



## Chopper Challenge

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## Special Thanks

Brian Nunes – John Deere  
Krone CA - Krone  
Garton Tractor, Inc. – New Holland  
HB Harvesting - Claas  
Lamb Chops, Inc. – trucks, fuel  
USCHI – sample analysis  
Lawrence Tractor – John Deere  
Pioneer Equipment Co. – Krone



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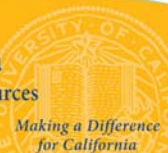


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## Chopper Comparison - 2012

Make	Claas	John Deere	Krone	New Holland	New Holland
Model	Jaguar 980	7950 Prodrive	Big X 1100	FR 9090	FR 9060
Rated Horsepower	860	800	1031	824	544
Header	Orbis 750	770	EzyCollect 753	480 FI	450 FI
Engine Hours	349	1401	16	40	78
Cutter Hours	309	902	4	20	46
# of Knives	24	40	20	24	24
Processor	new 9.8" standard	9.5' w/ Horning Spiral cut rolls	10" chrome 123 teeth	heavy duty 99/126 tooth	heavy duty 99/126 tooth
KP Differential	30%	32%	30%	22%	22%

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## Chopper Comparison - 2011

Make	John Deere	Claas	Krone	New Holland
Model	7950 Prodrive	Jaguar 980	Big X 800	FR 9090
Horsepower ECE R120	800	860	826	824
Header	770	Orbis 635	EzyCollect 753	480 FI
Engine Hours	210	2181	16	19
Cutter Hours	142	411	4	5
# of Knives	40	24	20	24
Processor	9.45" standard	9.8" standard	10" chrome roll	10" standard
KP Differential	32%	30%	30%	22%

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## Chopper Comparison - 2010

Make	John Deere	Claas	Krone	New Holland
Model	7950 Prodrive	Jaguar 980	Big X 800	FR 9090
Year	2010	2009	2008	2010
Horsepower ECE R120	800	860	826	824
Engine	Cummins 19.0 L	MB (2) OM460LA	MB OM460LA OM926LA	FPT 20 L V8
Header	770	Orbis 750	EzyCollect 7500	480 FI
Engine Hours	20	1469	890	4
Cutter Hours	3.4	1400	662	2.5
# of Knives	40	24	28	24
Processor	9.45" standard	Scherer 10"	10" chrome roll	10" standard
KP Differential	21%	30%	20%	22%
Blower gap	1.5 mm	5.3 mm	3.3 mm	2 mm

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## Materials and Methods - 2012




- ¼ mile field length
- 38" rows
- 2 rounds per plot
- ≈ 3 acres per plot
- 50' cut of each end
- 4 or 5 trucks per plot
- 25' headers, 20' NH9060

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## *Materials and Methods - 2011*




- ¼ mile field length
- 30" rows
- 3 rounds per plot
- ≈ 4 acres per plot
- 50' cut of each end
- 6 or 7 trucks per plot
- 25' headers, 20' Claas

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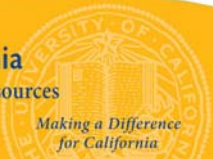
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## *Materials and Methods - 2010*



- 1/2 mile field length
- 30" rows
- 2 rounds per plot
- ≈ 6 acres per plot
- 50' cut of each end
- 9 or 10 trucks per plot
- 25' headers

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## ***Materials and Methods***



- Knives sharpened
- Cut length set at (TLC)
  - 16 mm 2012
  - 13 mm 2011
  - 17 mm 2010
- Processor set a 2 mm

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## ***Materials and Methods***



### **Fuel Measurement**

- Warmed up machine
- Parked in same spot
- Fill fuel tank
- Started run time
- Chop time
- Return to same spot
- Re-filled fuel tank

Fuel meter verified for  
½ to 2 gallon range

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## Materials and Methods



- Weighed full and empty
- Sample from each load
  - 10 spots
  - moisture analysis
- Composited for corn silage processing score
- Twice per plot
  - Particle Size Analysis
    - Penn State Particle Size Separator
    - Cut length

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## Materials and Methods



Corn Silage Processing Score

- Separated on 4.75mm and 1.18 mm screens
- Starch analyzed before and after shaking
- Dairyland Lab
- Mertens and Ferreira, 2001

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## Materials and Methods



- Uniform adjustments where possible
- Describe differences

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## Time Data – 2012

	Chopping Time	Driving Time	Chopping Time
	--- minutes ---		%
John Deere	24.3 a	12.8	69.6
Claas	18.8 b	11.6	63.8
Krone 1100	18.4 b	7.6	71.7
New Holland	23.1 a	7.4	75.7
NH 9060	24.2 a	6.3	79.2
LSD <sub>0.05</sub> <sup>‡</sup>	2.0	ns <sup>††</sup>	ns
C.V. % <sup>**</sup>	5.2	15.2	9.6



<sup>†</sup>Numbers followed by the same letter are not significantly different.

<sup>‡</sup>Least Significant Difference.

<sup>††</sup>Not Significantly Different.

<sup>\*\*</sup>Coefficient of Variation.

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## Time Data - 2011

	Chopping Time	Driving Time	Chopping Time
	--- Minutes ---		%
John Deere	20.6 b <sup>†</sup>	6.6	75.8
Claas	16.3 c	7.8	67.2
Krone	24.9 a	8.5	74.9
New Holland	19.8 b	6.4	75.6
LSD <sub>0.05</sub>	2.9	ns	ns
C.V. %	7.2	9.4	7.8

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## Time Data - 2010

	Chopping Time	Driving Time	Chopping Time	Field Length	¼ mile	½ mile
	sec.	Min.	%	% Chop Time	73%	79%
John Deere	33.8 b <sup>†</sup>	9.0	79.0			
Claas	30.6 c	9.4	78.5			
Krone	32.6 b	10.4	75.8			
New Holland	38.5 a	9.1	81.0			
LSD <sub>0.05</sub>	2.0	ns	ns			
C.V. %	2.9	8.8	7.8			

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## Throughput Data – 2012

	Fresh Weight	Moisture
	Tons	%
John Deere	107.2 a <sup>†</sup>	65.5
Claas	108.4 a	67.6
Krone 1100	109.8 a	66.3
New Holland 9090	104.9 a	64.9
New Holland 9060	84.0 b	64.7
LSD <sub>0.05</sub> <sup>‡</sup>	6.9	ns <sup>††</sup>
C.V. % <sup>†††</sup>	3.8	4.2



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## Throughput Data – 2011

	Forage Harvested	
	Fresh Weight	Moisture
	--- Tons ---	--- % ---
John Deere	73.4	58.9
Claas	75.0	58.1
Krone	75.4	57.6
New Holland	73.1	54.4
LSD <sub>0.05</sub>	ns	ns
C.V. %	8.1	3.0



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## Throughput Data – 2010

	Forage Harvested		
	Fresh Weight	Moisture	Yield
	Tons	%	Tons/ac @ 70 % moisture
John Deere	159.8 a <sup>†</sup>	64.8	25.3
Claas	152.3 ab	66.0	24.6
Krone	150.3 b	65.7	24.2
New Holland	158.5 a	65.7	25.5
LSD <sub>0.05</sub> <sup>‡</sup>	7.95	ns <sup>††</sup>	ns
C.V. % <sup>**</sup>	2.6	3.3	3.5

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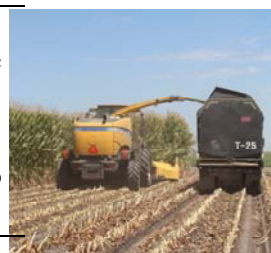
<sup>\*\*</sup>Coefficient of Variation.

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## Fuel Consumption – 2012

	Fuel			
	Cut Length	Total Used	Chop Time	Total Time
	mm	gal	----- gal/hr -----	
John Deere	15.2 c <sup>†</sup>	16.04 a	39.3 b	27.2 bc
Claas	17.8 a	12.40 bc	39.7 b	25.5 c
Krone 1100	15.1 c	14.11 ab	45.7 a	32.8 a
New Holland	16.0 bc	15.55 a	40.6 b	30.7 ab
NH 9060	16.9 ab	11.58 c	28.9 c	22.9 c
LSD <sub>0.05</sub>	1.3	2.5	4.36	5.0
C.V. %	4.3	9.0	5.2	9.5



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## Fuel Consumption – 2011

	Cut Length	Fuel		
		Total	Chop Time	Total Time
	mm	Gal	----- Gal/hr -----	
John Deere	11.6 b <sup>†</sup>	14.0 ab	40.7 b	27.2 b
Claas	13.0 a	12.1 b	44.9 ab	24.1 b
Krone	11.8 b	14.2 ab	34.2 c	33.4 a
New Holland	12.6 a	15.6 a	47.1 a	26.2 b
LSD <sub>0.05</sub>	0.58	2.5	2.9	5.2
C.V. %	2.4	9.0	7.2	9.4



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## Fuel Consumption – 2010

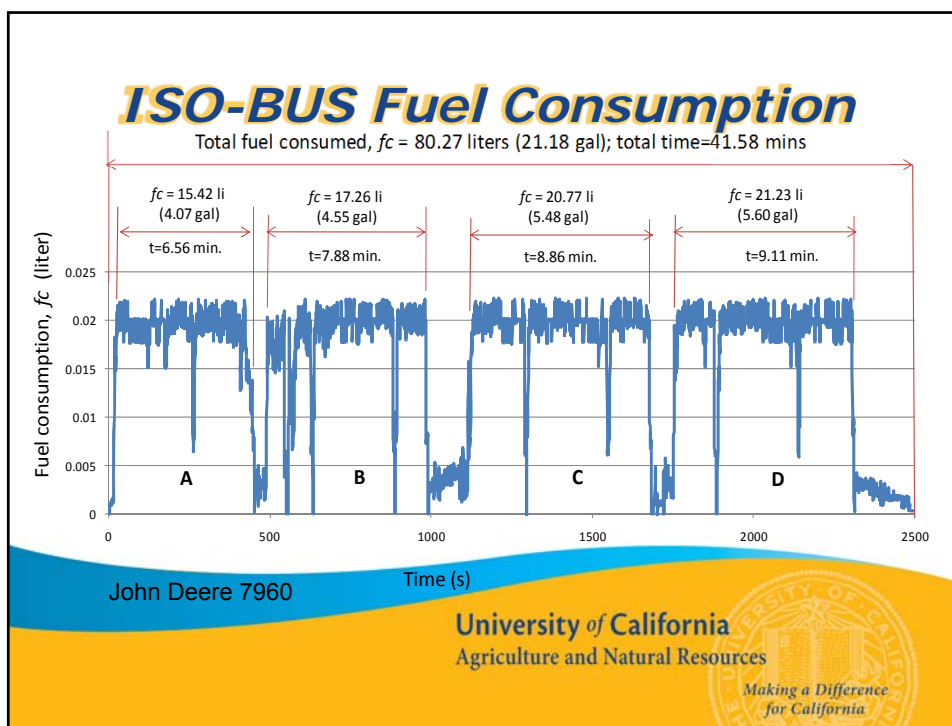
	Cut Length	Fuel		
		Total	Chop Time	Total Time
	mm	Gal	----- Gal/hr -----	
John Deere	15.88 b <sup>†</sup>	23.3 b	41.3	32.6
Claas	16.68 a	20.5 c	40.3	31.5
Krone	16.10 b	22.1 b	40.6	31.1
New Holland	14.96 c	26.1 a	40.8	33.1
LSD <sub>0.05</sub>	0.41	1.55	ns	ns
C.V. %	8.8	3.2	3.1	9.0



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### Throughput Data – 2012

	Fresh Weight		Cut Length
	Tons/hr	Tons/gal	mm
John Deere	268.5 b <sup>†</sup>	6.9 c	15.2 c
Claas	342.2 a	8.6 a	17.8 a
Krone 1100	354.9 a	7.8 b	15.1 c
New Holland	274.4 b	6.8 c	16.0 bc
NH 9060	207.9 c	7.2 bc	16.9 ab
LSD <sub>0.05</sub>	21.4	0.8	1.3
C.V. %	4.2	6.1	4.3

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## Throughput Data – 2011

	Forage Harvested		
	Fresh Weight		Cut Length
	Tons/hr	Tons/gal	mm
John Deere	219.6 b	5.4 ab	11.6 b <sup>†</sup>
Claas	269.5 a	6.1 a	13.0 a
Krone	177.2 c	5.2 b	11.8 b
New Holland	226.9 b	4.8 b	12.6 a
LSD <sub>0.05</sub>	11.5	0.77	0.58
C.V. %	2.0	7.2	2.4

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## Throughput Data – 2010

	Forage Harvested		
	Fresh Weight		Dry Cut Length
	Tons/hr	Tons/gal	mm
John Deere	283 b	6.86 b	15.88 b
Claas	298 a	7.43 a	16.68 a
Krone	276 b	6.81 b	16.10 b
New Holland	247 c	6.08 c	14.96 c
LSD <sub>0.05</sub>	11.5	0.49	0.41
C.V. %	2.0	3.6	8.8



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## Particle Size Analysis – 2012

	Fresh Weight			Cut Length
	Upper >0.75" (19 mm)	Middle	Lower < 0.31" (7.9 mm)	
	-----% -----			mm
John Deere	40.7 c <sup>†</sup>	44.0 a	15.3	15.2 c
Claas	55.0 ab	33.0 bc	15.3	17.8 a
Krone 1100	47.3 bc	39.7 ab	13.3	15.1 c
New Holland	57.0 ab	29.3 c	13.7	16.0 bc
NH 9060	53.3 ab	35.3 bc	11.3	16.9 ab
LSD <sub>0.05</sub>	8.1	8.9	ns	1.3
C.V. %	8.4	13.1	17.8	4.3



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## Particle Size Analysis - 2011

	Fresh Weight			Dry Weight
	Upper >0.75" (19 mm)	Middle	Lower < 0.31" (7.9 mm)	Cut Length
	-----% -----			mm
John Deere	13.7	64.0 b	22.3 a	11.6 b
Claas	20.5	62.4 b	17.1 b	13.0 a
Krone	12.0	70.3 a	17.6 b	11.8 b
New Holland	12.2	69.6 a	18.2 b	12.6 a
LSD <sub>0.05</sub>	ns	4.9	3.0	0.58
C.V. %	25.0	3.7	8.0	2.4



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## Particle Size Analysis - 2010

	Fresh Weight			Dry Weight
	Upper >0.75" (19 mm)	Middle	Lower < 0.31" (7.9 mm)	Cut Length
	-----% -----			mm
John Deere	13.7	69.2 b	17.1	15.88 b
Claas	14.8	64.4 c	20.8	16.68 a
Krone	16.0	70.9 ab	13.1	16.10 b
New Holland	9.1	73.7 a	17.2	14.96 c
LSD <sub>0.05</sub>	ns	3.9	ns	0.41
C.V. %	29.5	2.8	16.0	8.8



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## Corn Silage Processing Score – 2012

	Particle Fractions			CSPS
	Coarse >4.75mm	Medium	Fine <1.18mm	
	----- % -----			
John Deere	54.3 bc <sup>†</sup>	37.3 bc	8.3	41.0 bc
Claas	55.7 abc	36.3 abc	8.0	48.0 ab
Krone 1100	51.3 c	40.3 a	8.3	53.3 a
New Holland	60.0 ab	33.0 bc	7.0	48.0 ab
NH 9060	61.0 a	32.0c	6.7	35.3 c
LSD <sub>0.05</sub>	5.7	5.0	ns	10.4
C.V. %	7.1	9.6	11.2	13.2

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## Corn Silage Processing Score - 2011

	Particle Fractions			CSPS
	Coarse >4.75mm (0.19 in)	Medium	Fine <1.18mm (0.05 in)	
	----- % -----			
John Deere	49.0 c	40.7 a	10.3 a	44.7
Claas	62.7 ab	29.3 c	7.7 b	49.3
Krone	58.7 b	33.3 b	8.0 b	46.7
New Holland	64.7 a	28.3 c	7.0 b	42.7
LSD <sub>0.05</sub>	5.2	3.5	2.0	ns
C.V. %	4.4	5.3	12.0	15.8

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## Corn Silage Processing Score - 2010

	Particle Fractions			CSPS
	Coarse >4.75mm (0.19 in)	Medium	Fine <1.18mm (0.05 in)	
	----- % -----			
John Deere	58.3 a	34.0 bc	7.7 b	35.0 b
Claas	51.3 b	39.3 ab	9.3 a	57.7 a
Krone	63.0 a	31.0 c	6.3 c	35.7 b
New Holland	51.0 b	40.3 a	8.7 ab	52.0 a
LSD <sub>0.05</sub>	6.3	5.4	1.2	14.6
C.V. %	5.6	7.5	7.5	16.2

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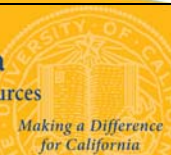
## Corn Silage Processing Score

	2010		2011		2012	
	Total	CSPS	Total	CSPS	Total	CSPS
	----- % -----					
John Deere	23.6	35.0 b	34.9	44.7	25.0	41.0 bc
Claas	24.8	57.7 a	35.6	49.3	30.9	48.0 ab
Krone	23.2	35.7 b	33.9	46.7		
New Holland	22.0	52.0 a	32.6	42.7	26.4	48.0 ab
Krone 1100					30.6	53.3 a
NH 9060					26.8	35.3 c
LSD <sub>0.05</sub>	ns	14.6	ns	ns	ns	10.4
C.V. %	10.0	16.2	7.0	15.8	10.5	13.2

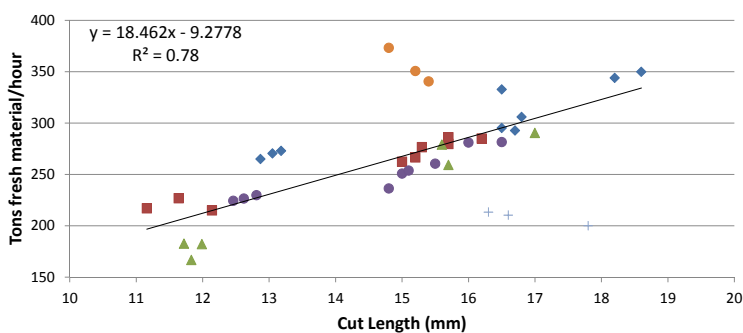
†Numbers followed by the same letter are not significantly different.

Processor set at 2 mm

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## Tons/Hour vs. Cut Length



2010-12

◆ Claas   ■ JD   ● NH   ● Krone 1100   + NH 9060   ▲ Krone

19 to 11 mm  
40 % decrease in capacity

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