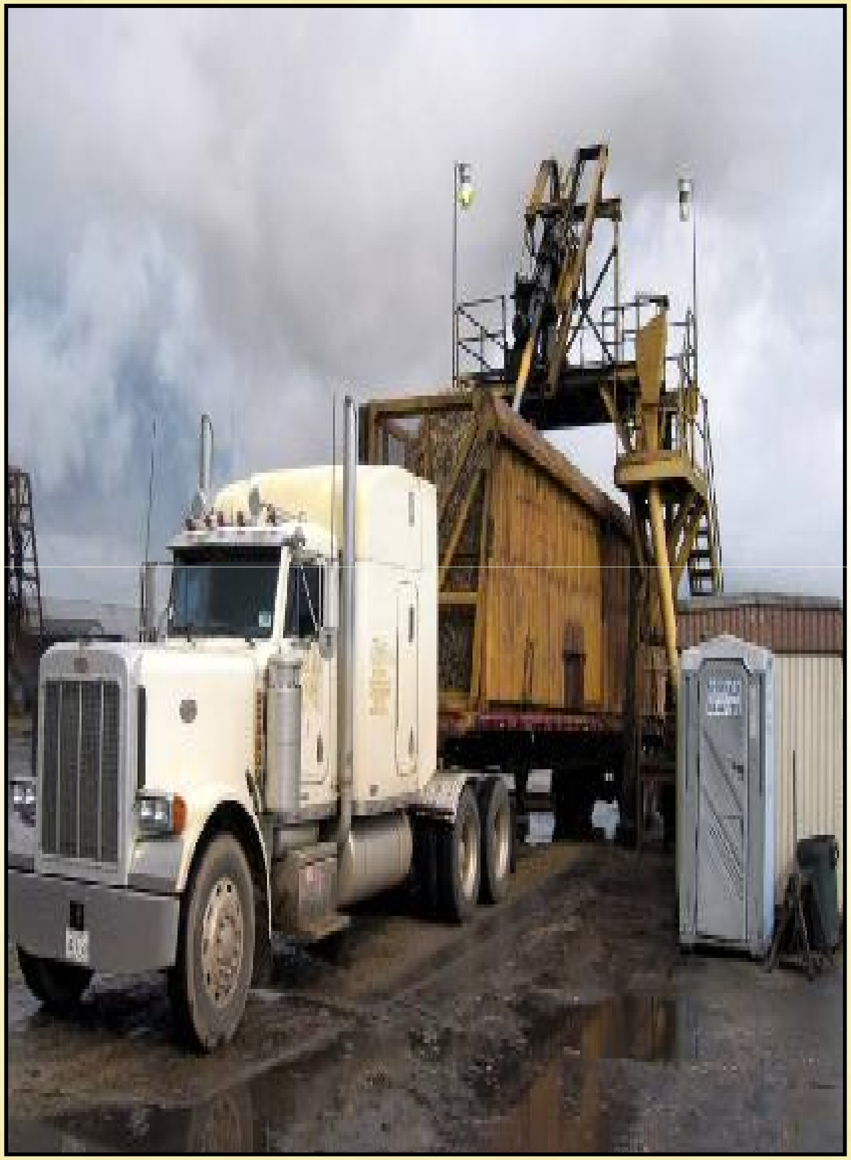
IDEAL CANE PAYMENT SYSTEM

1. Eliminate judgment in sample selection and processing
2. Standardize sample procurement and processing equipment
3. Minimize personnel requirements
4. Divorce sampling system from mill operation
5. Reflect effect of juice <u>quantity</u> and quality
6. Accurately predict recoverable sugar
7. Provide cane analysis for comparison with mill results

ORIGINAL CORER METHOD

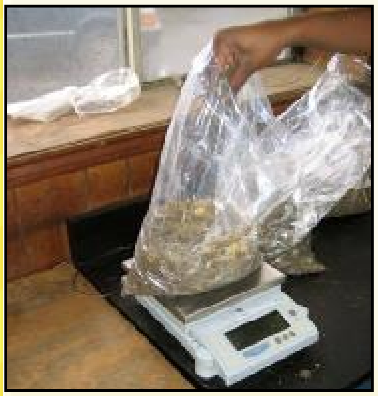
- Core cane
- Shred cane
- Press cane
- Analyze juice & cane
- Predict cane analysis
- Predict sugar yield
- 60% of sugar to growers

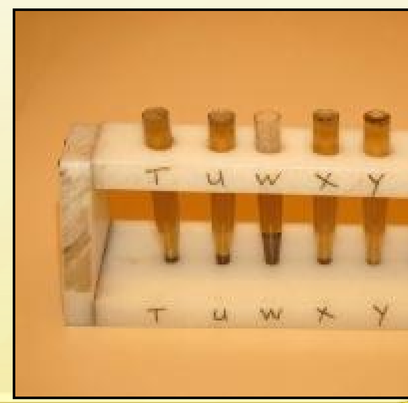
CORERS



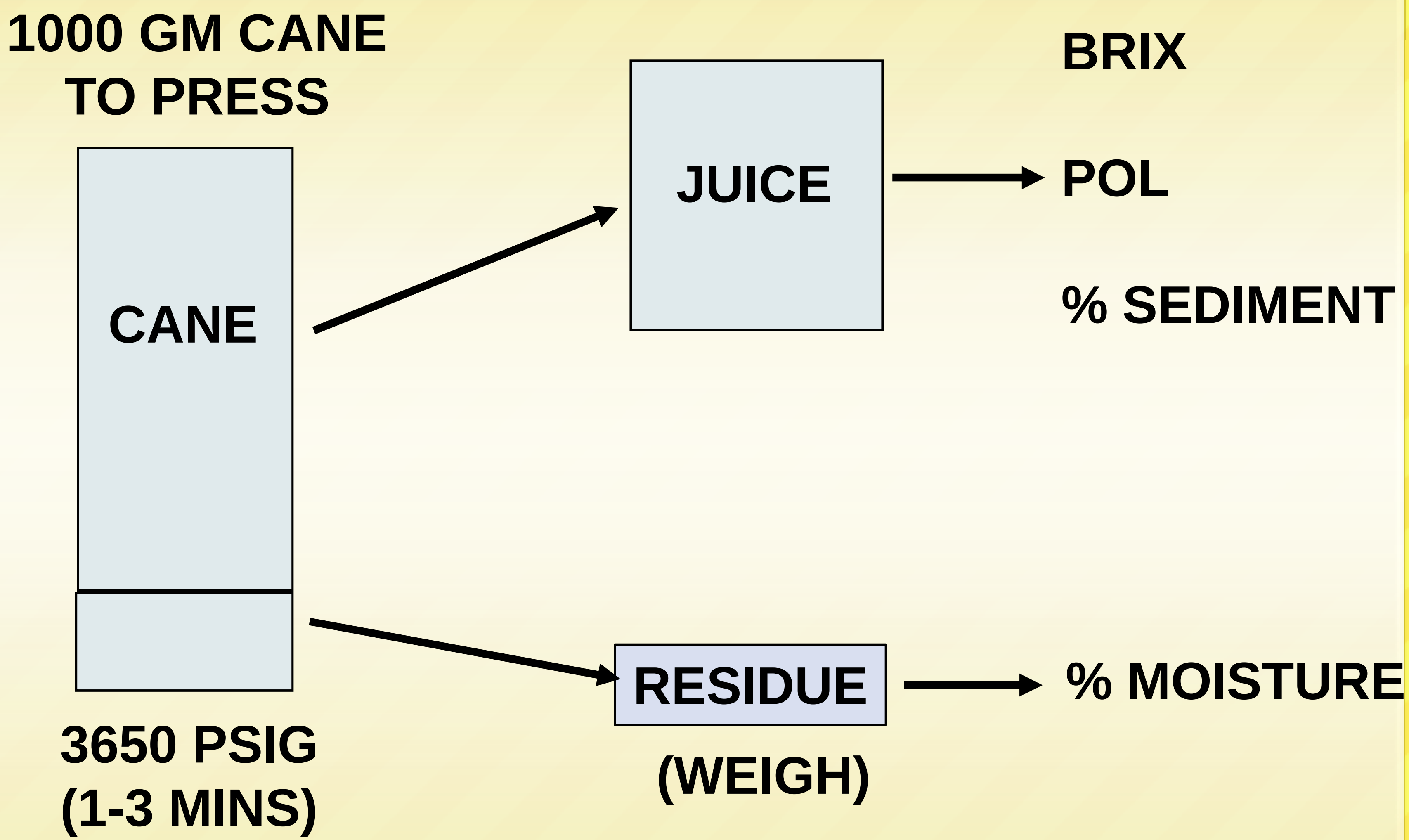
HYDRAULIC PRESS

CORE LAB EQUIPMENT & PROCEDURES





CANE COMPONENTS



CALCULATIONS

Assuming juice extracted has same composition as residual juice in residue,

Brix % cane
Pol % cane
Fiber % cane

are calculated

THEORETICAL RECOVERABLE SUGAR (TRS) PREDICTION

CANE ANALYSIS à TRS

Reduced Extraction = 91.9 **Assumed**
Boiling House Efficiency = 96 **Assumed**

TRS = (0.28 Pol – 0.08 Brix) X (100 - $\frac{56.67\ \text{Fiber}}{100\text{-Fiber}}$)

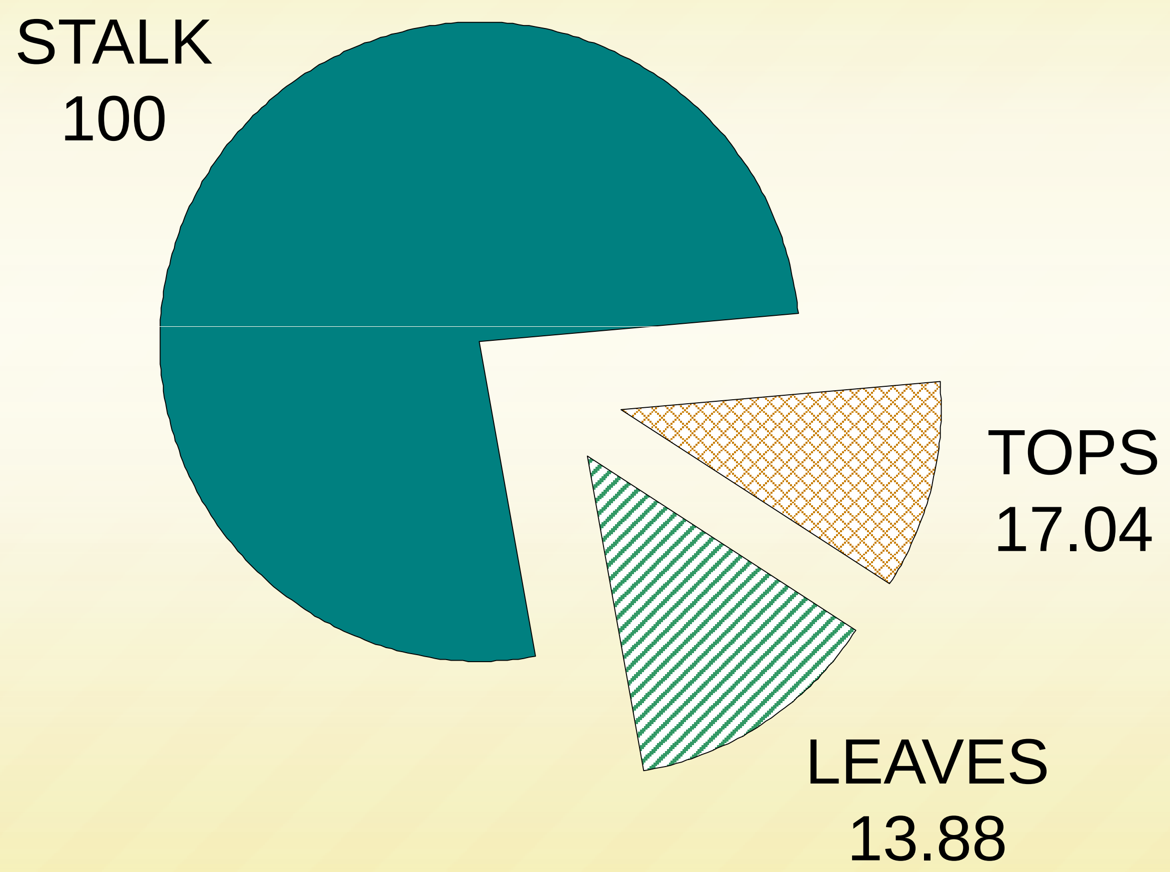
Liquidation Factor = $\frac{\text{Factory Lbs 96/TC}}{\text{Corer Lbs 96/TC}}$ X 100

Payment for cane = Corer TRS X Liq. Fac. X Grower Share

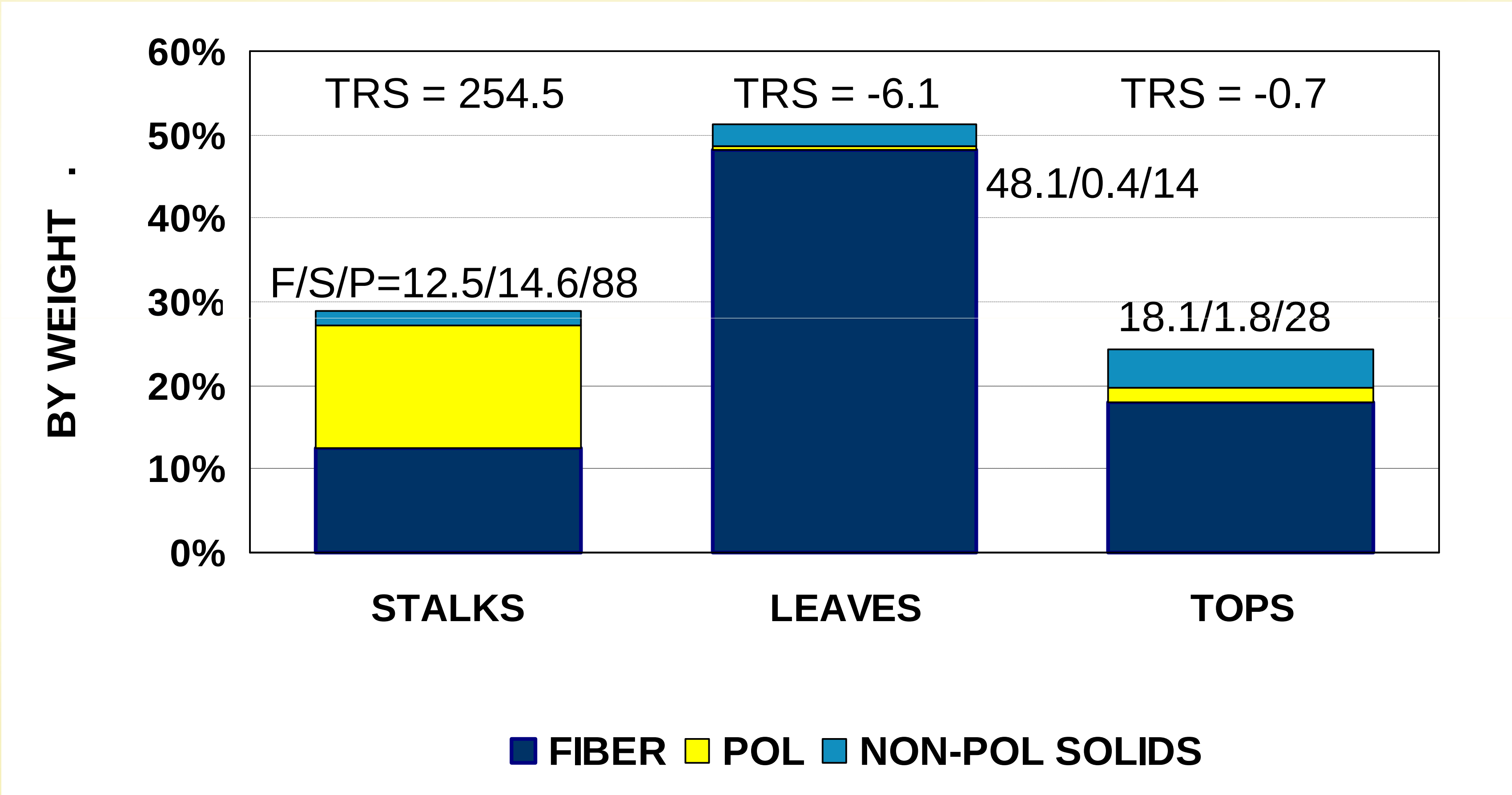
COMBINE HARVESTING

- Driven by high yielding varieties that lodge
- Green cane harvesting
- Increase in green leaves
- Increase in tops
- Increase in field soil
- Affect of above on TRS with increased green trash

TYPICAL COMPOSITION OF CANE



STALK, LEAVES AND TOPS
TYPICAL ANALYSIS & TRS



CHANGES TO CORE FORMULA - 1998

- Fiber changed to fibraque (Fiber x 1.3)
- Z factor to correct extracted juice purity to absolute juice
- Brix and pol predictions are very good

NEW FORMULA FOR TRS PREDICTION - 1998

Using the Brix and fibraque corrections, the following calculations should be used:

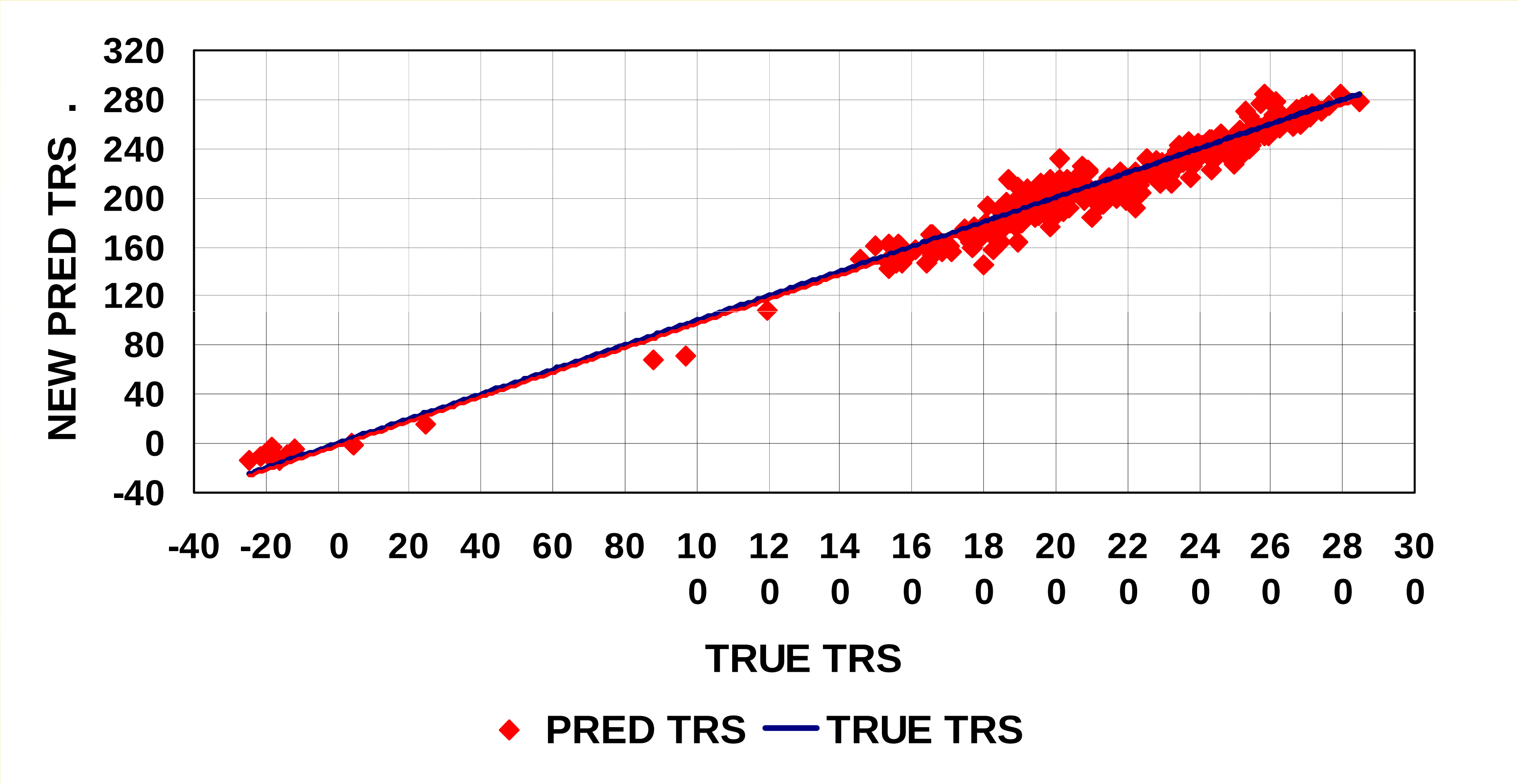
New Fiber = NF = F x 1.3
New Pol = NP = P x (100-NF)/(100-F)
New Brix = NB = B x (100-NF)/(100-F) x Z

where Z = $1.15 - 0.0018\left(\frac{1000 - \text{Corrected Residue Weight}}{10}\right)$

TRS = $(0.28NP - 0.08NB) \times \left(\frac{100 - 56.67NF}{100-NF}\right)$

where TRS = Theoretical Recoverable Sugar, lbs 96 sugar/ton cane
NP = Pol % Cane
NB = Brix % Cane
NF = Fiber % Cane

TRUE TRS VS NEW PREDICTED TRS
(% CANE)



GROWER SHEET

INPUT DATA

RESIDUE WT.	JUICE BRIX	JUICE POL	SEDT.	MOIST
427.6 g	18.2%	16.29%	7.5%	53.55%

CALCULATED RESULTS

CANE BRIX	CANE POL	FIBQ.	TRS	CRS @ 100 L.F.
15.23%	12.96%	20.45%	205.9 lb	205.9 lb

GROWER SHEET

VARYING INPUT DATA

	RESIDUE WT.	JUICE BRIX	JUICE POL	% SEDT.	% MOIST
VARY	+10 g	+1Unit	+1Unit	+1Unit	+1Unit
Δ TRS	-2.2 lb	-4.7 lb	+19.0 lb	-0.9 lb	+3.3 lb

GROWER SHEET

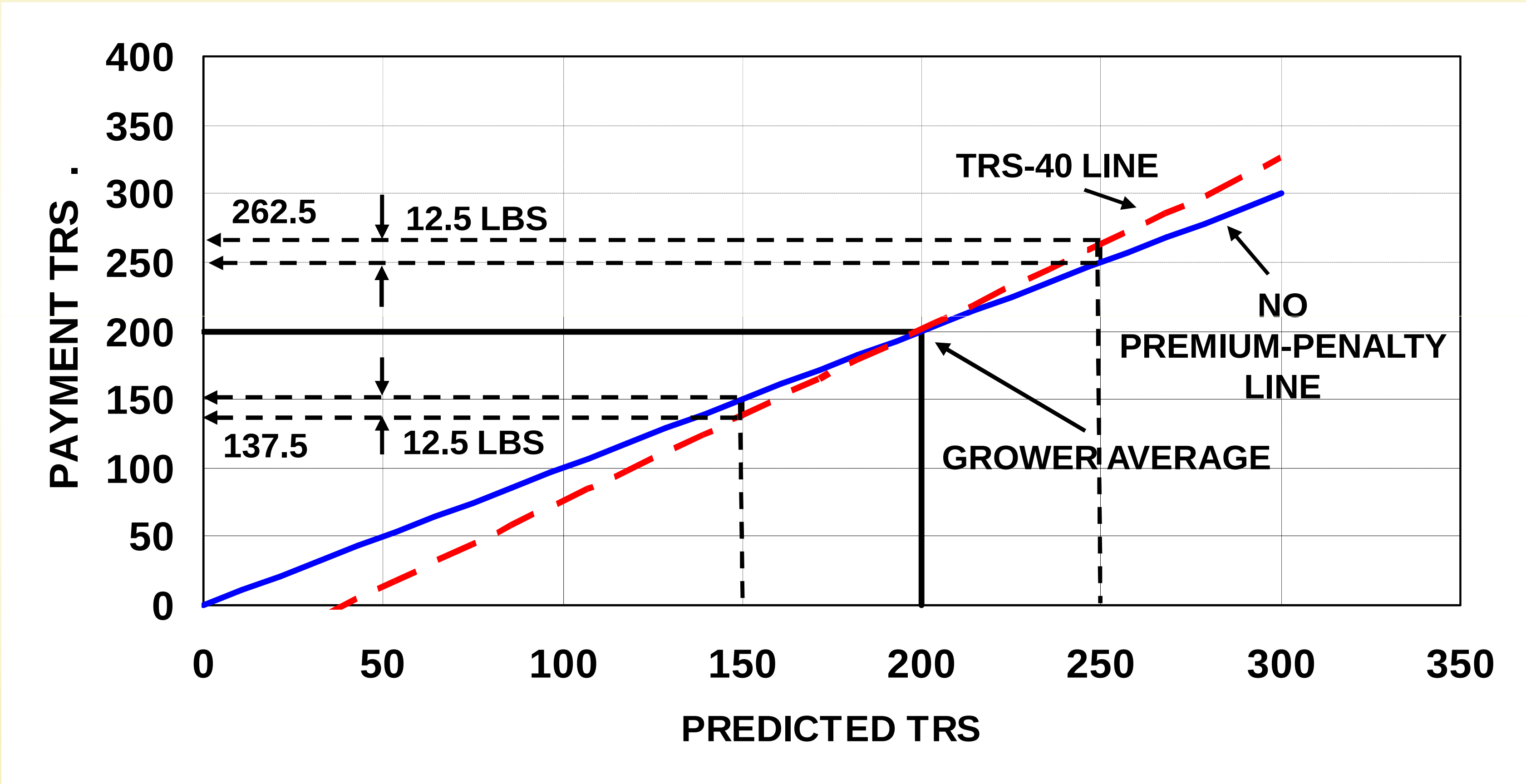
CALCULATED RESULTS

	CANE BRIX	CANE POL	FIBQ.
VARY	+1 Unit	+1Unit	+1Unit
Δ TRS	-6.8 lb	+23.9 lb	-4.7 lb

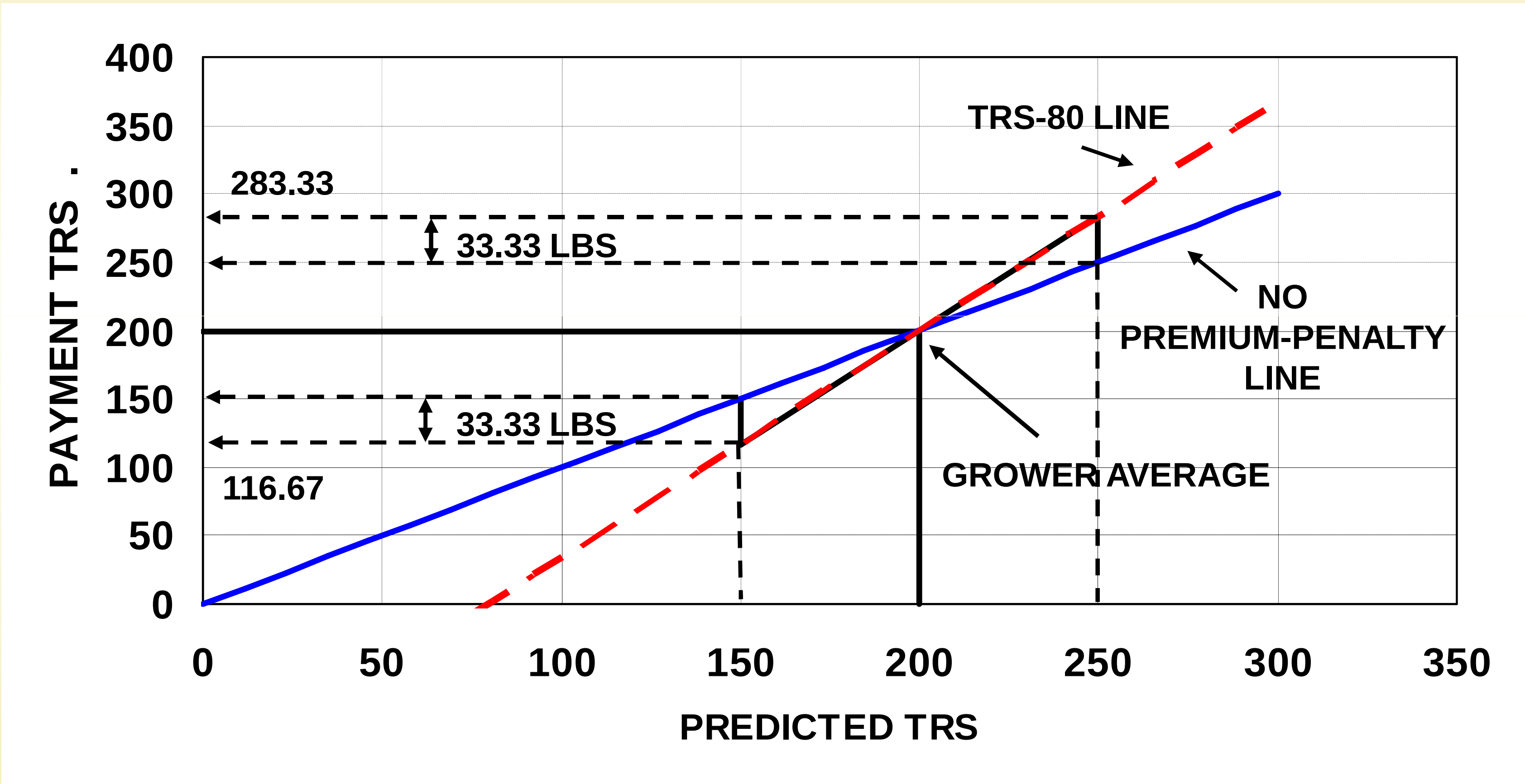
INCENTIVE SYSTEMS

1. Cost of processing 1 ton cane constant (approximately $3.25 - $3.50/ton)
2. High sugar content cane profitable (> 180 lb)
3. Low sugar content cane unprofitable (< 180 lb)
4. Need to raise cane quality such that sugar content exceeds 180 lb

COMPARISON OF TRS VS TRS-40 FORMULAS



COMPARISON OF TRS VS TRS-80 FORMULAS



HAND-HELD REFRACTOMETER FOR BRIXING

Estimating TRS/CRS Using Hand-Held Refractometer

- There is a quick and simple way to estimate the yield of recoverable sugar per ton of cane based on a brix reading using a hand-held refractometer.
- A simple procedure to estimate the yield of theoretical recoverable sugar per ton of cane (TRS/TC) using brix of juice obtained with a hand-held refractometer in the field is as follows:
- 1) Convert juice brix reading to juice sucrose using the following purity factors depending upon the date of harvest:

	0.65 in September	=	
Ave. Brix Reading*	X 0.75 in October/November	=	Sucrose
	0.85 in December	=	

- 2) Convert juice sucrose to normal juice sucrose using a constant factor of 0.85:
- Normal Juice Sucrose = Juice Sucrose X 0.85
- 3) Convert normal juice sucrose to pounds theoretical recoverable sugar per ton of cane (TRS/TC) using a constant factor of 17.2 (for every 1 unit of sucrose in normal juice a mill should be able to recover approximately 17.2 lb):
- TRS/TC (Clean or Net Cane) = Normal Juice Sucrose X 17.2
- 4) To simplify the procedure, the three factors (constants) used above can be consolidated into one value that is simply multiplied times the brix reading to obtain TRS/TC for clean or net cane. The consolidated factors are derived as follows:
- For September: Brix Reading from refractometer X Constant of 9.503 = TRS/TC (Clean or Net Cane Basis)
- For October/November : Brix Reading from refractometer X Constant of 10.965 = TRS/TC (Clean or Net Cane Basis)
- For December: Brix Reading from refractometer X Constant of 12.427 = TRS/TC (Clean or Net Cane Basis
- 5) However, one must remember that trash will reduce the TRS/TC. To convert TRS/TC (Clean or Net Cane Basis) to TRS/TC (Gross Cane or the Equivalent Value Obtained by the Core Sampling System, one must make the following adjustment:
- TRS/TC (Gross Cane) = TRS/TC (Clean or Net Cane Basis) - Ave. Trash Content (%) X 3.0 lb sugar loss/1% Trash
- 6) This value for TRS/TC (Gross Cane) can then be converted to yield of commercially recoverable sugar per ton of cane (CRS/TC) by applying the liquidation factor of your mill:
- CRS/TC (Gross) = TRS/TC (Gross Cane) X Mill's Liquidation Factor (1.00)

Estimating TRS/CRS Using Hand-Held Refractometer

- For greater accuracy in estimating TRS/TC, it would be advisable to Brix top, mid-point and bottom of stalk and use the average of the three values in the equations above. However, to obtain a rough estimate of the potential TRS/TC, one can brix only the mid-point of the stalk. (The most accurate method would be to brix every other internode on the same stalk and calculate the average of these reading. In the past, these estimated yields have been very close to actual TRS/TC when using this modified procedure. Also make sure the trash value you use is a realistic value. Even the cleanest harvested cane can have has 8-10% trash (extraneous material).
- Examples of using the consolidated factors are as follows:
- For September, Brix of 16.00 X 9.503 = 152.0 lb = TRS – 30 lb (10% Trash X 3.0 lb) = 122.0 lb = CRS/TC;
- For October, Brix of 18.00 X 10.965 = 197.4 lb = TRS – 30 lb (10% Trash X 3.0 lb) = 167.4 lb = CRS/TC;
- For December, Brix of 20.00 X 12.427 = 248.5 lb = TRS – 30 lb (10% Trash X 3.0 lb) = 218.5 lb = CRS/TC
- NOTE: As cane becomes more mature, one can revise purity factor upward from 0.65 to 0.75 and later to 0.85. By increasing this value will increase the value of normal juice sucrose thus having a direct bearing on sugar yield. Further, if the weather and field conditions are mostly dry and the farmer is doing a good job of removing trash, i.e., leaves and tops (either by burning, extractor fans or both) one can reduce the amount of trash in cane. This will also have a direct bearing on sugar yield. Of course, if the liquidation factor is anything other than 1.00, this will have a direct bearing on ultimate CRS/TC.
- For additional information on “Brixing to Improve Sugarcane Quality” see AgCenter Publication 2888 (08/02)(on line only) at www.lsuagcenter.com.

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SUMMARY

1. Cane is non-homogeneous, solid material (difficult to obtain representative sample).

2. Pre-1974, USDA payment system based on cane quality, but over predicts quality of poor quality cane and under predicts quality of high quality cane. Sampling frequency about every 65 tons.

3. Original corer system improved on cane quality prediction, but over predicted cane quality. Sampling frequency about every 25 tons.

SUMMARY (Continued)

4. Revised corer method (1998) accurately predicts pol, Brix and fiber % cane. Sampling frequency about every 25 tons.

5. Increased use of incentive systems likely to improve cane quality and profitability of sugar industry.

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THANK YOU FOR YOUR ATTENTION!
QUESTIONS?