

# **METERING AND CRACKAGE RATES FOR SPECIALTY SEEDS**

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# METERING AND CRACKAGE RATES FOR SPECIALITY SEEDS

## Table of Contents

	<u>Page</u>
ABSTRACT	1
INTRODUCTION	1
METER DESCRIPTIONS	1
SEED TYPES	4
SEED METER CALIBRATIONS	5
FLEXI-COIL METER CALIBRATIONS	6
HARMON INTERNATIONAL METER CALIBRATIONS	8
MORRIS METER CALIBRATIONS	10
NEW NOBLE SERVICES METER CALIBRATIONS	12
SEED CRACKAGE TESTS	14
CONCLUSIONS AND RECOMMENDATIONS	14
APPENDICES	15
APPENDIX I FLEXI-COIL METER CALIBRATION DATA AND REGRESSIONS	
APPENDIX II FLEXI-COIL SEED DATA TABLES	
APPENDIX III HARMON METER CALIBRATION DATA AND REGRESSIONS	
APPENDIX IV HARMON SEED DATA TABLES	
APPENDIX V MORRIS CALIBRATION DATA AND REGRESSIONS	
APPENDIX VI MORRIS SEED CURVES	
APPENDIX VII NEW NOBLE CALIBRATION DATA AND REGRESSIONS	
APPENDIX VIII NEW NOBLE SEED DATA TABLES	

## **ABSTRACT**

The purpose of this report was to determine the seed meter rate settings and crackage due to metering, of several speciality crops through pneumatic seeding implements. Four meter systems were used to meter buckwheat, canary seed, caraway, mustard (yellow), pinto beans, safflower and sunflower (oil) seeds. Metering rates were outlined and statistically significant crackage samples noted.

## **INTRODUCTION**

With the low price of conventional crops in recent years, farmers on the Canadian prairies have been looking to diversify into alternative crops. Limited farming income has necessitated farmers to using conventional grain equipment for special crop production. Little information is available to farmers on whether special crops can be seeded with conventional seeding equipment. This project outlines the ability of conventional pneumatic seeding equipment to meter specialty crops.

With assistance from the Alberta Wheat Pool, Region 1 Special Crops group of Alberta Agriculture, Flexi-coil Ltd., Harmon International Inc., Morris Industries Ltd. and New Noble Services Ltd., the Alberta Farm Machinery Research Centre (AFMRC) completed meter rate and crackage testing of seven specialty crops grown in the prairie provinces of Canada.

## **METER DESCRIPTIONS**

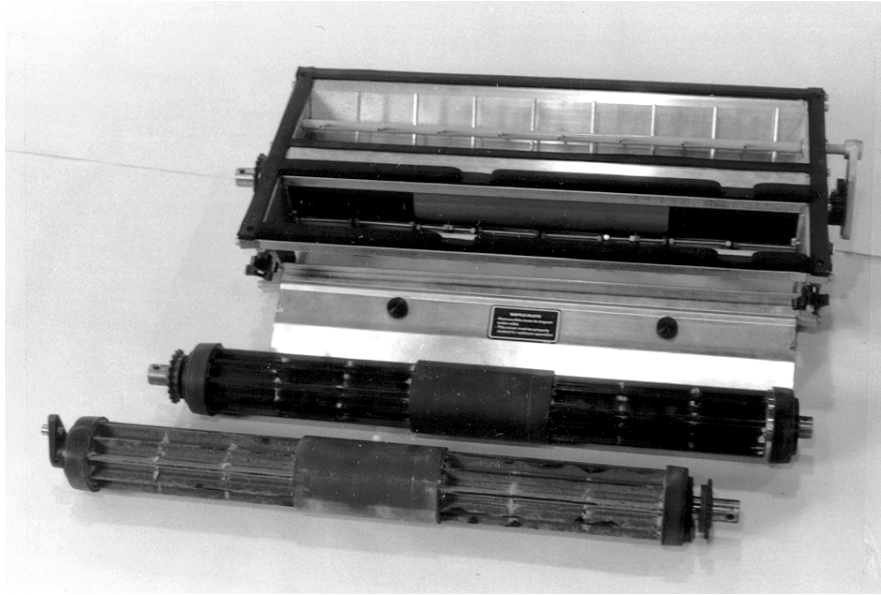
Four seed metering systems used with pneumatic seeding equipment were evaluated for seed metering rate vs. meter revolutions per minute and crackage. The four systems used were supplied by Flexi-coil, Harmon International, Morris Industries and New Noble Services.

The Flexi-coil metering system (FIGURE 1) tested was a continuous chain ground driven fluted roller type metering system. Seed and fertilizer metering rate was selected by adjusting meter revolutions. Seed was fed by gravity into the meter and then deposited into the primary air line.

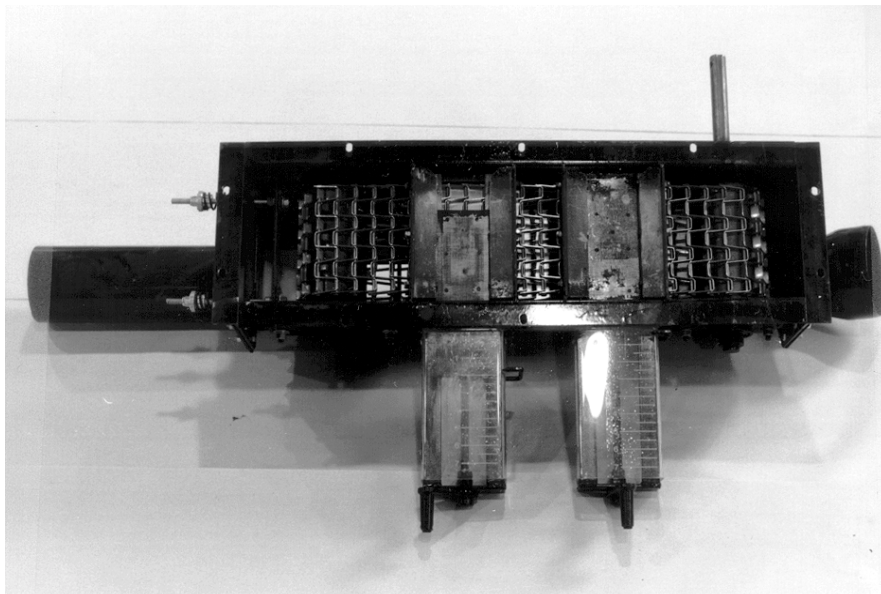
The Harmon metering system (FIGURE 2) was a continuous chain ground drive conveyor type metering system. Seed and fertilizer metering rates were selected using a gate control which adjusted the opening of the meter exposing seed to a conveyor. Once seed was deposited into the conveyor it was placed into the primary airflow line of the system.

The Morris metering system (FIGURE 3) was a continuous chain ground driven slanted fluted roller type metering system. Seed and fertilizer metering rate were selected by adjusting meter revolutions. Seed was fed by gravity into the metering system and then deposited into the primary air line.

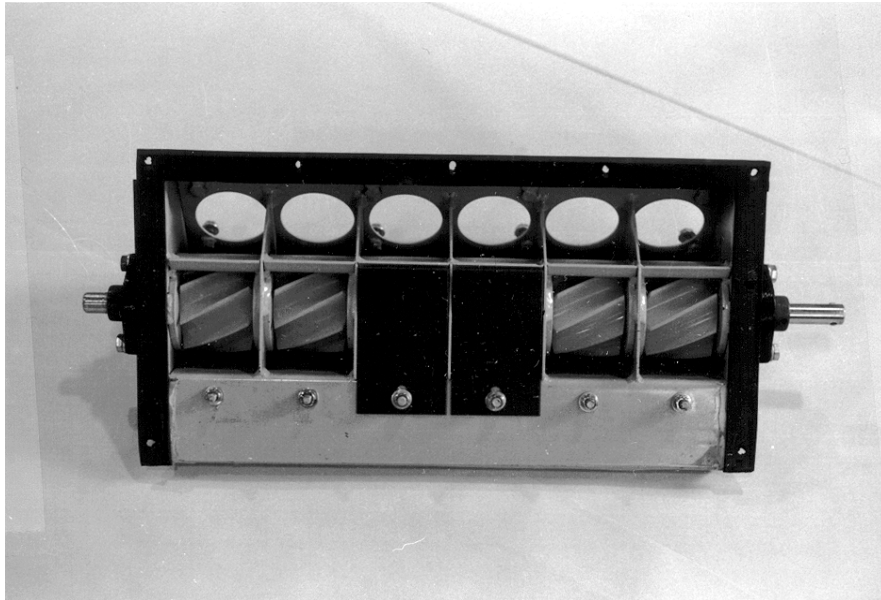
The New Noble metering system (FIGURE 4) was a continuous chain ground driven auger system. Seed and fertilizer was metered from a storage tank through augers into a primary air line. Seed was fed into the augers using gravity. Seed metering rate was adjusted by changing auger speeds. Once seed went through the auger it was deposited into the primary air line.



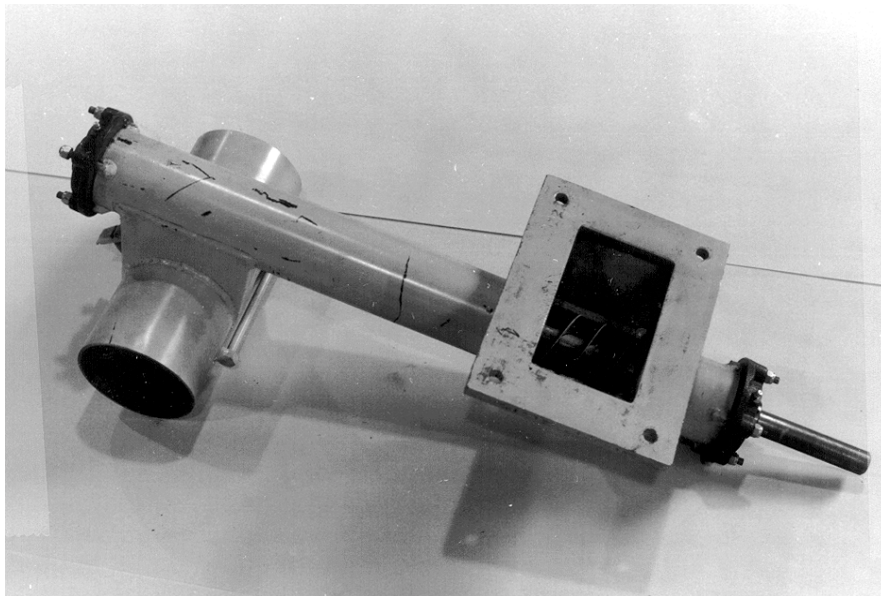
**FIGURE 1. Flexi-coil Ltd. Metering System.**



**FIGURE 2. Harmon International Inc. Metering System.**



**FIGURE 3. Morris Industries Ltd. Metering System.**



**FIGURE 4. New Noble Services Ltd. Metering System.**

## SEED TYPES

Seven seed types were used in the meter evaluation. The seeds used were buckwheat, canary seed, caraway, mustard (yellow), pinto beans, safflower and sunflower (oil). Typical western Canadian seeding rates are outlined in TABLE 1.

**TABLE 1. Seeding Rates.**

SEED TYPE	SEEDING RATE	
	lb/ac	kg/ha
Buckwheat	45	50
Canary Seed	30	34
Caraway	10	11
Mustard (Yellow)	9	10
Pinto Beans	130	146
Safflower	20	22
Sunflower (Oil)	3	3

Tests were completed to measure seed density and seed count. Seed density measurements were done with a standard 0.5 L density test. Seed density tests were repeated 10 times. Seed counts were done by counting and weighing 1,000 seeds. Seed counts were repeated five times. Average seed density measurements and seed counts are illustrated in TABLE 2.

**TABLE 2. Seed Density and Seed Counts.**

SEED TYPE	AVERAGE SEED DENSITY*			AVERAGE SEED COUNT**	
	lb/bu	g/L	lb/ft <sup>3</sup>	seeds/g	seeds/lb
Buckwheat	50.97	635.7	39.69	34.93	15,843
Canary Seed	58.05	724.1	45.20	126.61	57,424
Caraway	36.12	450.5	28.12	278.11	126,147
Mustard (Yellow)	56.68	731.9	45.69	179.87	81,588
Pinto Beans	61.74	770.0	48.07	2.63	1,191
Safflower	43.01	536.5	33.49	23.78	10,785
Sunflower (Oil)	28.76	359.5	22.44	22.34	10,133

\* Average of ten measurements.

\*\* Average of five measurements.

## **SEED METER CALIBRATIONS**

The test facility was made up of a digital scale, seed hopper, seed meter and meter drive. The seed meter drive consisted of a variable speed motor and chain direct drive gear system. Adjustments to meter operating speed were done by varying gear ratios and changing motor speed. The rpm was monitored throughout all tests.

Seed meter calibration were completed by determining seed metering rate in pounds over a number of meter rpm. From the data points, equations for seeding rate in lb/min vs. rpm were determined. In most cases,  $r^2$  of above 0.95 were found for regressions between meter rpm and seeding rate. A zero intercept was used for all regressions above an  $r^2$  value of 0.95. If an  $r^2$  of 0.95 could not be achieved with a zero intercept, an  $r^2$  was determined with a calculated intercept. The highest  $r^2$  equation was used in the final results. Equations, actual data points and statistical results are located in the Appendix of this report.

Data points for metering rate curves were set based on typical prairie seeding rates, 40 ft (12.1 m) of cultivator and a travel speed of 5 mph (8 km/h). Once a typical meter rpm was determined, data was taken to get a representative sample of the metering performance. All equations were calculated using a zero intercept.

## FLEXI-COIL METER CALIBRATIONS

TABLE 3 illustrates the meter output in lb/min vs. meter rpm. All equations were calculated using a zero intercept. Corresponding meter types are also listed. Meters which would not meter seed at typical product seeding rates were not tested.

**TABLE 3. Flex-coil Seed Meter Calibration.**

SEED TYPE	METER TYPE	METER OUTPUT (lb/min/run)	r <sup>2</sup> OF METER OUTPUT
Buckwheat	Fine	0.17318 * rpm	0.9990
	Coarse	0.26027 * rpm	0.9989
Canary Seed	Extra Fine	0.09798 * rpm	0.9974
	Fine	0.21240 * rpm	0.9994
	Coarse	0.31492 * rpm	0.9995
Caraway	Extra Fine	0.04387 * rpm	0.9889
	Fine	0.11660 * rpm	0.9959
	Coarse	0.17479 * rpm	0.9997
Mustard (Yellow)	Extra Fine	0.09256 * rpm	0.9970
	Fine	0.22583 * rpm	0.9999
	Coarse	0.33217 * rpm	0.9994
Pinto Beans	Coarse	0.20679 * rpm	0.8498
Safflower	Fine	0.13929 * rpm	0.9997
	Coarse	0.21431 * rpm	0.9984
Sunflower (Oil)	Fine	0.08241 * rpm	0.9994
	Coarse	0.12523 * rpm	0.9991

From the meter output equations (TABLE 3) constants for calculating meter box setting on the Flexi-coil system were also determined (TABLE 4). To calculate the required meter box setting, the following assumptions were made: (1) the meter drive wheel circumference is 178 inches (452 cm), (2) the correct drive ratio for the meter is used and (3) the meter displacement corresponds to the test density and equations outlined in TABLE 4. Flexi-coil meter graphs and data for the crops tested are located in Appendix I.





## HARMON INTERNATIONAL METER CALIBRATION

TABLE 5 illustrates the meter output vs. rpm equations and corresponding  $r^2$  for the Harmon meter. Corresponding sprocket configuration rpm's are also listed. Sprocket configurations which would not meter seed at typical product seeding rates were not tested.

**TABLE 5. Harmon Seed Meter Calibration.**

SEED TYPE	SPROCKET (rpm)	METER OUTPUT (lb/min)	$r^2$ OF METER OUTPUT
Buckwheat	28.70	3.3796 * rpm	0.9763
	56.50	6.5278 * rpm	0.9786
Canary Seed	14.60	2.2835 * rpm	0.9237
	28.90	4.4561 * rpm	0.9406
	56.50	8.7500 * rpm	0.9804
Caraway	14.50	1.3212 * rpm	0.9671
	28.90	2.5580 * rpm	0.9790
Mustard (Yellow)	5.67	0.9087 * rpm	0.9306
	14.40	2.2753 * rpm	0.9295
Pinto Beans	56.90	6.0518 * rpm	0.9864
Safflower	14.40	1.5329 * rpm	0.9713
	29.20	3.0050 * rpm	0.9784
	57.20	5.5237 * rpm	0.9802
Sunflower (Oil)	5.67	0.3643 * rpm	0.9689
	14.4	0.9507 * rpm	0.9988

From the meter output equations (TABLE 5), constants for calculating meter openings were determined. TABLE 6 contains corrected test data constants for determining gate openings. Data was corrected due to variations in meter rpm not corresponding to the set rates of the meter at 5 mph (8 km/h). To calculate meter opening required for seeding rates with the Harmon system the following assumption was made: At a ground speed of 5 mph (8 km/h) the seed meter rotates at 28.4 rpm with the #1 sprocket, 14.2 rpm with the #2 sprocket, 5.4 rpm with the #3 sprocket and 56.8 rpm with the additional #4 sprocket. Harmon meter charts and data for the crops tested are located in Appendix III.

**TABLE 6. Seeding Rate Constants.**

SEED	SPROCKET CONFIGURATION							
	#1		#2		#3		Additional	
	A(10-3)	B(10-2)	A(10-3)	B	A(10-3)	B	A(10-3)	B
Buckwheat	3.0206	0.0	N/A	N/A	N/A	N/A	1.5474	0.0
Canary Seed	2.7568	9.7382	5.5750	1.1291	N/A	N/A	1.2858	0.5188
Caraway	4.4101	6.2383	8.7810	0.6238	N/A	N/A	N/A	0.0
Mustard (Yellow)	N/A	N/A	5.5285	1.1372	14.2762	1.1161	N/A	0.0
Pinto Beans	N/A	N/A	N/A	N/A	N/A	N/A	1.6691	0.0
Safflower	3.4561	0.0	6.6824	0.0	1.8416	0.0	N/A	0.0
Sunflower (Oil)	N/A	0.0	10.7745	0.0	28.5525	0.0	N/A	0.0

Using the constants outlined in TABLE 6, the desired gate opening on the Harmon can be calculated using EQUATION 2.

**EQUATION 2.**

$$\text{Gate Opening} = (\text{Rate} \times \text{Width} \times A) - B$$

- Were: Rate = Seeding Rate (lb/ac)
- Width = Cultivator Width (ft)
- A = Constant from TABLE 6
- B = Constant from TABLE 6

From EQUATION 2 and TABLE 6, data tables similar to the manufacturers were developed for the seven crops tested. Data tables are located in Appendix IV and are based on actual data points rather than regression curves.

## MORRIS METER CALIBRATIONS

TABLE 7 illustrates the meter output vs. rpm equations and corresponding  $r^2$  for the Morris meter.

**TABLE 7. Morris Seed Meter Calibration.**

SEED TYPE	METER OUTPUT (lb/min/run)	$r^2$ OF METER OUTPUT
Buckwheat	0.25648 * rpm	0.9992
Canary Seed	0.28864 * rpm	0.9968
Caraway	0.18954 * rpm	0.9967
Mustard (Yellow)	0.31020 * rpm	0.9913
Pinto Beans	0.39974 * rpm	0.9933
Safflower	0.22891 * rpm	0.9987
Sunflower (Oil)	0.20043 * rpm	0.9995

From the meter output equations (TABLE 7), constants for calculating sprockets in the Morris system were determined (TABLE 8). To calculate sprockets required for seeding rates with the Morris system the following assumptions were made: (1) at a ground speed of 5 mph (8 km/h) the meter drive wheel rotates at 43 rpm, (2) each full meter shoot represents 10 cultivator shanks, (3) the slow speed drive reduces the meter's speed by a factor of 9.604 and (4) appropriate sprockets are used for the clutch output shaft which corresponds to different shank spacings. Morris meter graphs and data for the crops tested are located in Appendix V.

**TABLE 8. Quick Change Sprocket Changes.**

DRIVE	SEED	SETTING	CONSTANT
Slow	Mustard (Yellow)	A	3.10000
Slow	Sunflower (Oil)	C	4.79500
Direct	Canary Seed	A	0.34722
Direct	Caraway	A	0.52833
Direct	Safflower	B	0.43722
Direct	Buckwheat	B	0.39000
Direct	Pinto Bean	D	0.25000

Using the constants outlined in TABLE 8, the desired quick change sprockets for the Morris meter can be calculated using EQUATION 3.

**EQUATION 3.**

$$\text{Quick Change Sprocket} = (MSS/25) \times \text{Constant} \times \text{Rate}$$

Where: MSS = The number teeth on the meter shaft sprocket

(Standard = 25 teeth)

(Low Rate = 40 teeth or 35 teeth)

(High Rate = 15 teeth)

Constant = Value from TABLE 8

Rate = Seeding Rate (lb/ac)

From EQUATION 1 and TABLE 8, curves similar to the manufacturers curves were developed for the seven crops tested. Curves are located in Appendix VI.

## NEW NOBLE SERVICES METER CALIBRATIONS

TABLE 9, illustrates the meter output vs. equations and corresponding  $r^2$  for the New Noble meter. Corresponding augers are also listed. Auger configurations which would not meter seed at typical product seeding rates were not tested.

**TABLE 9. New Noble Services Seed Meter Calibration.**

SEED TYPE	METER TYPE	METER OUTPUT (lb/min)	$r^2$ OF METER OUTPUT
Buckwheat	Fine	0.10439	0.9931
	Course	0.09675	0.9962
Canary Seed	Fine	0.13845	0.9977
	Course	0.15437	0.9996
Caraway	Fine	0.07237	0.9992
Mustard (Yellow)	Fine	0.12389	0.9993
Pinto Beans	Course	0.98972	0.9897
Safflower	Fine	0.09326	0.9993
	Course	0.08930	0.9952
Sunflower (Oil)	Fine	0.05641	0.9964

From the meter output equations (TABLE 9), constants for calculating sprockets in the New Noble system were determined (TABLE 10). To calculate sprockets required for seeding rates with the New Noble system the following assumptions were made: (1) at a ground speed of 5 mph (8 km/h) the soft trac meter drive wheel rotates at 40 rpm, (2) each tooth on the driver sprocket represents one shank, and (3) shanks are spaced at 14 in. New Noble meter graphs and data for the crops tested are located in Appendix VII.

**TABLE 10. Sprocket Selection Constants.**

SEED TYPE	AUGER FLYTING	
	Double	Triple
Buckwheat	0.09675	0.10439
Canary Seed	0.15437	0.13845
Caraway	N/A	0.07237
Mustard (Yellow)	N/A	0.12389
Pinto Beans	0.14770	N/A
Safflower	0.08930	0.09326
Sunflower (Oil)	N/A	0.05641

Using the constants outlined (TABLE 10), the desired sprocket on the New Noble air seeder can be calculated using EQUATIONS 4 through 9.

Where: Rate = Seeding rate (lb/ac)  
 Constant = Value from TABLE 10  
 If required sprocket is not available use higher range.

**EQUATION 4.**

*Range 1      Sprocket = Rate / (1.243 x Constant)*

**EQUATION 5.**

*Range 2      Sprocket = Rate / (2.486 x Constant)*

**EQUATION 6.**

*Range 3      Sprocket = Rate / (6.629 x Constant)*

**EQUATION 7.**

*Range 4      Sprocket = 6788.57 x Constant / Rate*

**EQUATION 8.**

*Range 5      Sprocket = 13577.14 x Constant / Rate*

**EQUATION 9.**

*Range 6      Sprocket = 27154.29 x Constant / Rate*

From EQUATIONS 4 through 9 and TABLE 10, data tables similar to the manufacturers tables were developed for the seven crops tested. Data tables are located in Appendix VIII.

## **SEED CRACKAGE TESTS**

For crackage tests, seed was passed through the meter at 130 percent of the recommended seeding rates. If the metering system could seed at the 130 percent rate with different combinations of drives or meter sizes, the system using the greatest meter speed or causing the greatest damage was used for the test. Seed crackage tests were consistent for all meters.

The percent crackage was determined by the difference in the results between a new untouched seed sample and the sample which is passed at 130 percent of the recommended rate. Seeding rates were based on a 40 ft (12.2 m) seeding implement operating at 5 mph (8 km/h).

Each crackage sample was analyzed three times against samples of unmetered seed. A one way t-test was applied to the results to determine if the crackage was statistically significant. A p-value of 0.05 was used to determine significant crackage.

Of the seven seeds tested only pinto beans caused significant crackage with any of the meters. The pinto bean crackage was 0.3, 6.2 and 0.4 percent for the Flexi-coil, Harmon and New Nobles meters, respectively. The 6.2 percent crackage of pinto beans caused by the Harmon may have been reduced by dropping the slide plate on the meter. The Morris system did not show any significant crackage for any of the seed tested.

## **CONCLUSIONS AND RECOMMENDATIONS**

All metering systems tested provided adequate metering capabilities for the seven seeds tested.

While, the metering rate tables and graphs provided can be used to help select meter settings. Calibration tests should be performed with the seed and system to determine actual meter settings.

Minimum crackage occurred with all meters and all systems tested. Only pinto beans caused significant crackage in the meters.

Future testing should include the effect of pneumatic conveying and distribution on seed crackage and germination.



## **APPENDIX I**

### **FLEXI-COIL METER CALIBRATION DATA AND REGRESSIONS**

# Special Crops Metering

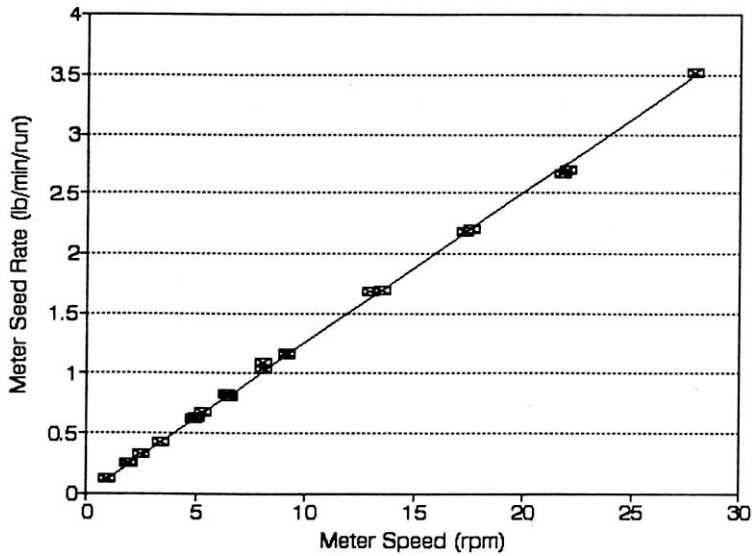
Meter: Flexi-coil	Date: May 1992	RL0692
Type: Coarse	Seed: Sunflower	

Meter Speed rpm	Sample Seed Weight		Sample Time min	Seed Rate Per Min.		Meter Seed Rate lb/min/run
	lb	kg		lb	kg	
0.9	7.56	3.43	10.36	0.73	0.33	0.12
1.0	7.41	3.36	10.08	0.74	0.33	0.12
1.9	6.70	3.04	4.45	1.51	0.68	0.25
2.0	5.94	2.69	3.94	1.51	0.68	0.25
2.5	7.67	3.48	3.96	1.94	0.88	0.32
3.4	7.62	3.46	2.92	2.61	1.18	0.43
3.4	6.81	3.09	2.63	2.59	1.17	0.43
4.9	9.84	4.46	2.63	3.74	1.70	0.62
5.0	9.03	4.10	2.37	3.81	1.73	0.64
5.3	8.71	3.95	2.15	4.05	1.84	0.68
6.4	8.05	3.65	1.63	4.94	2.24	0.82
6.5	6.49	2.94	1.33	4.88	2.21	0.81
8.1	8.62	3.91	1.39	6.20	2.81	1.03
8.1	6.01	2.73	0.92	6.53	2.96	1.09
9.2	8.44	3.83	1.22	6.92	3.14	1.15
9.2	9.28	4.21	1.32	7.03	3.19	1.17
13	8.36	3.79	0.83	10.07	4.57	1.68
13.5	9.11	4.13	0.90	10.12	4.59	1.69
17.3	9.03	4.10	0.69	13.09	5.94	2.18
17.6	9.11	4.13	0.69	13.20	5.99	2.20
21.8	10.26	4.65	0.64	16.03	7.27	2.67
22	9.54	4.33	0.59	16.17	7.33	2.69
27.9	10.76	4.88	0.51	21.06	9.55	3.51

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.028228
R Squared	0.999099
No. of Observations	23
Degrees of Freedom	22
X Coefficient(s)	0.125226
Std Err of Coef.	0.000499



# Special Crops Metering

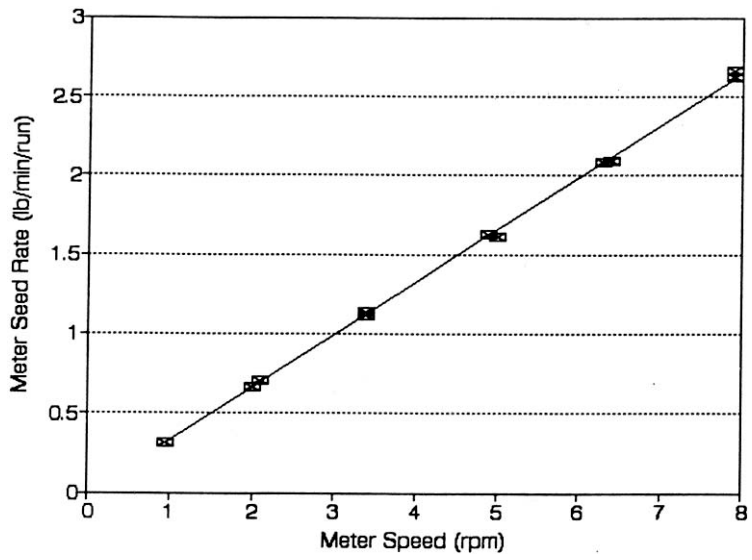
Meter: Flexi-coil Type: Coarse	Date: May 1992 Seed: Mustard (Yellow)	RL0692
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Meter Speed rpm	Sample Seed Weight		Sample Time min	Seed Rate Per Min.		Meter Seed Rate lb/min/run
	lb	kg		lb	kg	
1.0	7.80	3.54	4.13	1.89	0.86	0.31
1.0	10.56	4.79	5.61	1.88	0.85	0.31
2.0	11.68	5.30	2.92	4.00	1.81	0.67
2.1	12.73	5.77	3.03	4.20	1.91	0.70
3.4	13.99	6.35	2.06	6.79	3.08	1.13
3.4	11.69	5.30	1.75	6.68	3.03	1.11
4.9	15.87	7.20	1.63	9.74	4.42	1.62
5.0	13.28	6.02	1.37	9.69	4.40	1.62
6.3	13.89	6.30	1.11	12.51	5.68	2.09
6.4	13.56	6.15	1.08	12.56	5.70	2.09
7.9	15.40	6.99	0.98	15.71	7.13	2.62
7.9	14.84	6.73	0.93	15.96	7.24	2.66

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.020138
R Squared	0.999417
No~ of Observations	12
Degrees of Freedom	11
X Coefficient(s)	0.331101
Std Err of Coef.	0.001187



# Special Crops Metering

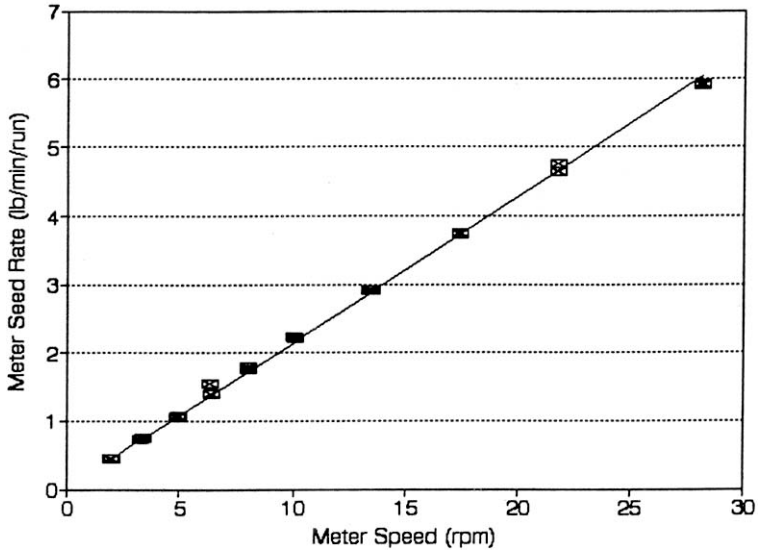
Meter: Flexi-coil	Date: May 1992	RL0692
Type: Coarse	Seed: Safflower	

Meter Speed rpm	Sample Seed Weight		Sample Time min	Seed Rate Per Min.		Meter Seed Rate lb/min/run
	lb	kg		lb	kg	
2.0	13.32	6.04	5.00	2.66	1.21	0.44
2.1	13.49	6.12	5.00	2.70	1.22	0.45
3.3	8.73	3.96	2.00	4.37	1.98	0.73
3.4	13.36	6.06	3.00	4.45	2.02	0.74
4.9	12.65	5.74	2.00	6.33	2.87	1.05
5.0	12.92	5.86	2.00	6.46	2.93	1.08
6.3	18.43	8.36	2.00	9.22	4.18	1.54
6.4	16.76	7.60	2.00	8.38	3.80	1.40
8.0	15.70	7.12	1.50	10.47	4.75	1.74
8.0	16.14	7.32	1.50	10.76	4.88	1.79
10.0	16.14	7.32	1.20	13.45	6.10	2.24
10.1	13.27	6.02	1.00	13.27	6.02	2.21
13.4	15.04	6.82	0.86	17.49	7.93	2.91
13.5	13.84	6.28	0.79	17.52	7.95	2.92
17.4	13.9	6.30	0.62	22.42	10.17	3.74
17.4	14.67	6.65	0.65	22.57	10.24	3.76
21.8	16.29	7.39	0.57	28.58	12.96	4.76
21.8	14.24	6.46	0.5T	27.92	12.67	4.65
28.2	15.61	7.08	0.44	35.48	16.09	5.91
28.2	16.00	7.26	0.45	35.56	16.13	5.93

Meter Speed vs Seed Rate

Regression Output:

Constant	0 2.0
Std Err of Y Est	0.071291
R Squared	0.998357
No. of Observations	20
Degrees of Freedom	19
X Coefficient(s)	0.214317
Std Err of Coef .	0.001127



# Special Crops Metering

Meter: Flexi-coil  
Type: Coarse

Date: May 1992  
Seed: Caraway

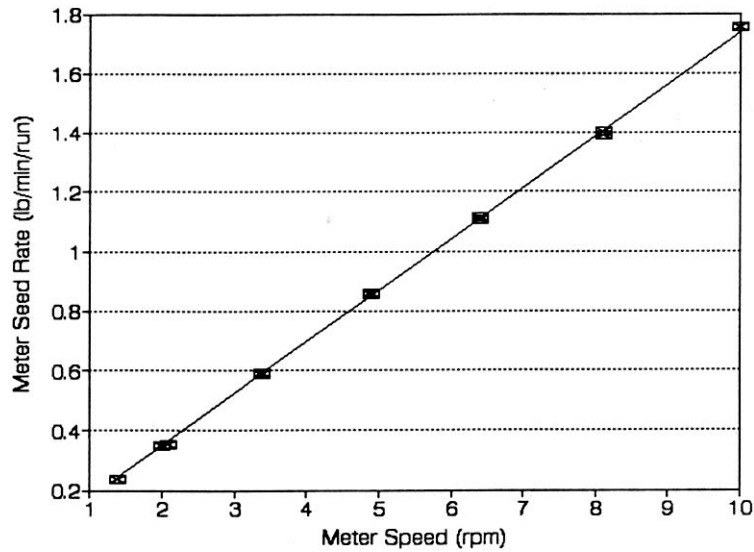
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Seed Rate Per lb	Seed Rate Min. kg	Meter Seed Rate lb/min/run
1.4	5.64	2.56	4.01	1.41	0.64	0.23
2.0	8.34	3.78	4.00	2.09	0.95	0.35
2.1	8.08	3.67	3.82	2.12	0.96	0.35
3.4	8.83	4.01	2.50	3.53	1.60	0.59
3.4	8.68	3.94	2.45	3.54	1.61	0.59
4.9	10.31	4.68	2.00	5.16	2.34	0.86
4.9	7.78	3.53	1.52	5.12	2.32	0.85
6.4	13.01	5.90	1.96	6.64	3.01	1.11
6.4	9.48	4.30	1.42	6.68	3.03	1.11
8.1	8.41	3.81	1.00	8.41	3.81	1.40
8.1	8.34	3.78	1.00	8.34	3.78	1.39
10.0	10.64	4.83	1.01	10.53	4.78	1.76

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.009519
R Squared	0.99961
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	0.173658
Std Err of Coef.	0.000479



# Special Crops Metering

Meter: Flexi-coil  
Type: Coarse

Date: May 1992  
Seed: Canary Seed

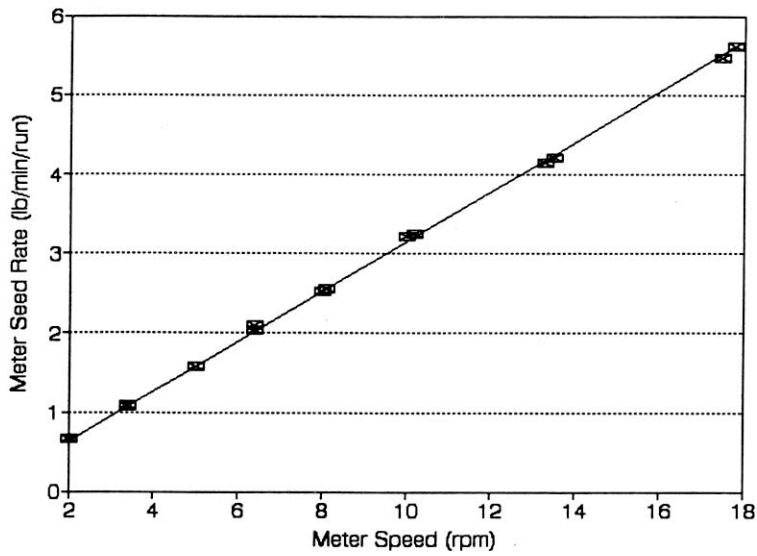
RL0692

Meter Speed rpm	Sample Weight lb	Seed Weight kg	Sample Time min	Seed Rate Per lb	Min. kg	Meter Seed Rate lb/min/run
2.0	13.75	6.24	3.50	3.93	1.78	0.65
2.0	11.81	5.36	3.00	3.94	1.79	0.66
3.4	13.07	5.93	2.00	6.54	2.96	1.09
3.4	16.02	7.27	2.50	6.41	2.91	1.07
5.0	14.19	6.44	1.50	9.46	4.29	1.58
5.0	14.15	6.42	1.50	9.43	4.28	1.57
6.4	18.31	8.31	1.50	12.21	5.54	2.03
6.4	18.90	8.57	1.50	12.60	5.72	2.10
8.0	15.13	6.86	1.00	15.13	6.86	2.52
8.1	15.34	6.96	1.00	15.34	6.96	2.56
10.0	19.22	8.72	1.00	19.22	8.72	3.20
10.2	19.46	8.83	1.00	19.46	8.83	3.24
13.3	23.39	10.61	0.94	24.88	11.29	4.15
13.5	18.15	8.23	0.72	25.21	11.43	4.20
17.5	18.7	8.48	0.57	32.81	14.88	5.47
17.8	17.86	8.10	0.53	33.70	15.29	5.62

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.035873
R Squared	0.999491
No. of Observations	16
Degrees of Freedom	15
X Coefficient(s)	0.314887
Std Err of Coef.	0.000933



# Special Crops Metering

Meter: Flexi-coil  
Type: Coarse

Date: May 1992  
Seed: Buckwheat

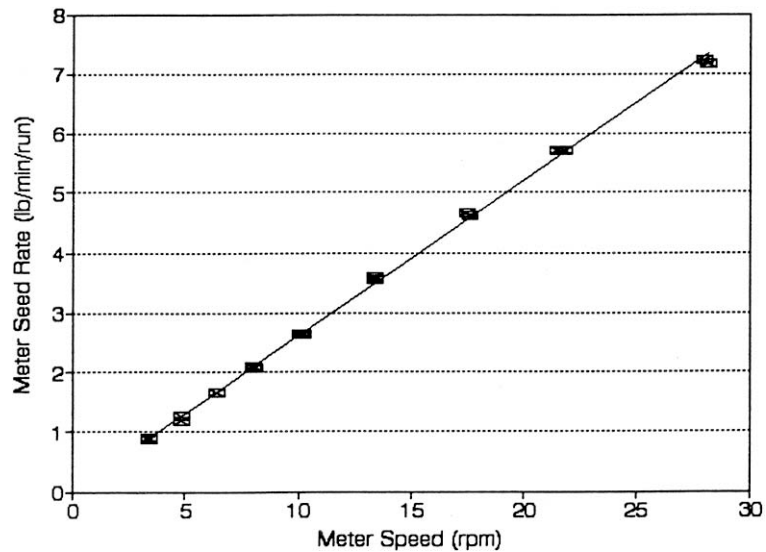
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Seed Rate Per lb	Seed Rate Min. kg	Meter Seed Rate lb/min/run
3.4	10.19	4.62	1.93	5.28	2.39	0.88
3.4	11.39	5.17	2.14	5.32	2.41	0.89
4.9	11.02	5.00	1.56	7.06	3.20	1.18
4.9	11.35	5.15	1.49	7.62	3.46	1.27
6.4	13.18	5.98	1.32	9.98	4.53	1.66
6.4	12.98	5.89	1.31	9.91	4.49	1.65
8.0	15.06	6.83	1.20	12.55	5.69	2.09
8.1	13.32	6.04	1.07	12.45	5.65	2.07
10.1	12.16	5.52	0.77	15.79	7.16	2.63
10.2	16.26	7.38	1.03	15.79	7.16	2.63
13.4	16.98	7.70	0.79	21.49	9.75	3.58
13.4	15.53	7.04	0.73	21.27	9.65	3.55
17.5	18.13	8.22	0.65	27.89	12.65	4.65
17.6	16.67	7.56	0.6	27.78	12.60	4.63
21.5	15.42	6.99	0.45	34.27	15.54	5.71
21.8	16.76	7.60	0.49	34.20	15.51	5.70
28	17.78	8.06	0.41	43.37	19.67	7.23
28.2	18.06	8.19	0.42	43.00	19.50	7.17

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.069792
R Squared	0.998899
No. of Observations	18
Degrees of Freedom	17
X Coefficient(s)	0.260283
Std Err of Coef.	0.001106



# Special Crops Metering

Meter: Flexi-coil  
Type: Fine

Date: May 1992  
Seed: Sunflower

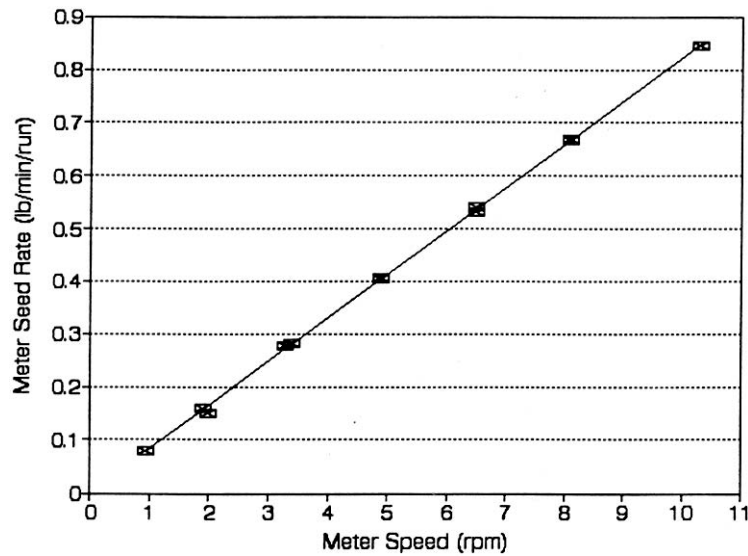
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Seed Rate Per lb	Seed Rate Min. kg	Meter Seed Rate lb/min/run
0.9	4.02	1.82	8.57	0.47	0.21	0.08
1.9	4.60	2.09	4.78	0.96	0.44	0.16
2.0	4.10	1.86	4.55	0.90	0.41	0.15
3.3	4.60	2.09	2.76	1.67	0.76	0.28
3.4	5.03	2.28	2.97	1.69	0.77	0.28
4.9	6.52	2.96	2.68	2.43	1.10	0.41
4.9	7.04	3.19	2.88	2.44	1.11	0.41
6.5	5.68	2.58	1.78	3.19	1.45	0.53
6.5	5.21	2.36	1.60	3.26	1.48	0.54
8.1	8.14	3.69	2.04	3.99	1.81	0.67
8.1	7.66	3.47	1.91	4.01	1.82	0.67
10.3	7.56	3.43	1.49	5.07	2.30	0.85

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.005757
R Squared	0.999419
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	0.082425
Std Err of Coef.	0.000288





# Special Crops Metering

Meter: Flexi-coil  
Type: Fine

Date: May 1992  
Seed: Canary Seed

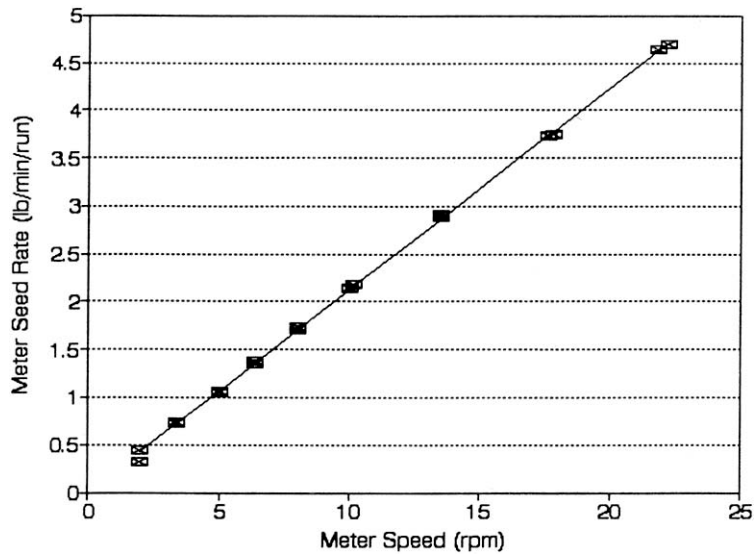
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Seed Rate Per lb	Seed Rate Min. kg	Meter Seed Rate lb/min/run
2.0	8.71	3.95	3.31	2.63	1.19	0.44
2.0	10.40	4.72	5.61	1.85	0.84	0.31
3.4	11.03	5.00	2.53	4.36	1.98	0.73
3.4	11.32	5.13	2.55	4.44	2.01	0.74
5.0	13.12	5.95	2.09	6.28	2.85	1.05
5.0	11.84	5.37	1.85	6.40	2.90	1.07
6.4	16.38	7.43	2.02	8.11	3.68	1.35
6.4	13.84	6.28	1.68	8.24	3.74	1.37
8.0	13.47	6.11	1.32	10.20	4.63	1.70
8.0	13.61	6.17	1.31	10.39	4.71	1.73
10.0	17.42	7.90	1.36	12.81	5.81	2.13
10.2	14.54	6.60	1.11	13.10	5.94	2.18
13.5	17.63	8.00	1.01	17.46	7.92	2.91
13.5	17.64	8.00	1.02	17.29	7.84	2.88
17.6	17.66	8.01	0.79	22.35	10.14	3.73
17.8	21.57	9.78	0.96	22.47	10.19	3.74
21.8	20.57	9.33	0.74	27.80	12.61	4.63
22.2	18.32	8.31	0.65	28.18	12.78	4.70

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.033997
R Squared	0.999405
No. of Observations	18
Degrees of Freedom	17
X Coefficient(s)	0.212388
Std Err of Coef.	0.000686



# Special Crops Metering

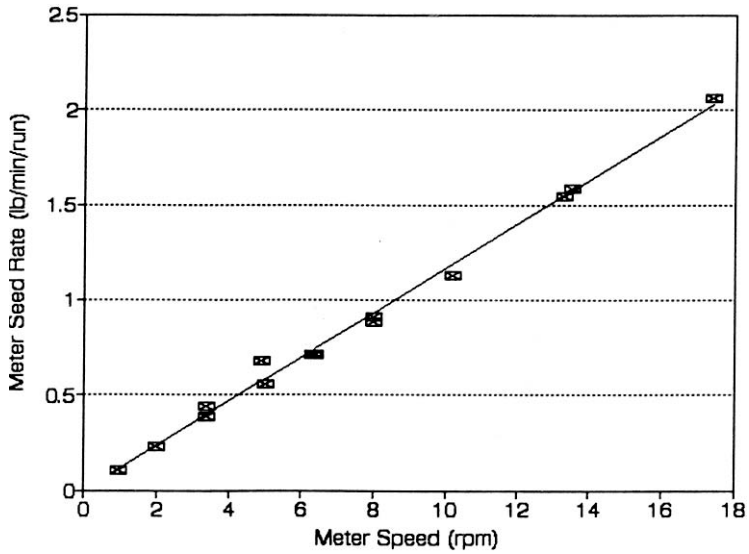
Meter: Flexi-coil	Date: May 1992	RL0692
Type: Fine	Seed: Caraway	

Meter Speed rpm	Sample Seed Weight		Sample Time min	Seed Rate Per Min.		Meter Seed Rate lb/min/run
	lb	kg		lb	kg	
1.0	4.94	2.24	7.78	0.63	0.29	0.11
2.0	2.64	1.20	1.90	1.39	0.63	0.23
2.0	5.70	2.59	4.18	1.36	0.62	0.23
3.4	7.14	3.24	2.72	2.62	1.19	0.44
3.4	5.15	2.34	2.24	2.30	1.04	0.38
4.9	9.63	4.37	2.37	4.06	1.84	0.68
5.0	5.53	2.51	1.66	3.33	1.51	0.56
6.3	6.09	2.76	1.42	4.29	1.95	0.71
6.4	7.80	3.54	1.82	4.29	1.94	0.71
8.0	7.95	3.61	1.50	5.30	2.40	0.88
8.0	4.85	2.20	0.89	5.45	2.47	0.91
0.2	7.29	3.31	1.08	6.75	3.06	1.13
3.3	10.86	4.93	1.17	9.28	4.21	1.55
3.5	10.64	4.83	1.12	9.50	4.31	1.58
7.4	10.94	4.83	0.86	12.37	5.61	2.06
7.4	14.32	6.50	1.16	12.34	5.60	2.06

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.040458
R Squared	0.995819
No. of Observations	16
Degrees of Freedom	15
X Coefficient(s)	0.116618
Std Err of Coef.	0.001098



# Special Crops Metering

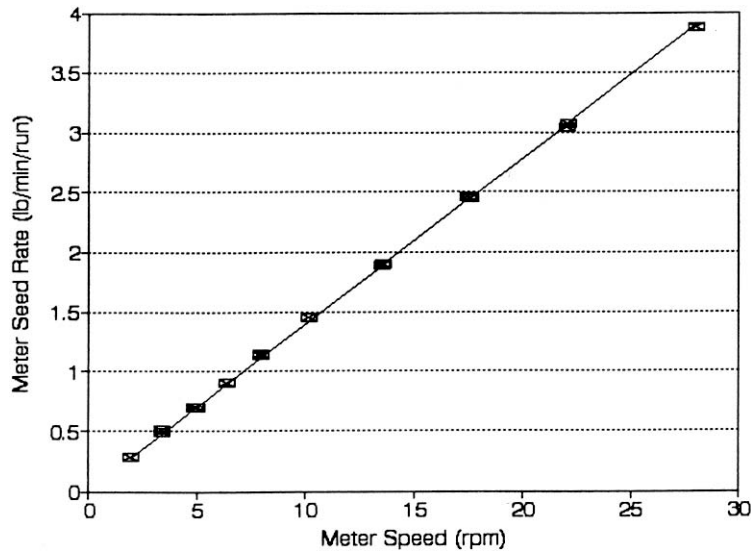
Meter: Flexi-coil	Date: May 1992	RL0692
Type: Fine	Seed: Safflower	

Meter Speed rpm	Sample Seed Weight		Sample Time min	Seed Rate Per Min.		Meter Seed Rate lb/min/run
	lb	kg		lb	kg	
2.0	6.18	2.80	3.58	1.73	0.78	0.29
2.0	5.83	2.64	3.38	1.72	0.78	0.29
3.4	6.30	2.86	2.12	2.97	1.35	0.50
3.4	12.21	5.54	3.97	3.08	1.40	0.51
19	4.9	9.82	4.45	2.35	4.18	1.90
5.0	9.07	4.11	2.16	4.20	1.90	0.70
6.4	9.06	4.11	1.66	5.46	2.48	0.91
6.4	8.35	3.79	1.54	5.42	2.46	0.90
8.0	8.98	4.07	1.32	6.80	3.09	1.13
8.0	8.37	3.80	1.22	6.86	3.11	1.14
10.2	8.68	3.94	1.00	8.68	3.94	1.45
10.2	10.37	4.70	1.19	8.71	3.95	1.45
13.5	11.65	5.28	1.03	11.31	5.13	1.89
13.6	10.90	4.94	0.96	11.35	5.15	1.89
17.5	11.96	5.42	0.81	14.77	6.70	2.46
17.6	11.05	5.01	0.75	14.73	6.68	2.46
22	12.39	5.62	0.68	18.22	8.26	3.04
22.1	12.53	5.68	0.68	18.43	8.36	3.07
28	14.66	6.65	0.63	23.27	10.56	3.88
28	9.30	4.22	0.40	23.25	10.55	3.88

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.020836
R Squared	0.999672
No. of Observations	20
Degrees of Freedom	0.70
X Coefficient(s)	0.139273
Std Err of Coef.	0.000329



# Special Crops Metering

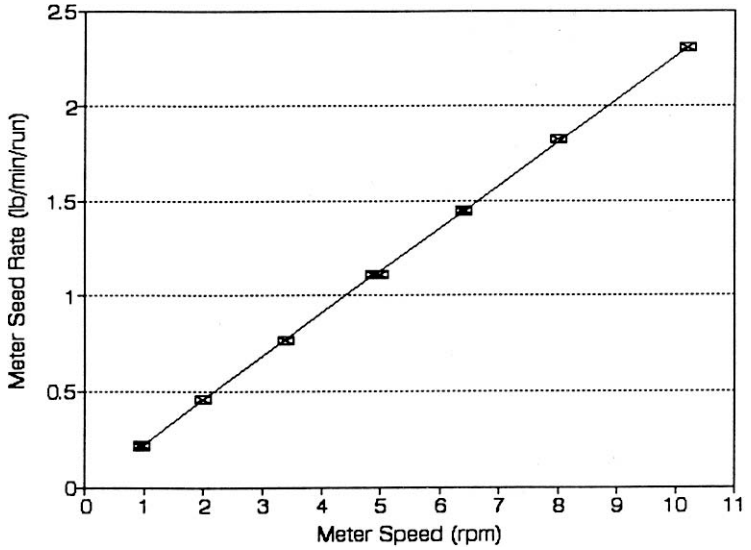
Meter: Flexi-coil Type: Fine	Date: May 1992 Seed: Mustard (Yellow)	RL0692
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Meter Speed rpm	Sample Seed Weight lb kg		Sample Time min	Seed Rate Per Min. lb kg		Meter Seed Rate lb/min/run
1.0	5.15	2.34	3.98	1.29	0.59	0.22
1.0	4.33	1.96	3.36	1.29	0.58	0.21
2.0	6.85	3.11	2.48	2.76	1.25	0.46
2.0	6.94	3.15	2.52	2.75	1.25	0.46
3.4	9.66	4.38	2.10	4.60	2.09	0.77
3.4	8.38	3.80	1.82	4.60	2.09	0.77
4.9	9.86	4.47	1.48	6.66	3.02	1.11
5.0	12.29	5.57	1.84	6.68	3.03	1.11
6.4	9.74	4.42	1.12	8.70	3.94	1.45
6.4	12.00	5.44	1.39	8.63	3.92	1.44
8.0	11.15	5.06	1.02	10.93	4.96	1.82
10.2	12.44	5.64	0.90	13.82	6.27	2.30

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.007827
R Squared	0.999857
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	0.22606
Std Err of Coef.	0.00043



# Special Crops Metering

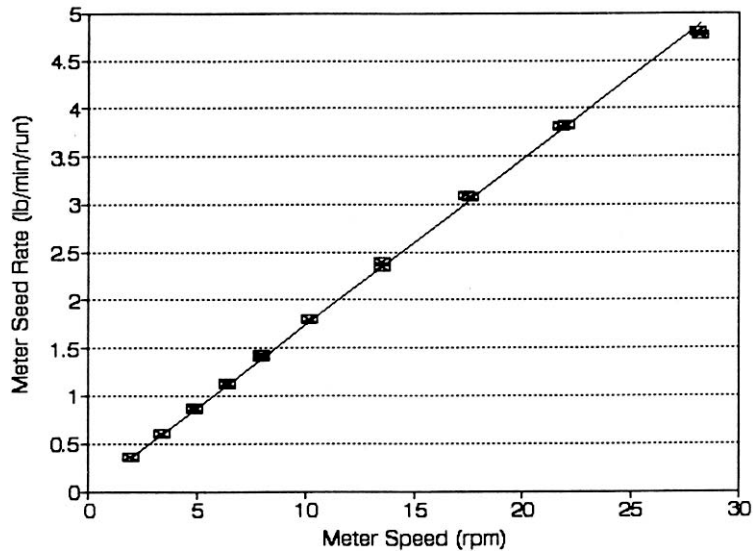
Meter: Flexi-coil	Date: May 1992	RL0692
Type: Fine	Seed: Buckwheat	

Meter Speed rpm	Sample Seed Weight		Sample Time min	Seed Rate Per Min.		Meter Seed Rate lb/min/run
	lb	kg		lb	kg	
2.0	5.99	2.72	2.80	2.14	0.97	0.36
2.0	7.54	3.42	3.58	2.11	0.96	0.35
3.4	7.92	3.59	2.20	3.60	1.63	0.60
3.4	10.27	4.66	2.86	3.59	1.63	0.60
4.9	10.43	4.73	1.99	5.24	2.38	0.87
4.9	12.15	5.51	2.36	5.15	2.34	0.86
6.4	10.19	4.62	1.51	6.75	3.06	1.12
6.4	10.21	4.63	1.52	6.72	3.05	1.12
8.0	11.99	5.44	1.40	8.56	3.88	1.43
8.0	10.66	4.84	1.27	8.39	3.81	1.40
10.2	12.02	5.45	1.11	10.83	4.91	1.80
10.2	10.55	4.79	0.98	10.77	4.88	1.79
13.5	13.96	6.33	0.97	14.39	6.53	2.40
13.5	13.51	6.13	0.96	14.07	6.38	2.35
17.4	14.67	6.65	0.79	18.57	8.42	3.09
17.6	15.19	6.89	0.82	18.52	8.40	3.09
21.8	13.94	6.32	0.61	22.85	10.37	3.81
22	14.89	6.75	0.65	22.91	10.39	3.82
28.1	15.56	7.06	0.54	28.81	13.07	4.80
28.2	14.55	6.60	0.51	28.53	12.94	4.75

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.045557
R Squared	0.998986
No. of Observations	20
Degrees of Freedom	19
X Coefficient(s)	0.173199
Std Err of Coef.	0.000719



# Special Crops Metering

Meter: Flexi-coil	Date: May 1992	RL0692
Type: Extra Fine	Seed: Canary Seed	

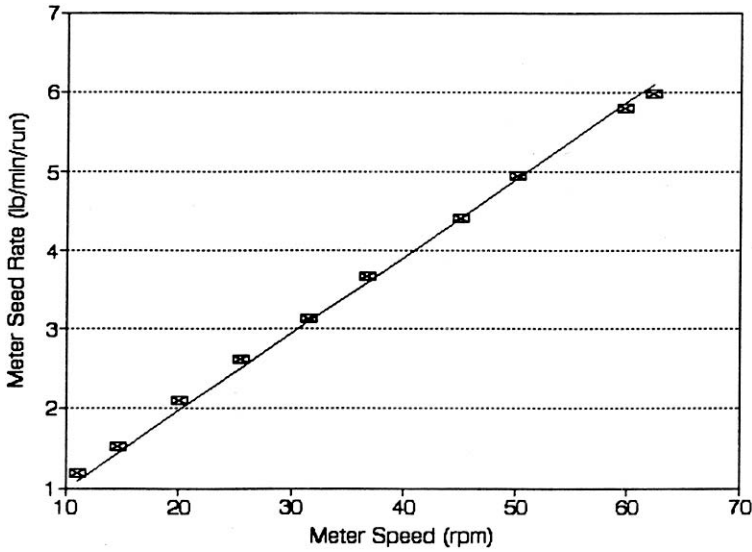
Meter Speed rpm	Sample Seed Weight lb kg	Sample Time min	Seed Rate Per Min. lb kg	Meter Seed Rate lb/min/run
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Meter Speed vs Seed Rate

Regression Output:

11.1	9.43	4.28	1.99	4.74	2.15	1.18
14.7	9.76	4.43	1.60	6.10	2.77	1.53
20.1	9.56	4.34	1.15	8.31	3.77	2.08
25.5	9.59	4.35	0.92	10.42	4.73	2.61
31.6	12.51	5.67	1.00	12.51	5.67	3.13
36.7	13.20	5.99	0.90	14.67	6.65	3.67
45.1	13.79	6.26	0.78	17.68	8.02	4.42
50.2	13.63	6.18	0.69	19.75	8.96	4.94
59.8	15.78	7.16	0.68	23.21	10.53	5.80
62.3	17.19	7.80	0.72	23.88	10.83	5.97

Constant	0
Std Err of Y Est	0.086961
R Squared	0.997436
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.097979
Std Err of Coef.	0.000693



# Special Crops Metering

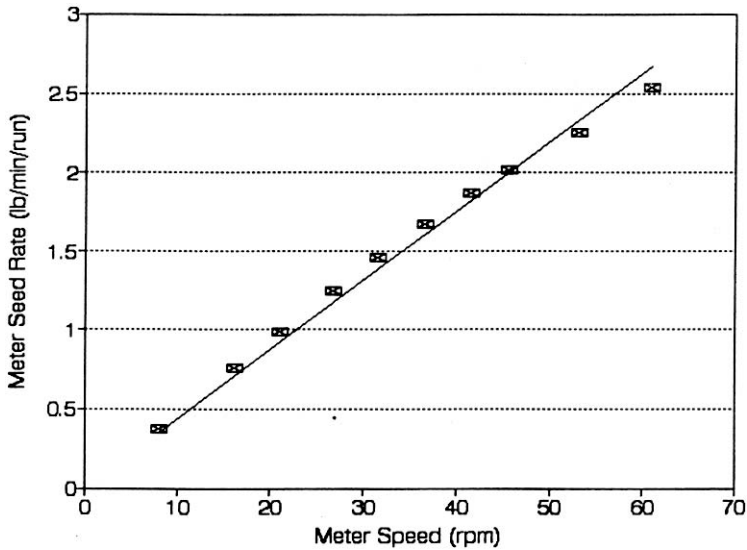
Meter: Flexi-coil	Date: May 1992	RL0692
Type: Extra Fine	Seed: Caraway	

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Seed Rate Per lb	Seed Rate Min. kg	Meter Seed Rate lb/min/run
8.0	4.38	1.99	2.96	1.48	0.67	0.37
16.2	5.32	2.41	1.76	3.02	1.37	0.76
21.0	5.74	2.60	1.46	3.93	1.78	0.98
26.8	7.31	3.32	1.46	5.01	2.27	1.25
31.5	6.43	2.92	1.10	5.85	2.65	1.46
36.7	6.68	3.03	1.00	6.68	3.03	1.67
41.5	5.84	2.65	0.78	7.49	3.40	1.87
45.5	5.80	2.63	0.72	8.06	3.65	2.01
53.2	6.32	2.87	0.70	9.03	4.10	2.26
60.9	8.64	3.92	0.85	10.16	4.61	2.54

Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.072817
R Squared	0.988764
N~ of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.043857
Std Err of Coef.	0.000612



# Special Crops Metering

Meter: Flexi-coil	Date: May 1992	RL0692
Type: Extra Fine	Seed: Mustard (Yellow)	

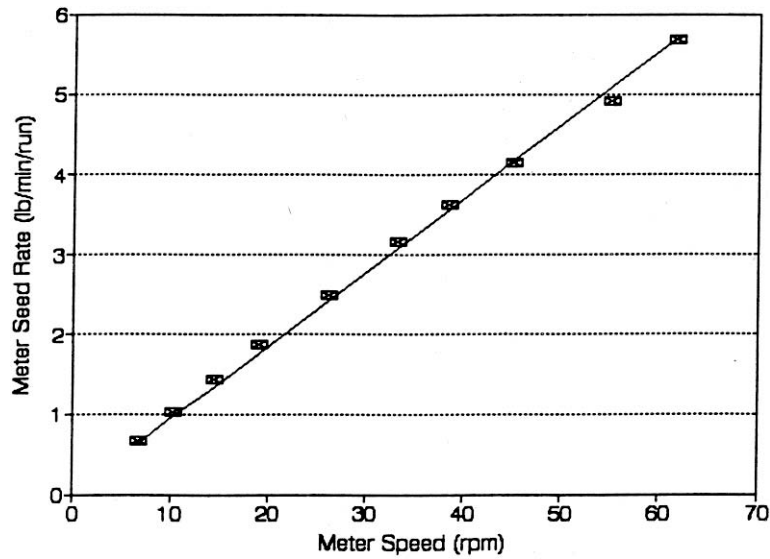
Meter Speed rpm	Sample Seed Weight lb kg	Sample Time min	Seed Rate Per Min. lb kg	Meter Seed Rate lb/min/run
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Meter Speed vs Seed Rate

Regression Output:

Constant	0
Std Err of Y Est	0.093192
R Squared	0.99698
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.092553
Std Err of Coef.	0.000822

6.8	5.99	2.72	2.25	2.66	1.21	0.67
10.4	7.31	3.32	1.79	4.08	1.85	1.02
14.4	10.55	4.79	1.83	5.77	2.61	1.44
19.0	8.74	3.96	1.17	7.47	3.39	1.87
26.2	12.04	5.46	1.21	9.95	4.51	2.49
33.3	12.54	5.69	0.99	12.67	5.75	3.17
38.5	12.49	5.67	0.86	14.52	6.59	3.63
45.1	12.14	5.51	0.73	16.63	7.54	4.16
55.0	11.58	5.25	0.59	19.63	8.90	4.91
61.6	12.29	5.57	0.54	22.76	10.32	5.69





**APPENDIX II**

**FLEXI-COIL SEED DATA TABLES**

FLEXI-COIL METERING RATES TABLES (lb/ac)

**BUCKWHEAT** (Coarse Meter)

**DENSITY** METER DRIVE BOX SETTING NUMBER

lb/ft <sup>3</sup>	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
34	7.7	14.5	17.3	20.3	23.3	26.3	29.5	32.7	36.0	39.3	42.8	46.3	49.9	53.6	57.3	61.1	65.0	69.0	73.0	77.1	81.3	85.6	89.9	94.3	98.8	103.4	108.0	112.7	122.4	132.3
36	8.1	15.3	18.4	21.4	24.6	27.9	31.2	34.6	38.1	41.7	45.3	49.0	52.8	56.7	60.7	64.7	68.8	73.0	77.3	81.7	86.1	90.6	95.2	99.9	104.6	109.5	114.4	119.4	129.6	140.1
38	8.6	16.2	19.4	22.6	26.0	29.4	32.9	36.5	40.2	44.0	47.8	51.8	55.8	59.9	64.1	68.3	72.7	77.1	81.6	86.2	90.9	95.7	100.5	105.4	110.4	115.5	120.7	126.0	136.8	147.9
40	9.0	17.0	20.4	23.8	27.4	31.0	34.7	38.5	42.3	46.3	50.3	54.5	58.7	63.0	67.4	71.9	76.5	81.2	85.9	90.7	95.7	100.7	105.8	111.0	116.3	121.6	127.1	132.6	144.0	155.7
42	9.5	17.9	21.4	25.0	28.7	32.5	36.4	40.4	44.4	48.6	52.9	57.2	61.6	66.2	70.8	75.5	80.3	85.2	90.2	95.3	100.5	105.7	111.1	116.5	122.1	127.7	133.4	139.2	151.2	163.4
44	10.0	18.7	22.4	26.2	30.1	34.1	38.1	42.3	46.6	50.9	55.4	59.9	64.6	69.3	74.2	79.1	84.1	89.3	94.5	99.8	105.2	110.8	116.4	122.1	127.9	133.8	139.8	145.9	158.4	171.2
46	10.4	19.6	23.4	27.4	31.5	35.6	39.9	44.2	48.7	53.2	57.9	62.7	67.5	72.5	77.5	82.7	88.0	93.3	98.8	104.4	110.0	115.8	121.7	127.6	133.7	139.9	146.1	152.5	165.6	179.0

**CANARY SEED** (Coarse Meter)

**DENSITY** METER DRIVE BOX SETTING NUMBER

lb/ft <sup>3</sup>	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
40	9.6	18.1	21.7	25.3	29.1	32.9	36.8	40.8	45.0	49.2	53.5	57.9	62.4	66.9	71.6	76.4	81.3	86.2	91.3	96.4	101.6	107.0	112.4	117.9	123.5	129.2	135.0	140.9	152.9	165.3
42	10.1	19.0	22.7	26.6	30.5	34.5	38.7	42.9	47.2	51.6	56.2	60.8	65.5	70.3	75.2	80.2	85.3	90.5	95.8	101.2	106.7	112.3	118.0	123.8	129.7	135.7	141.7	147.9	160.6	173.6
44	10.6	19.9	23.8	27.8	32.0	36.2	40.5	44.9	49.5	54.1	58.8	63.7	68.6	73.6	78.8	84.0	89.4	94.8	100.4	106.0	111.8	117.6	123.6	129.7	135.8	142.1	148.5	155.0	168.2	181.9
46	11.1	20.8	24.9	29.1	33.4	37.8	42.3	47.0	51.7	56.6	61.5	66.6	71.7	77.0	82.4	87.8	93.4	99.1	104.9	110.9	116.9	123.0	129.2	135.6	142.0	148.6	155.2	162.0	175.9	190.1
48	11.5	21.7	26.0	30.4	34.9	39.5	44.2	49.0	54.0	59.0	64.2	69.4	74.8	80.3	85.9	91.7	97.5	103.4	109.5	115.7	122.0	128.3	134.8	141.5	148.2	155.0	162.0	169.0	183.5	198.4
50	12.0	22.6	27.1	31.6	36.3	41.1	46.0	51.1	56.2	61.5	66.8	72.3	78.0	83.7	89.5	95.5	101.6	107.8	114.1	120.5	127.0	133.7	140.5	147.4	154.4	161.5	168.7	176.1	191.1	206.7
52	12.5	23.5	28.2	32.9	37.8	42.8	47.9	53.1	58.5	63.9	69.5	75.2	81.1	87.0	93.1	99.3	105.6	112.1	118.6	125.3	132.1	139.0	146.1	153.3	160.5	167.9	175.5	183.1	198.8	214.9

**CARAWAY** (Coarse Meter)

**DENSITY** METER DRIVE BOX SETTING NUMBER

lb/ft <sup>3</sup>	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
22	4.7	8.9	10.6	12.4	14.3	16.1	18.1	20.0	22.1	24.1	26.2	28.4	30.6	32.8	35.1	37.5	39.9	42.3	44.8	47.3	49.9	52.5	55.1	57.8	60.6	63.4	66.2	69.1	75.0	81.1
24	5.1	9.7	11.6	13.5	15.6	17.6	19.7	21.9	24.1	26.3	28.6	31.0	33.4	35.8	38.3	40.9	43.5	46.1	48.8	51.6	54.4	57.2	60.1	63.1	66.1	69.2	72.3	75.4	81.9	88.5
26	5.6	10.5	12.6	14.7	16.8	19.1	21.4	23.7	26.1	28.5	31.0	33.6	36.2	38.8	41.5	44.3	47.1	50.0	52.9	55.9	58.9	62.0	65.2	68.4	71.6	74.9	78.3	81.7	88.7	95.9
28	6.0	11.3	13.5	15.8	18.1	20.5	23.0	25.5	28.1	30.7	33.4	36.1	38.9	41.8	44.7	47.7	50.7	53.8	57.0	60.2	63.5	66.8	70.2	73.6	77.1	80.7	84.3	88.0	95.5	103.3
30	6.4	12.1	14.5	16.9	19.4	22.0	24.6	27.3	30.1	32.9	35.8	38.7	41.7	44.8	47.9	51.1	54.4	57.7	61.1	64.5	68.0	71.6	75.2	78.9	82.6	86.4	90.3	94.3	102.3	110.6
32	6.9	12.9	15.5	18.1	20.7	23.5	26.3	29.2	32.1	35.1	38.2	41.3	44.5	47.8	51.1	54.5	58.0	61.5	65.1	68.8	72.5	76.3	80.2	84.1	88.1	92.2	96.3	100.5	109.1	118.0
34	7.3	13.7	16.4	19.2	22.0	24.9	27.9	31.0	34.1	37.3	40.6	43.9	47.3	50.8	54.3	57.9	61.6	65.4	69.2	73.1	77.1	81.1	85.2	89.4	93.6	98.0	102.4	106.8	116.0	125.4

**MUSTARD - YELLOW** (Coarse Meter)

**DENSITY** METER DRIVE BOX SETTING NUMBER

lb/ft <sup>3</sup>	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
40	10.0	18.9	22.6	26.4	30.3	34.3	38.4	42.6	46.9	51.3	55.8	60.4	65.1	69.9	74.7	79.7	84.8	90.0	95.2	100.6	106.1	111.6	117.3	123.0	128.9	134.8	140.9	147.0	159.6	172.5
42	10.5	19.8	23.7	27.7	31.8	36.0	40.3	44.8	49.3	53.9	58.6	63.4	68.3	73.4	78.5	83.7	89.0	94.5	100.0	105.6	111.4	117.2	123.1	129.2	135.3	141.6	147.9	154.4	167.6	181.2
44	11.0	20.8	24.9	29.1	33.4	37.8	42.3	46.9	51.6	56.4	61.4	66.4	71.6	76.8	82.2	87.7	93.3	99.0	104.7	110.6	116.7	122.8	129.0	135.3	141.8	148.3	154.9	161.7	175.5	189.8
46	11.5	21.7	26.0	30.4	34.9	39.5	44.2	49.0	54.0	59.0	64.2	69.5	74.8	80.3	85.9	91.7	97.5	103.5	109.5	115.7	122.0	128.4	134.9	141.5	148.2	155.0	162.0	169.1	183.5	198.4
48	12.0	22.7	27.1	31.7	36.4	41.2	46.1	51.2	56.3	61.6	67.0	72.5	78.1	83.8	89.7	95.7	101.7	107.9	114.3	120.7	127.3	133.9	140.7	147.6	154.6	161.8	169.0	176.4	191.5	207.0
50	12.5	23.6	28.3	33.0	37.9	42.9	48.0	53.3	58.7	64.1	69.6	75.2	81.0	87.0	93.2	99.6	106.0	112.4	119.0	125.7	132.6	139.5	146.6	153.8	161.1	168.5	176.1	183.8	199.5	215.7
52	13.0	24.6	29.4	34.3	39.4	44.6	50.0	55.4	61.0	66.7	72.5	78.5	84.6	90.8	97.2	103.6	110.2	116.9	123.8	130.8	137.9	145.1	152.4	159.9	167.5	175.3	183.1	191.1	207.4	224.3

PINTO BEANS (Coarse Meter)		METER DRIVE BOX SETTING NUMBER																													
DENSITY		5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
42	6.2	11.7	14.0	16.4	18.8	21.3	23.9	26.5	29.2	31.9	34.7	37.5	40.4	43.4	46.4	49.5	52.7	55.9	59.2	62.5	65.9	69.3	72.9	76.4	80.1	83.8	87.5	91.3	99.1	107.2	
44	6.5	12.3	14.7	17.2	19.7	22.3	25.0	27.7	30.5	33.4	36.3	39.3	42.4	45.5	48.6	51.9	55.2	58.6	62.0	65.5	69.0	72.6	76.3	80.1	83.9	87.8	91.7	95.7	103.9	112.3	
46	6.8	12.9	15.4	18.0	20.6	23.4	26.1	29.0	31.9	34.9	38.0	41.1	44.3	47.5	50.9	54.2	57.7	61.2	64.8	68.5	72.2	75.9	79.8	83.7	87.7	91.7	95.9	100.0	108.6	117.4	
48	7.1	13.4	16.0	18.8	21.5	24.4	27.3	30.3	33.3	36.4	39.6	42.9	46.2	49.6	53.1	56.6	60.2	63.9	67.6	71.4	75.3	79.3	83.3	87.4	91.5	95.7	100.0	104.4	113.3	122.5	
50	7.4	14.0	16.7	19.5	22.4	25.4	28.4	31.5	34.7	38.0	41.3	44.7	48.1	51.7	55.3	59.0	62.7	66.5	70.4	74.4	78.4	82.6	86.7	91.0	95.3	99.7	104.2	108.7	118.0	127.6	
52	7.7	14.5	17.4	20.3	23.3	26.4	29.6	32.8	36.1	39.5	42.9	46.5	50.1	53.7	57.5	61.3	65.2	69.2	73.3	77.4	81.6	85.9	90.2	94.6	99.1	103.7	108.4	113.1	122.8	132.7	
54	8.0	15.1	18.1	21.1	24.2	27.4	30.7	34.1	37.5	41.0	44.6	48.2	52.0	55.8	59.7	63.7	67.7	71.9	76.1	80.4	84.7	89.2	93.7	98.3	102.9	107.7	112.5	117.4	127.5	137.8	

SAFFLOWER (Coarse Meter)		METER DRIVE BOX SETTING NUMBER																													
DENSITY		5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
28	6.2	11.6	13.9	16.3	18.7	21.1	23.7	26.3	28.9	31.6	34.4	37.2	40.1	43.0	46.0	49.1	52.2	55.4	58.7	62.0	65.3	68.8	72.2	75.8	79.4	83.1	86.8	90.6	98.3	106.3	
30	6.6	12.5	14.9	17.4	20.0	22.7	25.4	28.1	31.0	33.9	36.8	39.8	43.0	46.1	49.3	52.6	56.0	59.4	62.9	66.4	70.0	73.7	77.4	81.2	85.1	89.0	93.0	97.0	105.3	113.9	
32	7.1	13.3	15.9	18.6	21.3	24.2	27.1	30.0	33.0	36.1	39.3	42.5	45.8	49.2	52.6	56.1	59.7	63.3	67.1	70.8	74.7	78.6	82.6	86.6	90.7	94.9	99.2	103.5	112.4	121.5	
34	7.5	14.1	16.9	19.8	22.7	25.7	28.7	31.9	35.1	38.4	41.8	45.2	48.7	52.3	55.9	59.6	63.4	67.3	71.2	75.3	79.3	83.5	87.7	92.0	96.4	100.9	105.4	110.0	119.4	129.1	
36	7.9	15.0	17.9	20.9	24.0	27.2	30.4	33.8	37.2	40.6	44.2	47.8	51.6	55.3	59.2	63.1	67.2	71.3	75.4	79.7	84.0	88.4	92.9	97.4	102.1	106.8	111.6	116.4	126.4	136.7	
38	8.4	15.8	18.9	22.1	25.4	28.7	32.1	35.6	39.2	42.9	46.7	50.5	54.4	58.4	62.5	66.7	70.9	75.2	79.6	84.1	88.7	93.3	98.1	102.9	107.8	112.7	117.8	122.9	133.4	144.3	
40	8.8	16.6	19.9	23.2	26.7	30.2	33.8	37.5	41.3	45.2	49.1	53.2	57.3	61.5	65.8	70.2	74.6	79.2	83.8	88.5	93.3	98.2	103.2	108.3	113.4	118.7	124.0	129.4	140.5	151.9	

SUNFLOWER (Coarse Meter)		METER DRIVE BOX SETTING NUMBER																													
DENSITY		5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
16	3.1	5.8	6.9	8.1	9.3	10.5	11.8	13.1	14.4	15.8	17.1	18.5	20.0	21.4	22.9	24.5	26.0	27.6	29.2	30.9	32.6	34.3	36.0	37.8	39.6	41.4	43.2	45.1	49.0	53.0	
18	3.5	6.5	7.8	9.1	10.5	11.9	13.3	14.7	16.2	17.7	19.3	20.9	22.5	24.1	25.8	27.5	29.3	31.1	32.9	34.7	36.6	38.5	40.5	42.5	44.5	46.6	48.7	50.8	55.1	59.6	
20	3.8	7.2	8.7	10.1	11.6	13.2	14.7	16.4	18.0	19.7	21.4	23.2	25.0	26.8	28.7	30.6	32.5	34.5	36.5	38.6	40.7	42.8	45.0	47.2	49.5	51.7	54.1	56.4	61.2	66.2	
22	4.2	8.0	9.5	11.2	12.8	14.5	16.2	18.0	19.8	21.7	23.6	25.5	27.5	29.5	31.6	33.7	35.8	38.0	40.2	42.5	44.8	47.1	49.5	51.9	54.4	56.9	59.5	62.1	67.4	72.8	
24	4.6	8.7	10.4	12.2	14.0	15.8	17.7	19.6	21.6	23.6	25.7	27.8	30.0	32.2	34.4	36.7	39.0	41.4	43.9	46.3	48.8	51.4	54.0	56.7	59.3	62.1	64.9	67.7	73.5	79.5	
26	5.0	9.4	11.3	13.2	15.1	17.1	19.2	21.3	23.4	25.6	27.8	30.1	32.5	34.9	37.3	39.8	42.3	44.9	47.5	50.2	52.9	55.7	58.5	61.4	64.3	67.3	70.3	73.3	79.6	86.1	
28	5.4	10.1	12.1	14.2	16.3	18.4	20.6	22.9	25.2	27.6	30.0	32.4	35.0	37.5	40.2	42.8	45.6	48.3	51.2	54.0	57.0	60.0	63.0	66.1	69.2	72.4	75.7	79.0	85.7	92.7	

**BUCKWHEAT** (Fine Meter)

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
34	5.1	9.6	11.5	13.5	15.5	17.5	19.6	21.7	23.9	26.2	28.5	30.8	33.2	35.6	38.1	40.7	43.3	45.9	48.6	51.3	54.1	56.9	59.8	62.8	65.8	68.8	71.9	75.0	81.4	88.0
36	5.4	10.2	12.2	14.3	16.4	18.5	20.8	23.0	25.3	27.7	30.1	32.6	35.2	37.7	40.4	43.1	45.8	48.6	51.4	54.3	57.3	60.3	63.4	66.5	69.6	72.8	76.1	79.4	86.2	93.2
38	5.7	10.8	12.9	15.1	17.3	19.6	21.9	24.3	26.8	29.3	31.8	34.4	37.1	39.8	42.6	45.5	48.4	51.3	54.3	57.4	60.5	63.6	66.9	70.2	73.5	76.9	80.3	83.8	91.0	98.4
40	6.0	11.3	13.6	15.9	18.2	20.6	23.1	25.6	28.2	30.8	33.5	36.3	39.1	41.9	44.9	47.8	50.9	54.0	57.2	60.4	63.7	67.0	70.4	73.8	77.4	80.9	84.6	88.2	95.8	103.6
42	6.3	11.9	14.2	16.6	19.1	21.6	24.2	26.9	29.6	32.3	35.2	38.1	41.0	44.0	47.1	50.2	53.4	56.7	60.0	63.4	66.8	70.3	73.9	77.5	81.2	85.0	88.8	92.7	100.6	108.7
44	6.6	12.5	14.9	17.4	20.0	22.7	25.4	28.1	31.0	33.9	36.8	39.9	43.0	46.1	49.3	52.6	56.0	59.4	62.9	66.4	70.0	73.7	77.4	81.2	85.1	89.0	93.0	97.1	105.4	113.9
46	6.9	13.0	15.6	18.2	20.9	23.7	26.5	29.4	32.4	35.4	38.5	41.7	44.9	48.2	51.6	55.0	58.5	62.1	65.7	69.4	73.2	77.0	80.9	84.9	89.0	93.1	97.2	101.5	110.2	119.1

**CANARY SEED** (Fine Meter)

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
40	6.5	12.2	14.6	17.1	19.6	22.2	24.8	27.6	30.3	33.2	36.1	39.0	42.1	45.2	48.3	51.5	54.8	58.1	61.5	65.0	68.5	72.1	75.8	79.5	83.3	87.1	91.0	95.0	103.1	111.5
42	6.8	12.8	15.3	17.9	20.6	23.3	26.1	28.9	31.8	34.8	37.9	41.0	44.2	47.4	50.7	54.1	57.5	61.0	64.6	68.3	72.0	75.7	79.6	83.5	87.5	91.5	95.6	99.8	108.3	117.1
44	7.1	13.4	16.1	18.8	21.6	24.4	27.3	30.3	33.4	36.5	39.7	42.9	46.3	49.7	53.1	56.7	60.3	64.0	67.7	71.5	75.4	79.3	83.4	87.5	91.6	95.8	100.1	104.5	113.5	122.7
46	7.5	14.0	16.8	19.6	22.5	25.5	28.6	31.7	34.9	38.1	41.5	44.9	48.4	51.9	55.6	59.2	63.0	66.9	70.8	74.8	78.8	83.0	87.2	91.4	95.8	100.2	104.7	109.3	118.6	128.2
48	7.8	14.6	17.5	20.5	23.5	26.6	29.8	33.1	36.4	39.8	43.3	46.8	50.5	54.2	58.0	61.8	65.8	69.8	73.9	78.0	82.3	86.6	90.9	95.4	99.9	104.6	109.2	114.0	123.8	133.8
50	8.1	15.3	18.3	21.3	24.5	27.7	31.0	34.4	37.9	41.5	45.1	48.8	52.6	56.4	60.4	64.4	68.5	72.7	76.9	81.3	85.7	90.2	94.7	99.4	104.1	108.9	113.8	118.8	128.9	139.4
52	8.4	15.9	19.0	22.2	25.5	28.8	32.3	35.8	39.4	43.1	46.9	50.7	54.7	58.7	62.8	67.0	71.2	75.6	80.0	84.5	89.1	93.8	98.5	103.4	108.3	113.3	118.4	123.5	134.1	145.0

**CARAWAY** (Fine Meter)

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
22	3.1	5.9	7.1	8.3	9.5	10.8	12.1	13.4	14.7	16.1	17.5	18.9	20.4	21.9	23.4	25.0	26.6	28.2	29.9	31.6	33.3	35.0	36.8	38.6	40.4	42.3	44.2	46.1	50.1	54.1
24	3.4	6.5	7.7	9.0	10.4	11.7	13.1	14.6	16.1	17.6	19.1	20.7	22.3	23.9	25.6	27.3	29.0	30.8	32.6	34.4	36.3	38.2	40.1	42.1	44.1	46.1	48.2	50.3	54.6	59.0
26	3.7	7.0	8.4	9.8	11.2	12.7	14.2	15.8	17.4	19.0	20.7	22.4	24.1	25.9	27.7	29.5	31.4	33.3	35.3	37.3	39.3	41.4	43.5	45.6	47.8	50.0	52.2	54.5	59.2	64.0
28	4.0	7.5	9.0	10.5	12.1	13.7	15.3	17.0	18.7	20.5	22.3	24.1	26.0	27.9	29.8	31.8	33.8	35.9	38.0	40.2	42.3	44.6	46.8	49.1	51.4	53.8	56.2	58.7	63.7	68.9
30	4.3	8.1	9.7	11.3	13.0	14.7	16.4	18.2	20.1	21.9	23.9	25.8	27.8	29.9	32.0	34.1	36.3	38.5	40.7	43.0	45.4	47.7	50.2	52.6	55.1	57.7	60.2	62.9	68.3	73.8
32	4.6	8.6	10.3	12.1	13.8	15.7	17.5	19.4	21.4	23.4	25.5	27.6	29.7	31.9	34.1	36.4	38.7	41.0	43.4	45.9	48.4	50.9	53.5	56.1	58.8	61.5	64.3	67.1	72.8	78.7
34	4.9	9.2	11.0	12.8	14.7	16.6	18.6	20.7	22.7	24.9	27.1	29.3	31.5	33.9	36.2	38.6	41.1	43.6	46.2	48.8	51.4	54.1	56.8	59.6	62.5	65.4	68.3	71.3	77.4	83.6

**MUSTARD - YELLOW (Fine Meter)**

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
40	6.8	12.8	15.4	18.0	20.6	23.3	26.1	29.0	31.9	34.9	37.9	41.1	44.2	47.5	50.8	54.2	57.6	61.2	64.7	68.4	72.1	75.9	79.7	83.6	87.6	91.7	95.8	99.9	106.5	117.3
42	7.2	13.5	16.1	18.9	21.6	24.5	27.4	30.4	33.5	36.6	39.8	43.1	46.5	49.9	53.4	56.9	60.5	64.2	68.0	71.8	75.7	79.7	83.7	87.8	92.0	96.2	100.6	104.9	113.9	123.2
44	7.5	14.1	16.9	19.8	22.7	25.7	28.7	31.9	35.1	38.4	41.7	45.2	48.7	52.2	55.9	59.6	63.4	67.3	71.2	75.2	79.3	83.5	87.7	92.0	96.4	100.8	105.3	109.9	119.3	129.0
46	7.8	14.8	17.7	20.7	23.7	26.8	30.0	33.3	36.7	40.1	43.6	47.2	50.9	54.6	58.4	62.3	66.3	70.3	74.5	78.6	82.9	87.3	91.7	96.2	100.8	105.4	110.1	114.9	124.8	134.9
48	8.2	15.4	18.4	21.5	24.7	28.0	31.4	34.8	38.3	41.9	45.5	49.3	53.1	57.0	61.0	65.0	69.2	73.4	77.7	82.1	86.5	91.1	95.7	100.4	105.1	110.0	114.9	119.9	130.2	140.8
50	8.5	16.1	19.2	22.4	25.8	29.2	32.7	36.2	39.9	43.6	47.4	51.3	55.3	59.4	63.5	67.7	72.1	76.4	80.9	85.5	90.1	94.8	99.7	104.5	109.5	114.6	119.7	124.9	135.6	146.6
52	8.9	16.7	20.0	23.3	26.8	30.3	34.0	37.7	41.5	45.4	49.3	53.4	57.5	61.7	66.1	70.5	74.9	79.5	84.2	88.9	93.7	98.6	103.6	108.7	113.9	119.2	124.5	129.9	141.0	152.5

**SAFFLOWER (Fine Meter)**

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
28	4.0	7.6	9.1	10.6	12.1	13.7	15.4	17.1	18.8	20.5	22.3	24.2	26.1	28.0	29.9	31.9	34.0	36.0	38.1	40.3	42.5	44.7	47.0	49.3	51.6	54.0	56.4	58.9	63.9	69.1
30	4.3	8.1	9.7	11.3	13.0	14.7	16.5	18.3	20.1	22.0	23.9	25.9	27.9	30.0	32.1	34.2	36.4	38.6	40.9	43.2	45.5	47.9	50.3	52.8	55.3	57.8	60.4	63.1	68.5	74.0
32	4.6	8.6	10.3	12.1	13.9	15.7	17.6	19.5	21.5	23.5	25.5	27.6	29.8	32.0	34.2	36.5	38.8	41.2	43.6	46.0	48.5	51.1	53.7	56.3	59.0	61.7	64.5	67.3	73.0	79.0
34	4.9	9.2	11.0	12.8	14.7	16.7	18.7	20.7	22.8	25.0	27.1	29.4	31.6	34.0	36.3	38.8	41.2	43.7	46.3	48.9	51.6	54.3	57.0	59.8	62.7	65.6	68.5	71.5	77.6	83.9
36	5.2	9.7	11.6	13.6	15.6	17.7	19.8	21.9	24.2	26.4	28.7	31.1	33.5	36.0	38.5	41.0	43.7	46.3	49.0	51.8	54.6	57.5	60.4	63.3	66.3	69.4	72.5	75.7	82.2	88.8
38	5.5	10.3	12.3	14.4	16.5	18.7	20.9	23.2	25.5	27.9	30.3	32.8	35.4	38.0	40.6	43.3	46.1	48.9	51.8	54.7	57.6	60.7	63.7	66.9	70.0	73.3	76.6	79.9	86.7	93.8
40	5.7	10.8	12.9	15.1	17.3	19.6	22.0	24.4	26.8	29.4	31.9	34.5	37.2	40.0	42.8	45.6	48.5	51.5	54.5	57.5	60.7	63.8	67.1	70.4	73.7	77.1	80.6	84.1	91.3	98.7

**SUNFLOWER (Fine Meter)**

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
16	2.0	3.8	4.6	5.3	6.1	6.9	7.8	8.6	9.5	10.4	11.3	12.2	13.1	14.1	15.1	16.1	17.1	18.2	19.2	20.3	21.4	22.5	23.7	24.9	26.0	27.2	28.5	29.7	32.2	34.9
18	2.3	4.3	5.1	6.0	6.9	7.8	8.7	9.7	10.7	11.7	12.7	13.7	14.8	15.9	17.0	18.1	19.3	20.4	21.6	22.9	24.1	25.4	26.7	28.0	29.3	30.6	32.0	33.4	36.3	39.2
20	2.5	4.8	5.7	6.7	7.7	8.7	9.7	10.8	11.9	13.0	14.1	15.3	16.4	17.6	18.9	20.1	21.4	22.7	24.0	25.4	26.8	28.2	29.6	31.1	32.5	34.0	35.6	37.1	40.3	43.6
22	2.8	5.2	6.3	7.3	8.4	9.5	10.7	11.8	13.0	14.3	15.5	16.8	18.1	19.4	20.8	22.1	23.6	25.0	26.5	27.9	29.5	31.0	32.6	34.2	35.8	37.5	39.1	40.8	44.3	47.9
24	3.0	5.7	6.8	8.0	9.2	10.4	11.6	12.9	14.2	15.6	16.9	18.3	19.7	21.2	22.6	24.2	25.7	27.3	28.9	30.5	32.1	33.8	35.5	37.3	39.1	40.9	42.7	44.5	48.4	52.3
26	3.3	6.2	7.4	8.7	10.0	11.3	12.6	14.0	15.4	16.8	18.3	19.8	21.4	22.9	24.5	26.2	27.8	29.5	31.3	33.0	34.8	36.6	38.5	40.4	42.3	44.3	46.2	48.3	52.4	56.6
28	3.5	6.7	8.0	9.3	10.7	12.1	13.6	15.1	16.6	18.1	19.7	21.4	23.0	24.7	26.4	28.2	30.0	31.8	33.7	35.6	37.5	39.5	41.5	43.5	45.6	47.7	49.8	52.0	56.4	61.0

**CANARY SEED (Extra Fine Meter)**

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
40	3.0	5.6	6.7	7.9	9.0	10.2	11.5	12.7	14.0	15.3	16.6	18.0	19.4	20.8	22.3	23.8	25.3	26.8	28.4	30.0	31.6	33.3	35.0	36.7	38.4	40.2	42.0	43.8	47.6	51.4
42	3.1	5.9	7.1	8.3	9.5	10.7	12.0	13.3	14.7	16.1	17.5	18.9	20.4	21.9	23.4	25.0	26.5	28.2	29.8	31.5	33.2	34.9	36.7	38.5	40.3	42.2	44.1	46.0	50.0	54.0
44	3.3	6.2	7.4	8.7	9.9	11.3	12.6	14.0	15.4	16.8	18.3	19.8	21.3	22.9	24.5	26.1	27.8	29.5	31.2	33.0	34.8	36.6	38.5	40.3	42.3	44.2	46.2	48.2	52.3	56.6
46	3.4	6.5	7.7	9.1	10.4	11.8	13.2	14.6	16.1	17.6	19.1	20.7	22.3	24.0	25.6	27.3	29.1	30.8	32.6	34.5	36.4	38.3	40.2	42.2	44.2	46.2	48.3	50.4	54.7	59.2
48	3.6	6.8	8.1	9.4	10.8	12.3	13.7	15.3	16.8	18.4	20.0	21.6	23.3	25.0	26.7	28.5	30.3	32.2	34.1	36.0	37.9	39.9	42.0	44.0	46.1	48.2	50.4	52.6	57.1	61.7
50	3.7	7.0	8.4	9.8	11.3	12.8	14.3	15.9	17.5	19.1	20.8	22.5	24.3	26.0	27.9	29.7	31.6	33.5	35.5	37.5	39.5	41.6	43.7	45.8	48.0	50.2	52.5	54.8	59.5	64.3
52	3.9	7.3	8.8	10.2	11.8	13.3	14.9	16.5	18.2	19.9	21.6	23.4	25.2	27.1	29.0	30.9	32.9	34.9	36.9	39.0	41.1	43.3	45.5	47.7	49.9	52.3	54.6	57.0	61.9	66.9

**CARAWAY (Extra Fine Meter)**

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
22	1.2	2.2	2.7	3.1	3.6	4.1	4.5	5.0	5.5	6.1	6.6	7.1	7.7	8.2	8.8	9.4	10.0	10.6	11.2	11.9	12.5	13.2	13.8	14.5	15.2	15.9	16.6	17.3	18.8	20.4
24	1.3	2.4	2.9	3.4	3.9	4.4	4.9	5.5	6.0	6.6	7.2	7.8	8.4	9.0	9.6	10.3	10.9	11.6	12.3	12.9	13.7	14.4	15.1	15.8	16.6	17.4	18.1	18.9	20.5	22.2
26	1.4	2.6	3.2	3.7	4.2	4.8	5.4	5.9	6.5	7.2	7.8	8.4	9.1	9.7	10.4	11.1	11.8	12.5	13.3	14.0	14.8	15.6	16.4	17.2	18.0	18.8	19.6	20.5	22.3	24.1
28	1.5	2.8	3.4	4.0	4.6	5.2	5.8	6.4	7.0	7.7	8.4	9.1	9.8	10.5	11.2	12.0	12.7	13.5	14.3	15.1	15.9	16.8	17.6	18.5	19.4	20.2	21.2	22.1	24.0	25.9
30	1.6	3.0	3.6	4.3	4.9	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.5	11.2	12.0	12.8	13.6	14.5	15.3	16.2	17.1	18.0	18.9	19.8	20.7	21.7	22.7	23.7	25.7	27.8
32	1.7	3.2	3.9	4.5	5.2	5.9	6.6	7.3	8.1	8.8	9.6	10.4	11.2	12.0	12.8	13.7	14.6	15.4	16.3	17.3	18.2	19.2	20.1	21.1	22.1	23.1	24.2	25.2	27.4	29.6
34	1.8	3.4	4.1	4.8	5.5	6.3	7.0	7.8	8.6	9.4	10.2	11.0	11.9	12.7	13.6	14.5	15.5	16.4	17.4	18.3	19.3	20.4	21.4	22.4	23.5	24.6	25.7	26.8	29.1	31.5

**MUSTARD - YELLOW (Extra Fine Meter)**

DENSITY lb/ft <sup>3</sup>	METER DRIVE BOX SETTING NUMBER																													
	5	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	66	70
40	2.8	5.3	6.3	7.4	8.4	9.6	10.7	11.9	13.1	14.3	15.6	16.8	18.1	19.5	20.8	22.2	23.6	25.1	26.5	28.0	29.6	31.1	32.7	34.3	35.9	37.6	39.3	41.0	44.5	48.1
42	2.9	5.5	6.6	7.7	8.9	10.0	11.2	12.5	13.7	15.0	16.3	17.7	19.0	20.4	21.9	23.3	24.8	26.3	27.9	29.4	31.0	32.7	34.3	36.0	37.7	39.4	41.2	43.0	46.7	50.5
44	3.1	5.8	6.9	8.1	9.3	10.5	11.8	13.1	14.4	15.7	17.1	18.5	19.9	21.4	22.9	24.4	26.0	27.6	29.2	30.8	32.5	34.2	35.9	37.7	39.5	41.3	43.2	45.1	48.9	52.9
46	3.2	6.1	7.2	8.5	9.7	11.0	12.3	13.7	15.0	16.4	17.9	19.4	20.9	22.4	24.0	25.5	27.2	28.8	30.5	32.2	34.0	35.8	37.6	39.4	41.3	43.2	45.1	47.1	51.1	55.3
48	3.4	6.3	7.6	8.8	10.1	11.5	12.8	14.3	15.7	17.2	18.7	20.2	21.8	23.4	25.0	26.7	28.4	30.1	31.8	33.6	35.5	37.3	39.2	41.1	43.1	45.1	47.1	49.2	53.4	57.7
50	3.5	6.6	7.9	9.2	10.6	12.0	13.4	14.8	16.3	17.9	19.4	21.0	22.7	24.3	26.0	27.8	29.5	31.3	33.2	35.0	36.9	38.9	40.8	42.8	44.9	47.0	49.1	51.2	55.6	60.1
52	3.6	6.8	8.2	9.6	11.0	12.4	13.9	15.4	17.0	18.6	20.2	21.9	23.6	25.3	27.1	28.9	30.7	32.6	34.5	36.4	38.4	40.4	42.5	44.6	46.7	48.8	51.0	53.3	57.8	62.5

## **APPENDIX III**

### **HARMON METER CALIBRATION DATA AND REGRESSIONS**



# Special Crops Metering

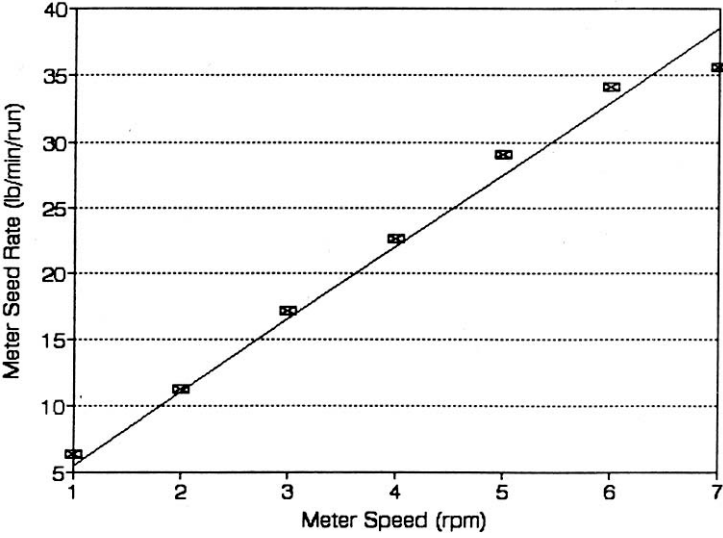
Meter: Harmon International Type: 57.2 rpm	Date: June 1992 Seed: Safflower	RL0692
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Meter Speed rpm	Sample Seed Weight lb kg	Sample Time min	Meter Seed Rate lb/min
--------------------	-----------------------------	--------------------	---------------------------

7.0	8.89 4.03	0.25	35.56
6.0	9.55 4.33	0.28	34.11
5.0	9.00 4.08	0.31	29.03
4.0	9.27 4.20	0.41	22.61
3.0	7.54 3.42	0.44	17.14
2.0	7.78 3.53	0.69	11.28
1.0	6.25 2.83	0.99	6.31

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	1.512651
R Squared	0.982041
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	5.495972
Std Err of Coef.	0.127842





# Special Crops Metering

Meter: Harmon International  
Type: 29.2 rpm

Date: June 1992  
Seed: Safflower

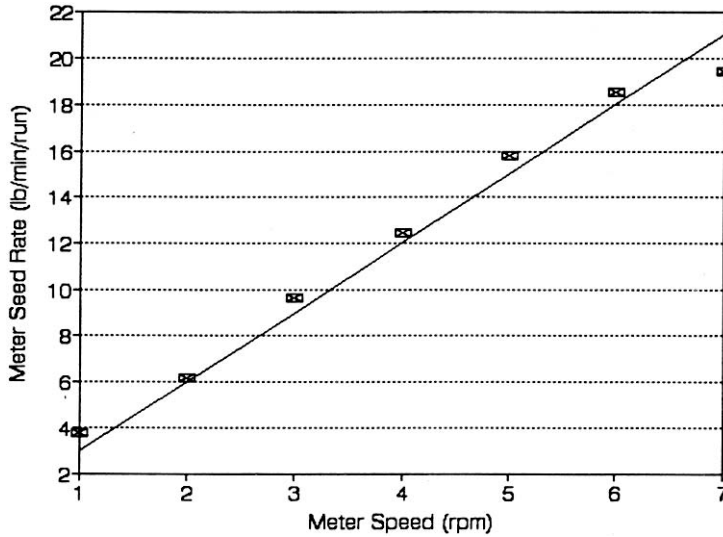
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
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7.0	8.34	3.78	0.43	19.40
6.0	9.27	4.20	0.50	18.54
5.0	8.51	3.86	0.54	15.76
4.0	7.59	3.44	0.61	12.44
3.0	7.52	3.41	0.78	9.64
2.0	6.40	2.90	1.03	6.21
1.0	4.40	2.00	1.16	3.79

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.887014
R Squared	0.978319
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	3.005126
Std Err of Coef.	0.074966



# Special Crops Metering

Meter: Harmon International  
Type: 14.4 rpm

Date: June 1992  
Seed: Safflower

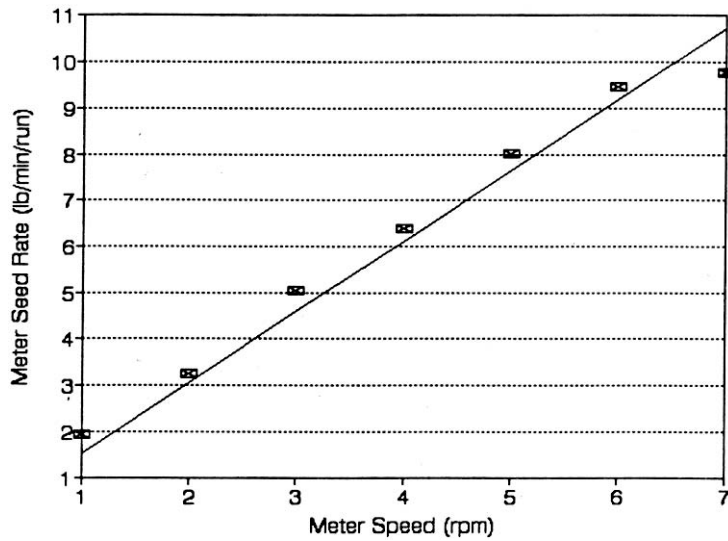
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
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7.0	8.02	3.64	0.82	9.78
6.0	8.06	3.66	0.85	9.48
5.0	7.85	3.56	0.98	8.01
4.0	7.34	3.33	1.15	6.38
3.0	5.56	2.52	1.10	5.05
2.0	4.96	2.25	1.52	3.26
1.0	4.50	2.04	2.32	1.94

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.512842
R Squared	0.971284
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	1.532633
Std Err of Coef.	0.043343



# Special Crops Metering

Meter: Harmon International  
Type: 14.6 rpm

Date: June 1992  
Seed: Canary Seed

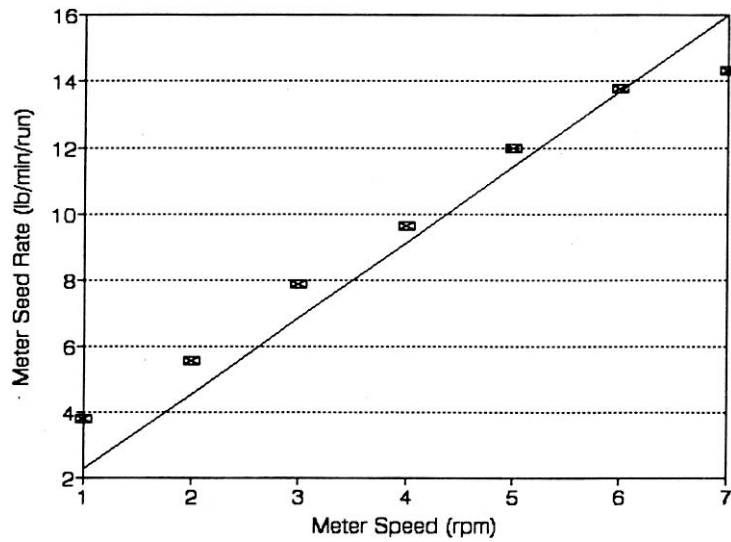
RL0692

Meter Speed rpm	Sample Seed Weight lb      kg	Sample Time min	Meter Seed Rate lb/min
--------------------	----------------------------------	--------------------	---------------------------

1.0	7.50	3.40	1.97	3.81
2.0	8.30	3.76	1.50	5.53
3.0	11.32	5.13	1.44	7.86
4.0	13.07	5.93	1.36	9.61
5.0	13.88	6.30	1.16	11.97
6.0	15.27	6.93	1.11	13.76
7.0	14.48	6.57	1.01	14.34

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	1.11969
R Squared	0.923565
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	2.28302
Std Err of Coef.	0.094631



# Special Crops Metering

Meter: Harmon International  
Type: 28.9 rpm

Date: June 1992  
Seed: Canary Seed

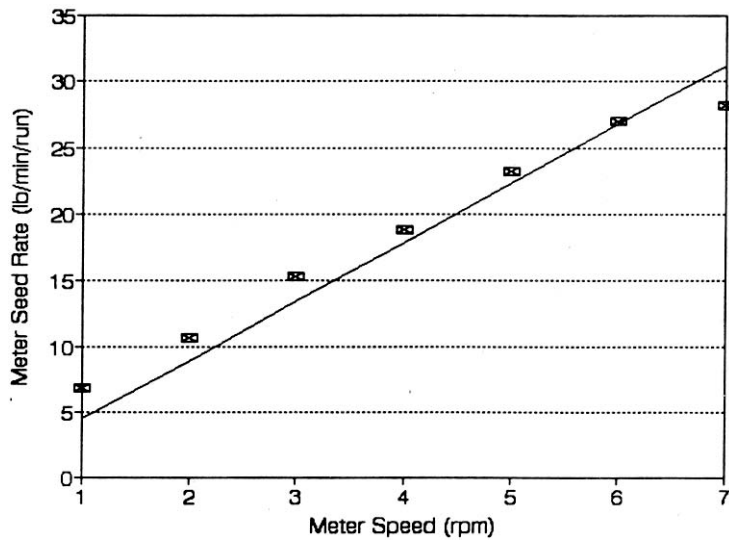
RL0692

Meter Speed rpm	Sample Seed Weight lb      kg	Sample Time min	Meter Seed Rate lb/min
--------------------	----------------------------------	--------------------	---------------------------

1.0	9.76	4.43	1.42	6.87
2.0	11.50	5.22	1.08	10.65
3.0	14.31	6.49	0.94	15.22
4.0	13.53	6.14	0.72	18.79
5.0	15.08	6.84	0.65	23.20
6.0	15.92	7.22	0.59	26.98
7.0	15.20	6.89	0.54	28.15

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	1.975203
R Squared	0.940704
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	4.456727
Std Err of Coef.	0.166935



# Special Crops Metering

Meter: Harmon International  
Type: 56.5 rpm

Date: June 1992  
Seed: Canary Seed

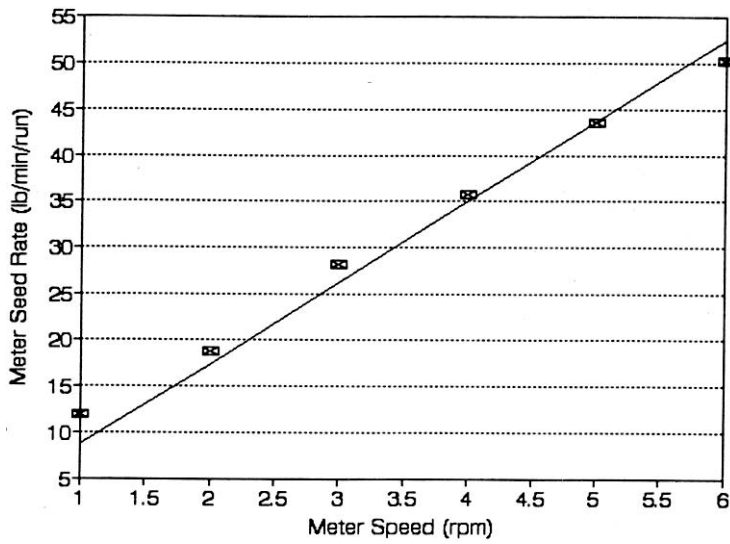
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
--------------------	-----------------------------	-----------------------------	-----------------------	------------------------------

1.0	11.31	5.13	0.95	11.91
2.0	14.11	6.40	0.75	18.81
3.0	14.09	6.39	0.50	28.18
4.0	14.28	6.48	0.40	35.70
5.0	14.82	6.72	0.34	43.59
6.0	17.08	7.75	0.34	50.24

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	2.051852
R Squared	0.980339
No. of Observations	6
Degrees of Freedom	5
X Coefficient(s)	8.749724
Std Err of Coef.	0.215093



# Special Crops Metering

Meter: Harmon International  
Type: 14.5 rpm

Date: June 1992  
Seed: Caraway

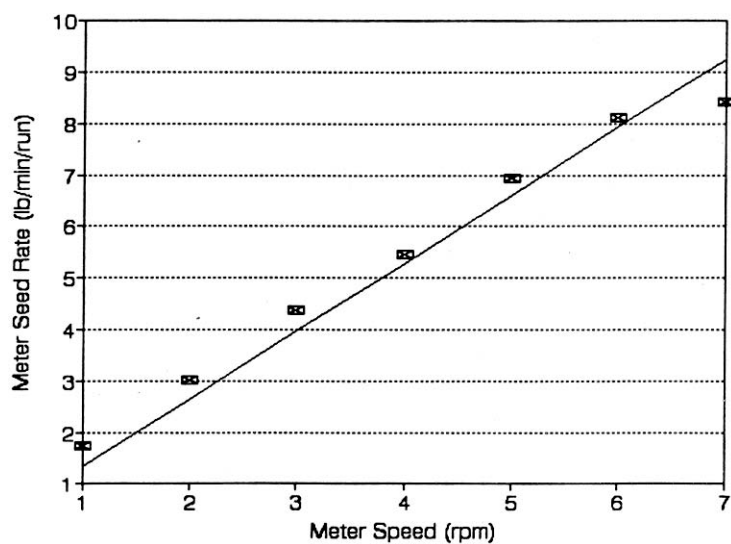
RL0692

Meter Speed rpm	Sample Seed Weight		Sample Time min	Meter Seed Rate lb/min
	lb	kg		

1.0	3.77	1.71	2.18	1.73
2.0	3.55	1.61	1.18	3.01
3.0	5.88	2.67	1.35	4.36
4.0	5.23	2.37	0.96	5.45
5.0	6.11	2.77	0.88	6.94
6.0	6.16	2.79	0.76	8.11
7.0	7.08	3.21	0.84	8.43

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.46518
R Squared	0.966838
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	1.321087
Std Err of Coef.	0.039315
Std Err of Coef.	0.215093



# Special Crops Metering

Meter: Harmon International  
Type: 29.0 rpm

Date: June 1992  
Seed: Caraway

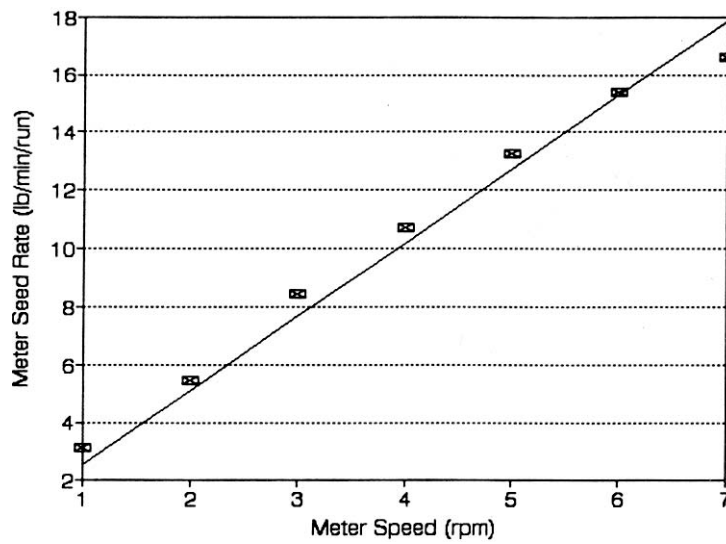
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
--------------------	-----------------------------	-----------------------------	-----------------------	------------------------------

1.0	4.43	2.01	1.42	3.12
2.0	4.92	2.23	0.90	5.47
3.0	5.90	2.68	0.70	8.43
4.0	6.31	2.86	0.59	10.69
5.0	6.63	3.01	0.50	13.26
6.0	6.16	2.79	0.40	15.40
7.0	6.14	2.79	0.37	16.59

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.725291
R Squared	0.979352
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	2.549861
Std Err of Coef.	0.061298
Std Err of Coef.	0.215093



# Special Crops Metering

Meter: Harmon International  
Type: 5.67 rpm

Date: June 1992  
Seed: Mustard (Yellow)

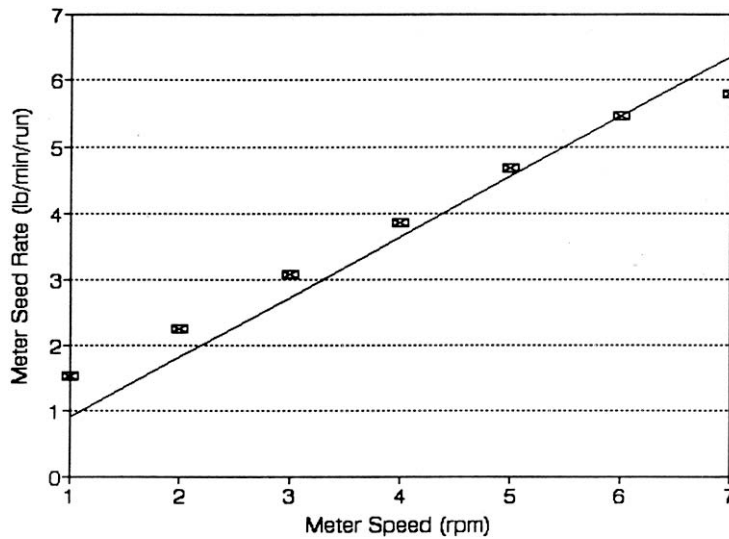
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
--------------------	-----------------------------	-----------------------------	-----------------------	------------------------------

1.0	6.20	2.81	4.07	1.52
2.0	5.93	2.69	2.65	2.24
3.0	8.85	4.01	2.87	3.08
4.0	6.00	2.72	1.56	3.85
5.0	6.87	3.12	1.47	4.67
6.0	5.46	2.48	1.00	5.46
7.0	7.40	3.36	1.28	5.78

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.424246
R Squared	0.9307
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	0.908789
Std Err of Coef.	0.035855
Std Err of Coef.	0.215093





# Special Crops Metering

Meter: Harmon International  
Type: 14.4 rpm

Date: June 1992  
Seed: Mustard (Yellow)

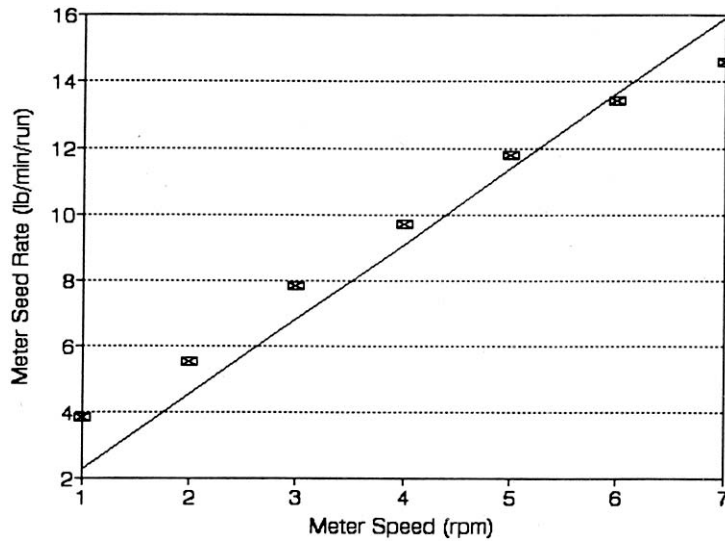
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
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1.0	8.36	3.79	2.18	3.83
2.0	11.20	5.08	2.03	5.52
3.0	10.60	4.81	1.35	7.85
4.0	11.96	5.42	1.23	9.72
5.0	12.93	5.86	1.10	11.75
6.0	12.21	5.54	0.91	13.42
7.0	11.80	5.35	0.81	14.57

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	1.068625
R Squared	0.929241
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	2.27552
Std Err of Coef.	0.090315
Std Err of Coef.	0.215093



# Special Crops Metering

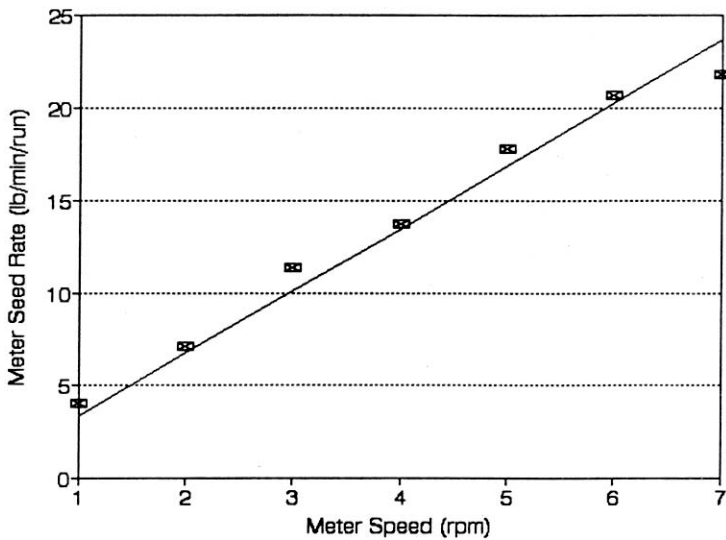
Meter: Harmon International Type: 28.7 rpm	Date: June 1992 Seed: Buckwheat	RL0692
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Meter Speed rpm	Sample Weight lb	Sample Weight kg	Sample Time min	Meter Seed Rate lb/min
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7.0	10.91	4.95	0.50	21.82
6.0	10.75	4.88	0.52	20.67
5.0	10.14	4.60	0.57	17.79
4.0	9.65	4.38	0.70	13.79
3.0	9.07	4.11	0.80	11.34
2.0	8.24	3.74	1.16	7.10
1.0	9.08	4.12	2.22	4.09

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	1.03747
R Squared	0.976315
No of Observations	7
Degrees of Freedom	6
X Coefficient(s)	3.379844
Std Err of Coef.	0.087682
Std Err of Coef.	0.215093



# Special Crops Metering

Meter: Harmon International  
Type: 56.9 rpm

Date: June 1992  
Seed: Buckwheat

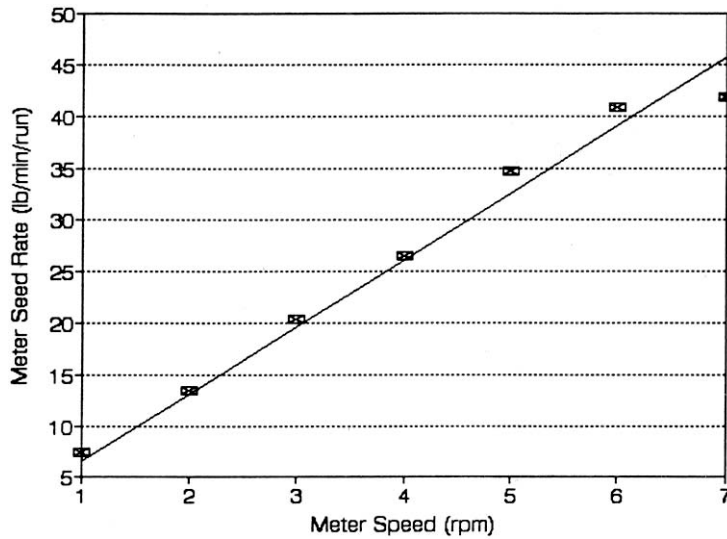
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
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7.0	12.15	5.51	0.29	41.90
6.0	11.43	5.18	0.28	40.82
5.0	11.12	5.04	0.32	34.75
4.0	11.11	5.04	0.42	26.45
3.0	11.16	5.06	0.55	20.29
2.0	10.68	4.84	0.80	13.35
1.0	10.17	4.61	1.38	7.37

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	1.958803
R Squared	0.978833
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	6.51933
Std Err of Coef.	0.165549
Std Err of Coef.	0.215093



# Special Crops Metering

Meter: Harmon International  
Type: 56.9 rpm

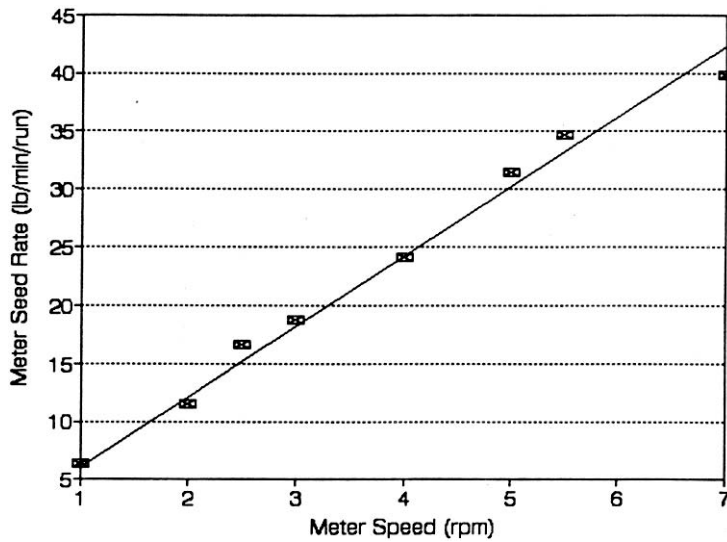
Date: June 1992  
Seed: Pinto Beans

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
7.0	12.73	5.77	0.32	39.78
5.5	12.50	5.67	0.36	34.72
5.0	11.34	5.14	0.36	31.50
4.0	11.57	5.25	0.48	24.10
3.0	11.96	5.42	0.64	18.69
2.5	11.11	5.04	0.67	16.58
2.0	10.82	4.91	0.94	11.51
1.0	8.33	3.78	1.30	6.41

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	1.370681
R Squared	0.986294
No. of Observations	8
Degrees of Freedom	7
X Coefficient(s)	6.051988
Std Err of Coef.	0.115637
Std Err of Coef.	0.215093 7.0



# Special Crops Metering

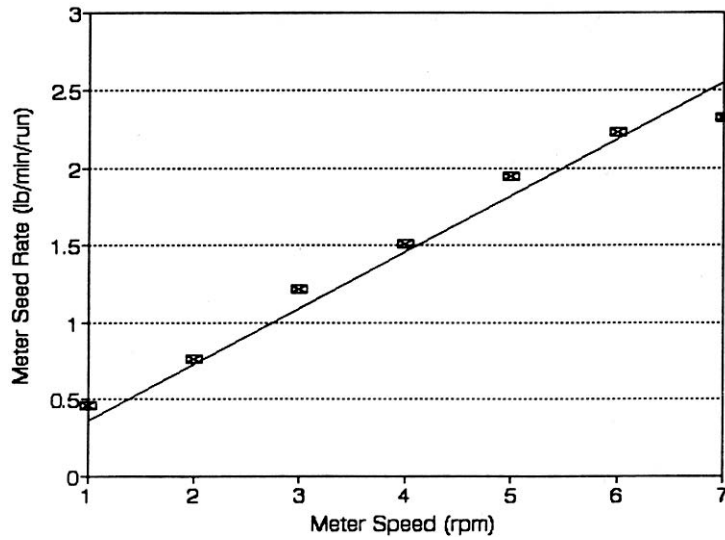
Meter: Harmon International Type: 5.56 rpm	Date: June 1992 Seed: Sunflower	RL0692
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Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
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7.0	3.62	1.64	1.56	2.32
6.0	4.06	1.84	1.82	2.23
5.0	3.71	1.68	1.91	1.94
4.0	4.26	1.93	2.82	1.51
3.0	3.77	1.71	3.11	1.21
2.0	3.07	1.39	4.03	0.76
1.0	1.79	0.81	3.92	0.46

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.126538
R Squared	0.969197
No. of Observations	7
Degrees of Freedom	6
X Coefficient(s)	0.364283
Std Err of Coef.	0.010694



# Special Crops Metering

Meter: Harmon International  
Type:14.4 rpm

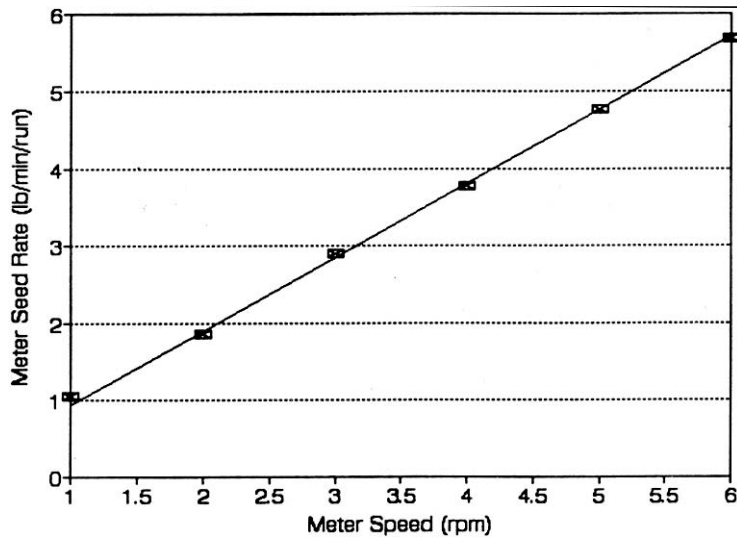
Date: June 1992  
Seed: Sunflower

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
1.0	3.27	1.48	3.08	1.06
2.0	2.32	1.05	1.25	1.86
3.0	4.24	1.92	1.46	2.90
4.0	3.47	1.57	0.92	3.77
5.0	3.43	1.56	0.72	4.76
6.0	4.04	1.83	0.71	5.69

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.060582
R Squared	0.998802
No. of Observations	6
Degrees of Freedom	5
X Coefficient(s)	0.950915
Std Err of Coef.	0.006351



**APPENDIX IV**

**HARMON SEED DATA TABLES**

CANARY SEED

Sprocket configuration #1

	Gate Opening									
	1	2	3	4	4.5	5	5.5	6	6.5	7
20	33.4	51.8	74.0	91.4	102.1	112.8	122.0	131.2	134.0	136.8
22	30.4	47.1	67.3	83.1	92.8	102.5	110.9	119.3	121.8	124.4
C 24	27.8	43.2	61.7	76.2	85.1	94.0	101.7	109.3	111.7	114.0
u 26	25.7	39.8	56.9	70.3	78.5	86.8	93.8	100.9	103.1	105.2
l 28	23.9	37.0	52.9	65.3	72.9	80.6	87.1	93.7	95.7	97.7
t 30	22.3	34.5	49.3	60.9	68.1	75.2	81.3	87.5	89.3	91.2
32	20.9	32.4	46.3	57.1	63.8	70.5	76.3	82.0	83.8	85.5
w 34	19.6	30.5	43.5	53.8	60.1	66.4	71.8	77.2	78.8	80.5
i 36	18.6	28.8	41.1	50.8	56.7	62.7	67.8	72.9	74.4	76.0
d 38	17.6	27.3	38.9	48.1	53.7	59.4	64.2	69.1	70.5	72.0
t 40	16.7	25.9	37.0	45.7	51.1	56.4	61.0	65.6	67.0	68.4
h 42	15.9	24.7	35.2	43.5	48.6	53.7	58.1	62.5	63.8	65.1
44	15.2	23.5	33.6	41.5	46.4	51.3	55.5	59.6	60.9	62.2
ft 46	14.5	22.5	32.2	39.7	44.4	49.0	53.0	57.0	58.3	59.5
48	13.9	21.6	30.8	38.1	42.5	47.0	50.8	54.7	55.8	57.0
50	13.4	20.7	29.6	36.6	40.8	45.1	48.8	52.5	53.6	54.7

(Represents pounds per acre)

CANARY SEED

Additional Sprocket

	Gate Opening									
	1	2	3	4	4.5	5	5.5	6	6.5	7
20	59.2	93.6	140.0	177.6	197.2	216.8	233.4	250.0	0.0	0.0
22	53.8	85.1	127.3	161.5	179.3	197.1	212.2	227.3	0.0	0.0
C 24	49.3	78.0	116.7	148.0	164.3	180.7	194.5	208.3	0.0	0.0
u 26	45.5	72.0	107.7	136.6	151.7	166.8	179.5	192.3	0.0	0.0
l 28	42.3	66.9	100.0	126.9	140.9	154.9	166.7	178.6	0.0	0.0
t 30	39.5	62.4	93.3	118.4	131.5	144.5	155.6	166.7	0.0	0.0
32	37.0	58.5	87.5	111.0	123.3	135.5	145.9	156.3	0.0	0.0
w 34	34.8	55.1	82.4	104.5	116.0	127.5	137.3	147.1	0.0	0.0
i 36	32.9	52.0	77.8	98.7	109.6	120.4	129.7	138.9	0.0	0.0
d 38	31.2	49.3	73.7	93.5	103.8	114.1	122.8	131.6	0.0	0.0
t 40	29.6	46.8	70.0	88.8	98.6	108.4	116.7	125.0	0.0	0.0
h 42	28.2	44.6	66.7	84.6	93.9	103.2	111.1	119.0	0.0	0.0
44	26.9	42.5	63.6	80.7	89.6	98.5	106.1	113.6	0.0	0.0
ft 46	25.7	40.7	60.9	77.2	85.7	94.3	101.5	108.7	0.0	0.0
48	24.7	39.0	58.3	74.0	82.2	90.3	97.3	104.2	0.0	0.0
50	23.7	37.4	56.0	71.0	78.9	86.7	93.4	100.0	0.0	0.0

(Represents pounds per acre)

CANARY SEED

Sprocket configuration #2

	Gate Opening									
	1	2	3	4	4.5	5	5.5	6	6.5	7
20	18.4	26.6	37.8	46.2	51.9	57.6	61.9	66.2	67.6	69.0
22	16.7	24.2	34.4	42.0	47.2	52.4	56.3	60.2	61.5	62.7
C 24	15.3	22.2	31.5	38.5	43.3	48.0	51.6	55.2	56.3	57.5
u 26	14.2	20.5	29.1	35.5	39.9	44.3	47.6	50.9	52.0	53.1
l 28	13.1	19.0	27.0	33.0	37.1	41.1	44.2	47.3	48.3	49.3
t 30	12.3	17.7	25.2	30.8	34.6	38.4	41.3	44.1	45.1	46.0
32	11.5	16.6	23.6	28.9	32.4	36.0	38.7	41.4	42.3	43.1
w 34	10.8	15.6	22.2	27.2	30.5	33.9	36.4	38.9	39.8	40.6
i 36	10.2	14.8	21.0	25.7	28.8	32.0	34.4	36.8	37.6	38.3
d 38	9.7	14.0	19.9	24.3	27.3	30.3	32.6	34.8	35.6	36.3
t 40	9.2	13.3	18.9	23.1	26.0	28.8	31.0	33.1	33.8	34.5
h 42	8.8	12.7	18.0	22.0	24.7	27.4	29.5	31.5	32.2	32.9
44	8.4	12.1	17.2	21.0	23.6	26.2	28.1	30.1	30.7	31.4
46	8.0	11.6	16.4	20.1	22.6	25.0	26.9	28.8	29.4	30.0
ft 48	7.7	11.1	15.7	19.3	21.6	24.0	25.8	27.6	28.2	28.8
50	7.4	10.6	15.1	18.5	20.8	23.0	24.8	26.5	27.0	27.6

(Represents pounds per acre)

CARAWAY

Sprocket Configuration #1

	Gate Opening									
	1	2	3	4	4.5	5	5.5	6	6.5	7
20	15.2	26.6	40.8	51.8	58.1	64.4	70.0	75.6	78.0	80.4
22	13.8	24.2	37.1	47.1	52.8	58.5	63.6	68.7	70.9	73.1
C 24	12.7	22.2	34.0	43.2	48.4	53.7	58.3	63.0	65.0	67.0
u 26	11.7	20.5	31.4	39.8	44.7	49.5	53.8	58.2	60.0	61.8
l 28	10.9	19.0	29.1	37.0	41.5	46.0	50.0	54.0	55.7	57.4
t 30	10.1	17.7	27.2	34.5	38.7	42.9	46.7	50.4	52.0	53.6
32	9.5	16.6	25.5	32.4	36.3	40.3	43.8	47.3	48.8	50.3
w 34	8.9	15.6	24.0	30.5	34.2	37.9	41.2	44.5	45.9	47.3
i 36	8.4	14.8	22.7	28.8	32.3	35.8	38.9	42.0	43.3	44.7
d 38	8.0	14.0	21.5	27.3	30.6	33.9	36.8	39.8	41.1	42.3
t 40	7.6	13.3	20.4	25.9	29.1	32.2	35.0	37.8	39.0	40.2
h 42	7.2	12.7	19.4	24.7	27.7	30.7	33.3	36.0	37.1	38.3
44	6.9	12.1	18.5	23.5	26.4	29.3	31.8	34.4	35.5	36.5
46	6.6	11.6	17.7	22.5	25.3	28.0	30.4	32.9	33.9	35.0
ft 48	6.3	11.1	17.0	21.6	24.2	26.8	29.2	31.5	32.5	33.5
50	6.1	10.6	16.3	20.7	23.2	25.8	28.0	30.2	31.2	32.2

(Represents pounds per acre)



**YELLOW MUSTARD SEED** Sprocket configuration #2

	1	2	3	4	4.5	5	5.5	6	6.5	7
20	18.8	27.0	38.4	47.4	52.4	57.4	61.4	65.4	68.3	71.2
22	17.1	24.5	34.9	43.1	47.6	52.2	55.8	59.5	62.1	64.7
C 24	15.7	22.5	32.0	39.5	43.7	47.8	51.2	54.5	56.9	59.3
u 26	14.5	20.8	29.5	36.5	40.3	44.2	47.2	50.3	52.5	54.8
l 28	13.4	19.3	27.4	33.9	37.4	41.0	43.9	46.7	48.8	50.9
t 30	12.5	18.0	25.6	31.6	34.9	38.3	40.9	43.6	45.5	47.5
32	11.8	16.9	24.0	29.6	32.8	35.9	38.4	40.9	42.7	44.5
w 34	11.1	15.9	22.6	27.9	30.8	33.8	36.1	38.5	40.2	41.9
i 36	10.4	15.0	21.3	26.3	29.1	31.9	34.1	36.3	37.9	39.6
d 38	9.9	14.2	20.2	24.9	27.6	30.2	32.3	34.4	35.9	37.5
t 40	9.4	13.5	19.2	23.7	26.2	28.7	30.7	32.7	34.2	35.6
h 42	9.0	12.9	18.3	22.6	25.0	27.3	29.2	31.1	32.5	33.9
44	8.5	12.3	17.5	21.5	23.8	26.1	27.9	29.7	31.0	32.4
46	8.2	11.7	16.7	20.6	22.8	25.0	26.7	28.4	29.7	31.0
48	7.8	11.3	16.0	19.8	21.8	23.9	25.6	27.3	28.5	29.7
50	7.5	10.8	15.4	19.0	21.0	23.0	24.6	26.2	27.3	28.5

(Represents pounds per acre)

**SAFFLOWERS** Sprocket Configuration #2

	1	2	3	4	4.5	5	5.5	6	6.5	7
20	9.4	16.0	24.6	31.2	35.2	39.2	42.7	46.2	47.0	47.8
22	8.5	14.5	22.4	28.4	32.0	35.6	38.8	42.0	42.7	43.5
C 24	7.8	13.3	20.5	26.0	29.3	32.7	35.6	38.5	39.2	39.8
u 26	7.2	12.3	18.9	24.0	27.1	30.2	32.8	35.5	36.2	36.8
l 28	6.7	11.4	17.6	22.3	25.1	28.0	30.5	33.0	33.6	34.1
t 30	6.3	10.7	16.4	20.8	23.5	26.1	28.5	30.8	31.3	31.9
32	5.9	10.0	15.4	19.5	22.0	24.5	26.7	28.9	29.4	29.9
w 34	5.5	9.4	14.5	18.4	20.7	23.1	25.1	27.2	27.6	28.1
i 36	5.2	8.9	13.7	17.3	19.6	21.8	23.7	25.7	26.1	26.6
d 38	4.9	8.4	12.9	16.4	18.5	20.6	22.5	24.3	24.7	25.2
t 40	4.7	8.0	12.3	15.6	17.6	19.6	21.4	23.1	23.5	23.9
h 42	4.5	7.6	11.7	14.9	16.8	18.7	20.3	22.0	22.4	22.8
44	4.3	7.3	11.2	14.2	16.0	17.8	19.4	21.0	21.4	21.7
46	4.1	7.0	10.7	13.6	15.3	17.0	18.6	20.1	20.4	20.8
48	3.9	6.7	10.3	13.0	14.7	16.3	17.8	19.3	19.6	19.9
50	3.8	6.4	9.8	12.5	14.1	15.7	17.1	18.5	18.8	19.1

(Represents pounds per acre)

**YELLOW MUSTARD SEED** Sprocket Configuration #3

	1	2	3	4	4.5	5	5.5	6	6.5	7
20	7.2	10.6	14.6	18.2	20.1	22.0	23.9	25.8	26.5	27.2
22	6.5	9.6	13.3	16.5	18.3	20.0	21.7	23.5	24.1	24.7
C 24	6.0	8.8	12.2	15.2	16.8	18.3	19.9	21.5	22.1	22.7
u 26	5.5	8.2	11.2	14.0	15.5	16.9	18.4	19.8	20.4	20.9
l 28	5.1	7.6	10.4	13.0	14.4	15.7	17.1	18.4	18.9	19.4
t 30	4.8	7.1	9.7	12.1	13.4	14.7	15.9	17.2	17.7	18.1
32	4.5	6.6	9.1	11.4	12.6	13.8	14.9	16.1	16.6	17.0
w 34	4.2	6.2	8.6	10.7	11.8	12.9	14.1	15.2	15.6	16.0
i 36	4.0	5.9	8.1	10.1	11.2	12.2	13.3	14.3	14.7	15.1
d 38	3.8	5.6	7.7	9.6	10.6	11.6	12.6	13.6	13.9	14.3
t 40	3.6	5.3	7.3	9.1	10.1	11.0	12.0	12.9	13.3	13.6
h 42	3.4	5.0	7.0	8.7	9.6	10.5	11.4	12.3	12.6	13.0
44	3.3	4.8	6.6	8.3	9.1	10.0	10.9	11.7	12.0	12.4
46	3.1	4.6	6.3	7.9	8.7	9.6	10.4	11.2	11.5	11.8
48	3.0	4.4	6.1	7.6	8.4	9.2	10.0	10.8	11.0	11.3
50	2.9	4.2	5.8	7.3	8.0	8.8	9.6	10.3	10.6	10.9

(Represents pounds per acre)

**SAFFLOWER** Additional Sprocket

	1	2	3	4	4.5	5	5.5	6	6.5	7
20	31.0	55.4	84.2	111.2	127.0	142.8	156.7	170.6	172.7	174.8
22	28.2	50.4	76.5	101.1	115.5	129.8	142.5	155.1	157.0	158.9
C 24	25.8	46.2	70.2	92.7	105.8	119.0	130.6	142.2	143.9	145.7
u 26	23.8	42.6	64.8	85.5	97.7	109.8	120.5	131.2	132.8	134.5
l 28	22.1	39.6	60.1	79.4	90.7	102.0	111.9	121.9	123.4	124.9
t 30	20.7	36.9	56.1	74.1	84.7	95.2	104.5	113.7	115.1	116.5
32	19.4	34.6	52.6	69.5	79.4	89.3	97.9	106.6	107.9	109.3
w 34	18.2	32.6	49.5	65.4	74.7	84.0	92.2	100.4	101.6	102.8
i 36	17.2	30.8	46.8	61.8	70.6	79.3	87.1	94.8	95.9	97.1
d 38	16.3	29.2	44.3	58.5	66.8	75.2	82.5	89.8	90.9	92.0
t 40	15.5	27.7	42.1	55.6	63.5	71.4	78.4	85.3	86.4	87.4
h 42	14.8	26.4	40.1	53.0	60.5	68.0	74.6	81.2	82.2	83.2
44	14.1	25.2	38.3	50.5	57.7	64.9	71.2	77.5	78.5	79.5
46	13.5	24.1	36.6	48.3	55.2	62.1	68.1	74.2	75.1	76.0
48	12.9	23.1	35.1	46.3	52.9	59.5	65.3	71.1	72.0	72.8
50	12.4	22.2	33.7	44.5	50.8	57.1	62.7	68.2	69.1	69.9

(Represents pounds per acre)

**SAFFLOWERS**

**Sprocket Configuration #2**

	1	2	3	4	4.5	5	5.5	6	6.5	7
20	9.4	16.0	24.6	31.2	35.2	39.2	42.7	46.2	47.0	47.8
22	8.5	14.5	22.4	28.4	32.0	35.6	38.8	42.0	42.7	43.5
C 24	7.8	13.3	20.5	26.0	29.3	32.7	35.6	38.5	39.2	39.8
u 26	7.2	12.3	18.9	24.0	27.1	30.2	32.8	35.5	36.2	36.8
l 28	6.7	11.4	17.6	22.3	25.1	28.0	30.5	33.0	33.6	34.1
t 30	6.3	10.7	16.4	20.8	23.5	26.1	28.5	30.8	31.3	31.9
32	5.9	10.0	15.4	19.5	22.0	24.5	26.7	28.9	29.4	29.9
w 34	5.5	9.4	14.5	18.4	20.7	23.1	25.1	27.2	27.6	28.1
i 36	5.2	8.9	13.7	17.3	19.6	21.8	23.7	25.7	26.1	26.6
d 38	4.9	8.4	12.9	16.4	18.5	20.6	22.5	24.3	24.7	25.2
t 40	4.7	8.0	12.3	15.6	17.6	19.6	21.4	23.1	23.5	23.9
h 42	4.5	7.6	11.7	14.9	16.8	18.7	20.3	22.0	22.4	22.8
44	4.3	7.3	11.2	14.2	16.0	17.8	19.4	21.0	21.4	21.7
46	4.1	7.0	10.7	13.6	15.3	17.0	18.6	20.1	20.4	20.8
48	3.9	6.7	10.3	13.0	14.7	16.3	17.8	19.3	19.6	19.9
50	3.8	6.4	9.8	12.5	14.1	15.7	17.1	18.5	18.8	19.1

(Represents pounds per acre)

**YELLOW MUSTARD SEED**

**Sprocket configuration #2**

	1	2	3	4	4.5	5	5.5	6	6.5	7
20	18.8	27.0	38.4	47.4	52.4	57.4	61.4	65.4	68.3	71.2
22	17.1	24.5	34.9	43.1	47.6	52.2	55.8	59.5	62.1	64.7
C 24	15.7	22.5	32.0	39.5	43.7	47.8	51.2	54.5	56.9	59.3
u 26	14.5	20.8	29.5	36.5	40.3	44.2	47.2	50.3	52.5	54.8
l 28	13.4	19.3	27.4	33.9	37.4	41.0	43.9	46.7	48.8	50.9
t 30	12.5	18.0	25.6	31.6	34.9	38.3	40.9	43.6	45.5	47.5
32	11.8	16.9	24.0	29.6	32.8	35.9	38.4	40.9	42.7	44.5
w 34	11.1	15.9	22.6	27.9	30.8	33.8	36.1	38.5	40.2	41.9
i 36	10.4	15.0	21.3	26.3	29.1	31.9	34.1	36.3	37.9	39.6
d 38	9.9	14.2	20.2	24.9	27.6	30.2	32.3	34.4	35.9	37.5
t 40	9.4	13.5	19.2	23.7	26.2	28.7	30.7	32.7	34.2	35.6
h 42	9.0	12.9	18.3	22.6	25.0	27.3	29.2	31.1	32.5	33.9
44	8.5	12.3	17.5	21.5	23.8	26.1	27.9	29.7	31.0	32.4
46	8.2	11.7	16.7	20.6	22.8	25.0	26.7	28.4	29.7	31.0
48	7.8	11.3	16.0	19.8	21.8	23.9	25.6	27.3	28.5	29.7
50	7.5	10.8	15.4	19.0	21.0	23.0	24.6	26.2	27.3	28.5

(Represents pounds per acre)

**SAFFLOWER**

**Additional Sprocket**

	1	2	3	4	4.5	5	5.5	6	6.5	7
20	31.0	55.4	84.2	111.2	127.0	142.8	156.7	170.6	172.7	174.8
22	28.2	50.4	76.5	101.1	115.5	129.8	142.5	155.1	157.0	158.9
C 24	25.8	46.2	70.2	92.7	105.8	119.0	130.6	142.2	143.9	145.7
u 26	23.8	42.6	64.8	85.5	97.7	109.8	120.5	131.2	132.8	134.5
l 28	22.1	39.6	60.1	79.4	90.7	102.0	111.9	121.9	123.4	124.9
t 30	20.7	36.9	56.1	74.1	84.7	95.2	104.5	113.7	115.1	116.5
32	19.4	34.6	52.6	69.5	79.4	89.3	97.9	106.6	107.9	109.3
w 34	18.2	32.6	49.5	65.4	74.7	84.0	92.2	100.4	101.6	102.8
i 36	17.2	30.8	46.8	61.8	70.6	79.3	87.1	94.8	95.9	97.1
d 38	16.3	29.2	44.3	58.5	66.8	75.2	82.5	89.8	90.9	92.0
t 40	15.5	27.7	42.1	55.6	63.5	71.4	78.4	85.3	86.4	87.4
h 42	14.8	26.4	40.1	53.0	60.5	68.0	74.6	81.2	82.2	83.2
44	14.1	25.2	38.3	50.5	57.7	64.9	71.2	77.5	78.5	79.5
46	13.5	24.1	36.6	48.3	55.2	62.1	68.1	74.2	75.1	76.0
48	12.9	23.1	35.1	46.3	52.9	59.5	65.3	71.1	72.0	72.8
50	12.4	22.2	33.7	44.5	50.8	57.1	62.7	68.2	69.1	69.9

(Represents pounds per acre)

**YELLOW MUSTARD SEED**

**Sprocket Configuration #3**

	1	2	3	4	4.5	5	5.5	6	6.5	7
20	7.2	10.6	14.6	18.2	20.1	22.0	23.9	25.8	26.5	27.2
22	6.5	9.6	13.3	16.5	18.3	20.0	21.7	23.5	24.1	24.7
C 24	6.0	8.8	12.2	15.2	16.8	18.3	19.9	21.5	22.1	22.7
u 26	5.5	8.2	11.2	14.0	15.5	16.9	18.4	19.8	20.4	20.9
l 28	5.1	7.6	10.4	13.0	14.4	15.7	17.1	18.4	18.9	19.4
t 30	4.8	7.1	9.7	12.1	13.4	14.7	15.9	17.2	17.7	18.1
32	4.5	6.6	9.1	11.4	12.6	13.8	14.9	16.1	16.6	17.0
w 34	4.2	6.2	8.6	10.7	11.8	12.9	14.1	15.2	15.6	16.0
i 36	4.0	5.9	8.1	10.1	11.2	12.2	13.3	14.3	14.7	15.1
d 38	3.8	5.6	7.7	9.6	10.6	11.6	12.6	13.6	13.9	14.3
t 40	3.6	5.3	7.3	9.1	10.1	11.0	12.0	12.9	13.3	13.6
h 42	3.4	5.0	7.0	8.7	9.6	10.5	11.4	12.3	12.6	13.0
44	3.3	4.8	6.6	8.3	9.1	10.0	10.9	11.7	12.0	12.4
46	3.1	4.6	6.3	7.9	8.7	9.6	10.4	11.2	11.5	11.8
48	3.0	4.4	6.1	7.6	8.4	9.2	10.0	10.8	11.0	11.3
50	2.9	4.2	5.8	7.3	8.0	8.8	9.6	10.3	10.6	10.9

(Represents pounds per acre)

PINTO BEANS Additional Sprocket

	Gate Opening									
	1	2	3	4	4.5	5	5.5	6	6.5	7
20	30.0	60.0	89.8	119.8	134.8	149.8	164.8	179.8	194.7	209.6
22	27.3	54.5	81.6	108.9	122.5	136.2	149.8	163.5	177.0	190.5
C 24	25.0	50.0	74.8	99.8	112.3	124.8	137.3	149.8	162.3	174.7
u 26	23.1	46.2	69.1	92.2	103.7	115.2	126.8	138.3	149.8	161.2
l 28	21.4	42.9	64.1	85.6	96.3	107.0	117.7	128.4	139.1	149.7
t 30	20.0	40.0	59.9	79.9	89.9	99.9	109.9	119.9	129.8	139.7
32	18.8	37.5	56.1	74.9	84.3	93.6	103.0	112.4	121.7	131.0
w 34	17.6	35.3	52.8	70.5	79.3	88.1	96.9	105.8	114.5	123.3
i 36	16.7	33.3	49.9	66.6	74.9	83.2	91.6	99.9	108.2	116.4
d 38	15.8	31.6	47.3	63.1	70.9	78.8	86.7	94.6	102.5	110.3
t 40	15.0	30.0	44.9	59.9	67.4	74.9	82.4	89.9	97.4	104.8
h 42	14.3	28.6	42.8	57.0	64.2	71.3	78.5	85.6	92.7	99.8
44	13.6	27.3	40.8	54.5	61.3	68.1	74.9	81.7	88.5	95.3
ft 46	13.0	26.1	39.0	52.1	58.6	65.1	71.7	78.2	84.7	91.1
48	12.5	25.0	37.4	49.9	56.2	62.4	68.7	74.9	81.1	87.3
50	12.0	24.0	35.9	47.9	53.9	59.9	65.9	71.9	77.9	83.8

(Represents pounds per acre)

SUNFLOWER SEEDS Sprocket configuration #2

	Gate Opening									
	1	2	3	4	4.5	5	5.5	6	6.5	7
20	5.2	9.0	14.2	18.4	20.8	23.2	25.5	27.8	0.0	0.0
22	4.7	8.2	12.9	16.7	18.9	21.1	23.2	25.3	0.0	0.0
C 24	4.3	7.5	11.8	15.3	17.3	19.3	21.3	23.2	0.0	0.0
u 26	4.0	6.9	10.9	14.2	16.0	17.8	19.6	21.4	0.0	0.0
l 28	3.7	6.4	10.1	13.1	14.9	16.6	18.2	19.9	0.0	0.0
t 30	3.5	6.0	9.5	12.3	13.9	15.5	17.0	18.5	0.0	0.0
32	3.3	5.6	8.9	11.5	13.0	14.5	15.9	17.4	0.0	0.0
w 34	3.1	5.3	8.4	10.8	12.2	13.6	15.0	16.4	0.0	0.0
i 36	2.9	5.0	7.9	10.2	11.6	12.9	14.2	15.4	0.0	0.0
d 38	2.7	4.7	7.5	9.7	10.9	12.2	13.4	14.6	0.0	0.0
t 40	2.6	4.5	7.1	9.2	10.4	11.6	12.8	13.9	0.0	0.0
h 42	2.5	4.3	6.8	8.8	9.9	11.0	12.1	13.2	0.0	0.0
44	2.4	4.1	6.5	8.4	9.5	10.5	11.6	12.6	0.0	0.0
ft 46	2.3	3.9	6.2	8.0	9.0	10.1	11.1	12.1	0.0	0.0
48	2.2	3.8	5.9	7.7	8.7	9.7	10.6	11.6	0.0	0.0
50	2.1	3.6	5.7	7.4	8.3	9.3	10.2	11.1	0.0	0.0

(Represents pounds per acre)

SUNFLOWER SEEDS Sprocket Configuration #3

	Gate Opening									
	1	2	3	4	4.5	5	5.5	6	6.5	7
20	2.2	3.6	5.8	7.2	8.3	9.4	10.1	10.8	11.0	11.2
22	2.0	3.3	5.3	6.5	7.5	8.5	9.2	9.8	10.0	10.2
C 24	1.8	3.0	4.8	6.0	6.9	7.8	8.4	9.0	9.2	9.3
u 26	1.7	2.8	4.5	5.5	6.4	7.2	7.8	8.3	8.5	8.6
l 28	1.6	2.6	4.1	5.1	5.9	6.7	7.2	7.7	7.9	8.0
t 30	1.5	2.4	3.9	4.8	5.5	6.3	6.7	7.2	7.3	7.5
32	1.4	2.3	3.6	4.5	5.2	5.9	6.3	6.8	6.9	7.0
w 34	1.3	2.1	3.4	4.2	4.9	5.5	5.9	6.4	6.5	6.6
i 36	1.2	2.0	3.2	4.0	4.6	5.2	5.6	6.0	6.1	6.2
d 38	1.2	1.9	3.1	3.8	4.4	4.9	5.3	5.7	5.8	5.9
t 40	1.1	1.8	2.9	3.6	4.2	4.7	5.1	5.4	5.5	5.6
h 42	1.0	1.7	2.8	3.4	4.0	4.5	4.8	5.1	5.2	5.3
44	1.0	1.6	2.6	3.3	3.8	4.3	4.6	4.9	5.0	5.1
ft 46	1.0	1.6	2.5	3.1	3.6	4.1	4.4	4.7	4.8	4.9
48	0.9	1.5	2.4	3.0	3.5	3.9	4.2	4.5	4.6	4.7
50	0.9	1.4	2.3	2.9	3.3	3.8	4.0	4.3	4.4	4.5

(Represents pounds per acre)

## **APPENDIX V**

### **MORRIS CALIBRATION DATA AND REGRESSIONS**

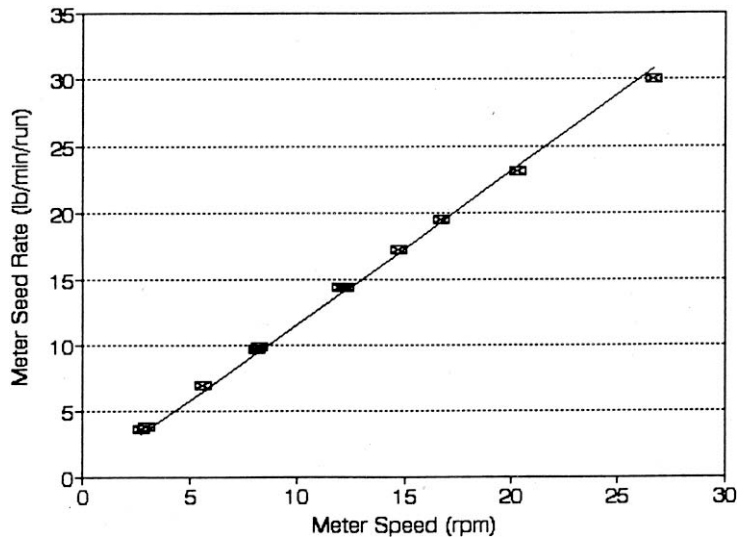
# Special Crops Metering

Meter: Morris Type: A	Date: June 1992 Seed: Canary	RL0692
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Meter Speed rpm	Sample Seed Weight lb      kg	Sample Time min	Meter Seed Rate lb/min
2.8	6.62    3.00	1.83	3.62
3.0	9.80    4.45	2.55	3.84
5.6	11.65   5.28	1.68	6.93
5.6	11.84   5.37	1.71	6.92
8.1	12.33   5.59	1.27	9.71
8.2	10.99   4.98	1.11	9.90
12	11.65   5.28	0.81	14.38
12.2	10.35   4.69	0.72	14.38
14.7	12.73   5.77	0.74	17.20
16.7	12.23   5.55	0.63	19.41
20.3	13.13   5.96	0.57	23.04
26.7	15.92   7.22	0.53	30.04

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.452755
R Squared	0.996862
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	1.154593
Std Err of Coef.	0.009821



# Special Crops Metering

Meter: Morris  
Type: B

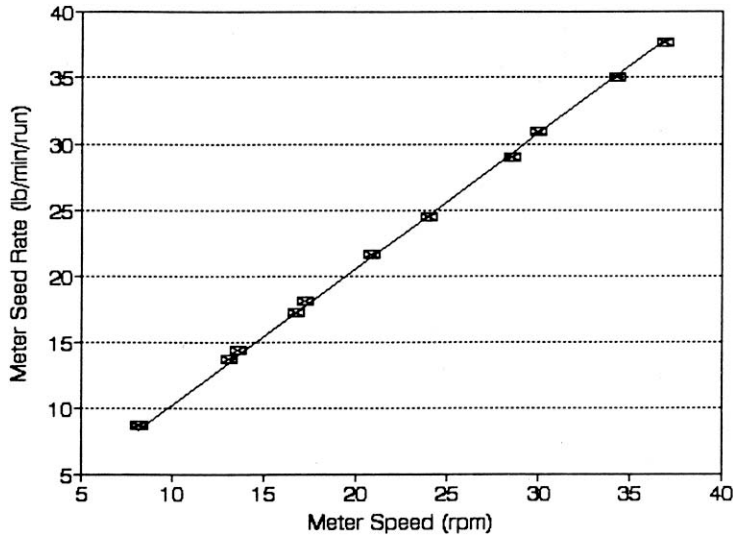
Date: June 1992  
Seed: Buckwheat

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
8.1	8.76	3.97	1.00	8.76
8.2	10.87	4.93	1.25	8.70
13.1	12.20	5.53	0.89	13.71
13.6	10.33	4.69	0.72	14.35
16.8	12.23	5.55	0.71	17.23
17.3	11.91	5.40	0.66	18.05
20.9	12.55	5.69	0.58	21.64
24	14.18	6.43	0.58	24.45
28.5	13.03	5.91	0.45	28.96
30	13	5.90	0.42	30.95
34.3	13.98	6.34	0.4	34.95
36.9	14.3	6.49	0.38	37.63

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.283826
R Squared	0.999166
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	1.025987
Std Err of Coef.	0.003566



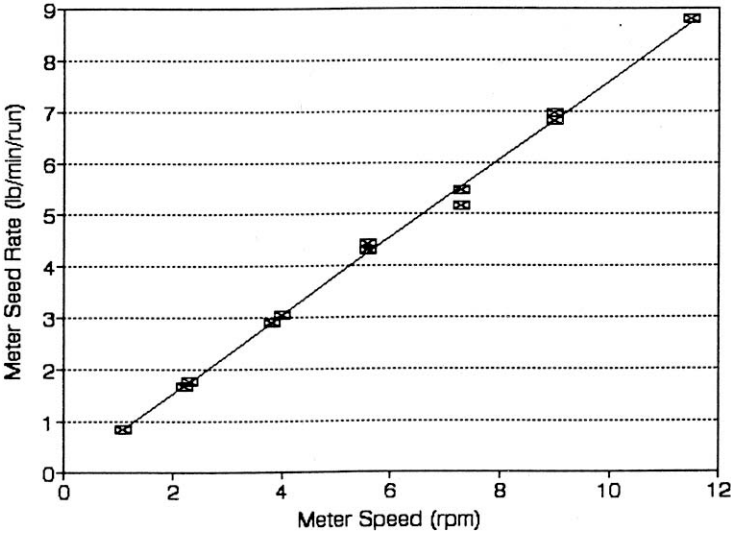
# Special Crops Metering

Meter: Morris Type: A	Date: June 1992 Seed: Caraway	RL0692
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Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
1.1	2.82	1.28	3.37	0.84
2.2	3.59	1.63	2.17	1.65
2.3	4.85	2.20	2.73	1.78
3.8	4.32	1.96	1.49	2.90
4.0	4.77	2.16	1.57	3.04
5.6	5.48	2.49	1.27	4.31
5.6	4.91	2.23	1.11	4.42
7.3	6.16	2.79	1.13	5.45
7.3	5.41	2.45	1.05	5.15
9	6.19	2.81	0.89	6.96
9	5.24	2.38	0.77	6.81
11.5	5.72	2.59	0.65	8.80

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.139885
R Squared	0.996665
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	0.758318
Std Err of Coef.	0.006223



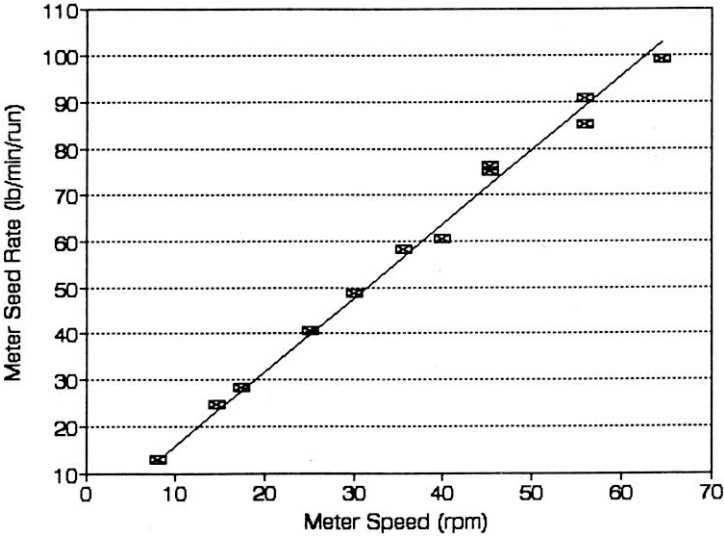
# Special Crops Metering

Meter: Morris Type: D	Date: June 1992 Seed: Pinto Beans	RL0692
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Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
8.1	20.23	9.18	1.55	13.05
14.7	17.48	7.93	0.70	24.97
17.3	17.06	7.74	0.60	28.43
25.1	17.43	7.91	0.43	40.53
30.0	16.63	7.54	0.84	48.91
35.6	18.07	8.20	0.31	58.29
40	18.21	8.2S	0.3	60.70
45.4	20.58	9.33	0.27	76.22
45.4	18.02	8.17	0.24	75.08
56	17.88	8.11	0.21	85.14
56	19.08	8.65	0.21	90.86
64.6	17.81	8.08	0.18	98.94

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	2.592614
R Squared	0.991296
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	1.539581
Std Err of Coef.	0.018544





# Special Crops Metering

Meter: Morris  
Type: B

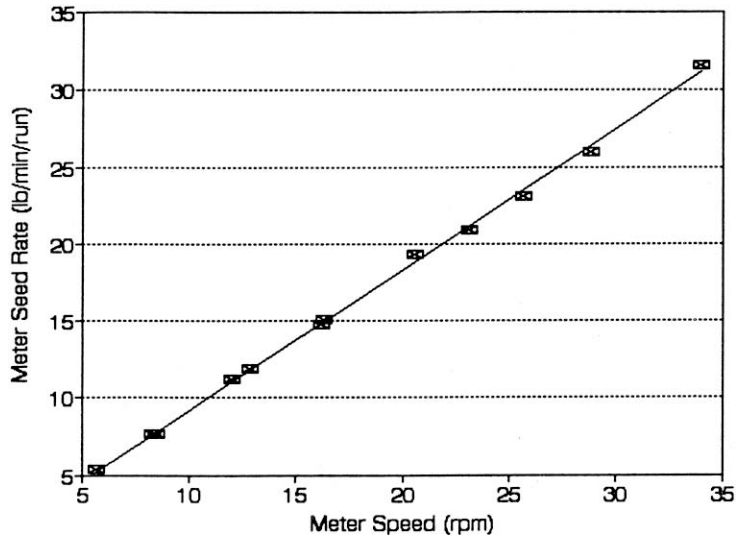
Date: June 1992  
Seed: Safflower

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
5.7	7.01	3.18	1.30	5.39
8.3	9.42	4.27	1.22	7.72
8.5	8.86	4.02	1.15	7.70
12.0	9.62	4.36	0.86	11.19
12.9	8.76	3.97	0.74	11.84
16.2	10.34	4.69	0.70	14.77
16.3	10.06	4.56	0.67	15.01
20.6	9.86	4.47	0.51	19.33
23.1	9.63	4.37	0.46	20.93
25.7	10.15	4.60	0.44	23.07
28.8	10.65	4.83	0.41	25.98
34.0	12.30	5.58	0.39	31.54

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.287323
R Squared	0.998737
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	0.915586
Std Err of Coef.	0.004229



# Special Crops Metering

Meter: Morris  
Type: C

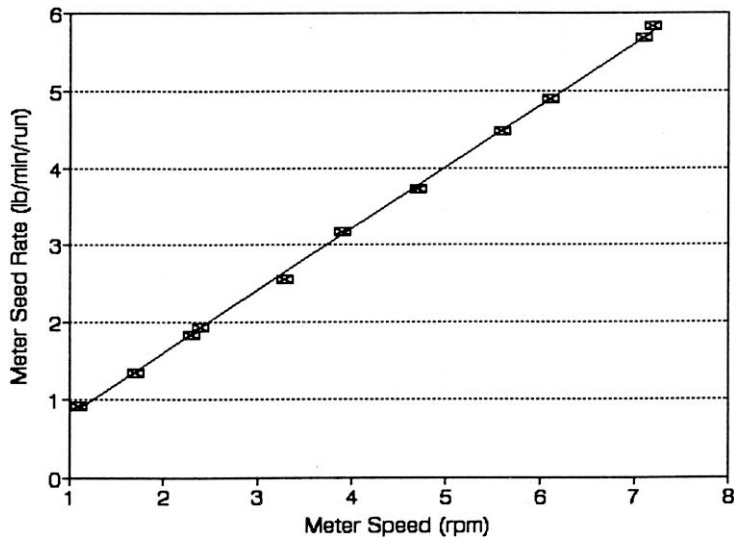
Date: June 1992  
Seed: Sunflower

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
1.1	3.66	1.66	3.98	0.92
1.1	2.80	1.27	3.04	0.92
1.7	3.49	1.58	2.58	1.35
2.3	4.56	2.07	2.50	1.82
2.4	4.83	2.19	2.50	1.93
3.3	4.06	1.84	1.59	2.55
3.9	5.64	2.56	1.78	3.17
4.7	5.21	2.36	1.4	3.72
5.6	6.23	2.83	1.39	4.48
6.1	6.22	2.82	1.27	4.90
7.1	6.03	2.74	1.06	5.69
7.2	4.89	2.22	0.84	5.82

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.040984
R Squared	0.999479
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	0.801757
Std Err of Coef.	0.002671



# Special Crops Metering

Meter: Morris  
Type: A

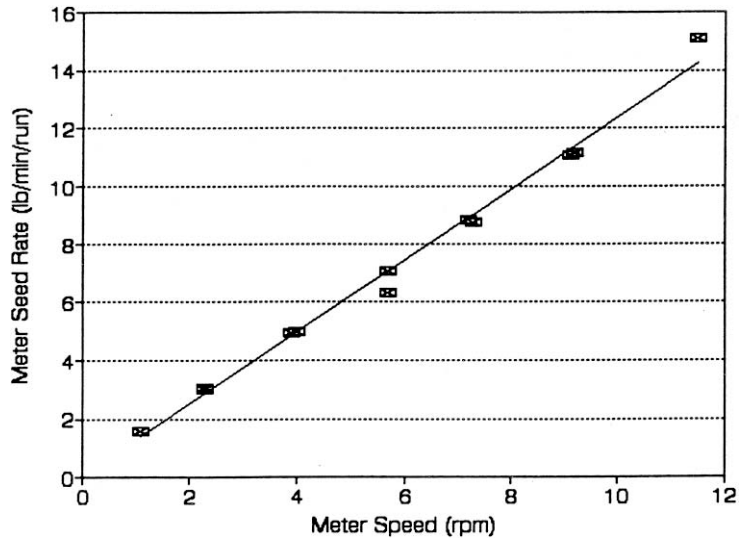
Date: June 1992  
Seed: Mustard

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
1.1	4.13	1.87	2.66	1.55
2.3	6.64	3.01	2.23	2.98
2.3	8.88	4.03	2.92	3.04
3.9	8.36	3.79	1.70	4.92
4.0	8.98	4.07	1.81	4.96
5.7	8.53	3.87	1.35	6.32
5.7	11.53	5.23	1.63	7.07
7.2	9.21	4.18	1.04	8.86
7.3	10.79	4.89	1.23	8.77
9.1	10.65	4.83	0.96	11.09
9.2	12.86	5.83	1.15	11.18
11.5	11.63	5.28	0.77	15.10

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.373906
R Squared	0.991297
No. of Observations	12
Degrees of Freedom	11
X Coefficient(s)	1.240689
Std Err of Coef.	0.016511



**APPENDIX VI**

**MORRIS SEED CURVES**

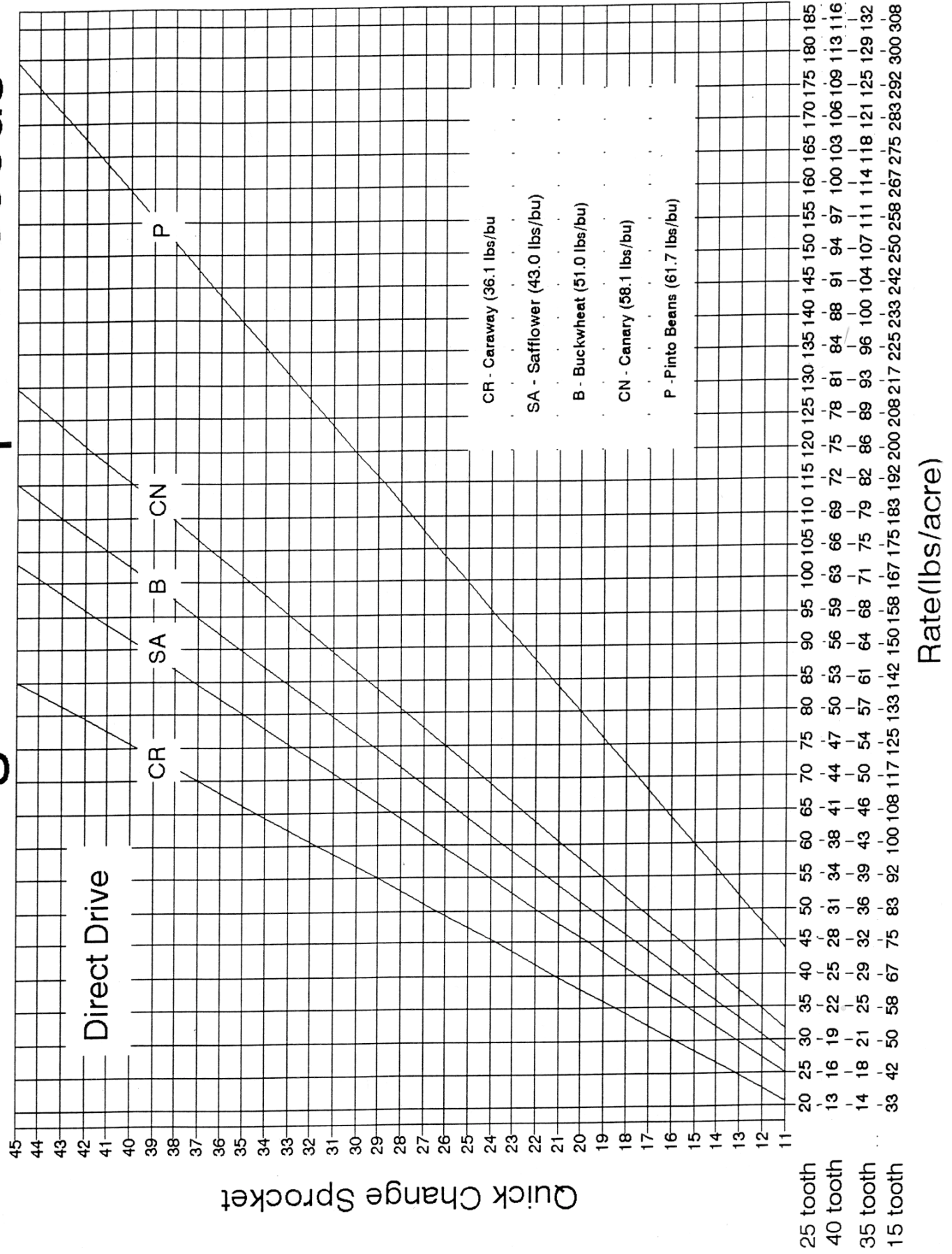
DELIVERY RATE IN POUNDS PER ACRE

Quick Sprocket	Rpm(Sta)	Rpm(slow)	MUSTAR (slow) set A	SUNFLO (slow) set C	CANARY set A	CARAWA set A	SAFFLO set B	BUCKWH set B	PINTO set D
11	8.32	0.87	3.55	2.29	31.72	20.83	25.15	28.18	43.93
12	9.08	0.95	3.87	2.50	34.60	22.72	27.44	30.75	47.92
13	9.84	1.02	4.19	2.71	37.48	24.61	29.73	33.31	51.91
14	10.60	1.10	4.52	2.92	40.37	26.51	32.01	35.87	55.91
15	11.35	1.18	4.84	3.13	43.25	28.40	34.30	38.43	59.90
16	12.11	1.26	5.16	3.34	46.14	30.30	36.59	40.99	63.89
17	12.87	1.34	5.49	3.54	49.02	32.19	38.87	43.56	67.89
18	13.62	1.42	5.81	3.75	51.90	34.08	41.16	46.12	71.88
19	14.38	1.50	6.13	3.96	54.79	35.98	43.45	48.68	75.87
20	15.14	1.58	6.45	4.17	57.67	37.87	45.74	51.24	79.87
21	15.89	1.65	6.78	4.38	60.55	39.76	48.02	53.81	83.86
22	16.65	1.73	7.10	4.59	63.44	41.66	50.31	56.37	87.85
23	17.41	1.81	7.42	4.80	66.32	43.55	52.60	58.93	91.85
24	18.16	1.89	7.74	5.00	69.20	45.44	54.88	61.49	95.84
25	18.92	1.97	8.07	5.21	72.09	47.34	57.17	64.05	99.83
26	19.68	2.05	8.39	5.42	74.97	49.23	59.46	66.62	103.83
27	20.43	2.13	8.71	5.63	77.85	51.12	61.74	69.18	107.82
28	21.19	2.21	9.03	5.84	80.74	53.02	64.03	71.74	111.81
29	21.95	2.29	9.36	6.05	83.62	54.91	66.32	74.30	115.81
30									
31	23.46	2.44	10.00	6.46	89.39	58.70	70.89	79.43	123.79
32	24.22	2.52	10.33	6.67	92.27	60.59	73.18	81.99	127.79
33									
34									
35	26.49	2.76	11.29	7.30	100.92	66.27	80.04	89.68	139.77
36									
37									
38	28.76	2.99	12.26	7.92	109.57	71.95	86.90	97.36	151.75
39									
40	30.27	3.15	12.91	8.34	115.34	75.74	91.47	102.49	159.73
41									
42									
43									
44	33.30	3.47	14.20	9.17	126.87	83.31	100.62	112.73	175.71
45	34.06	3.55	14.52		129.76	85.21	102.90	115.30	179.70

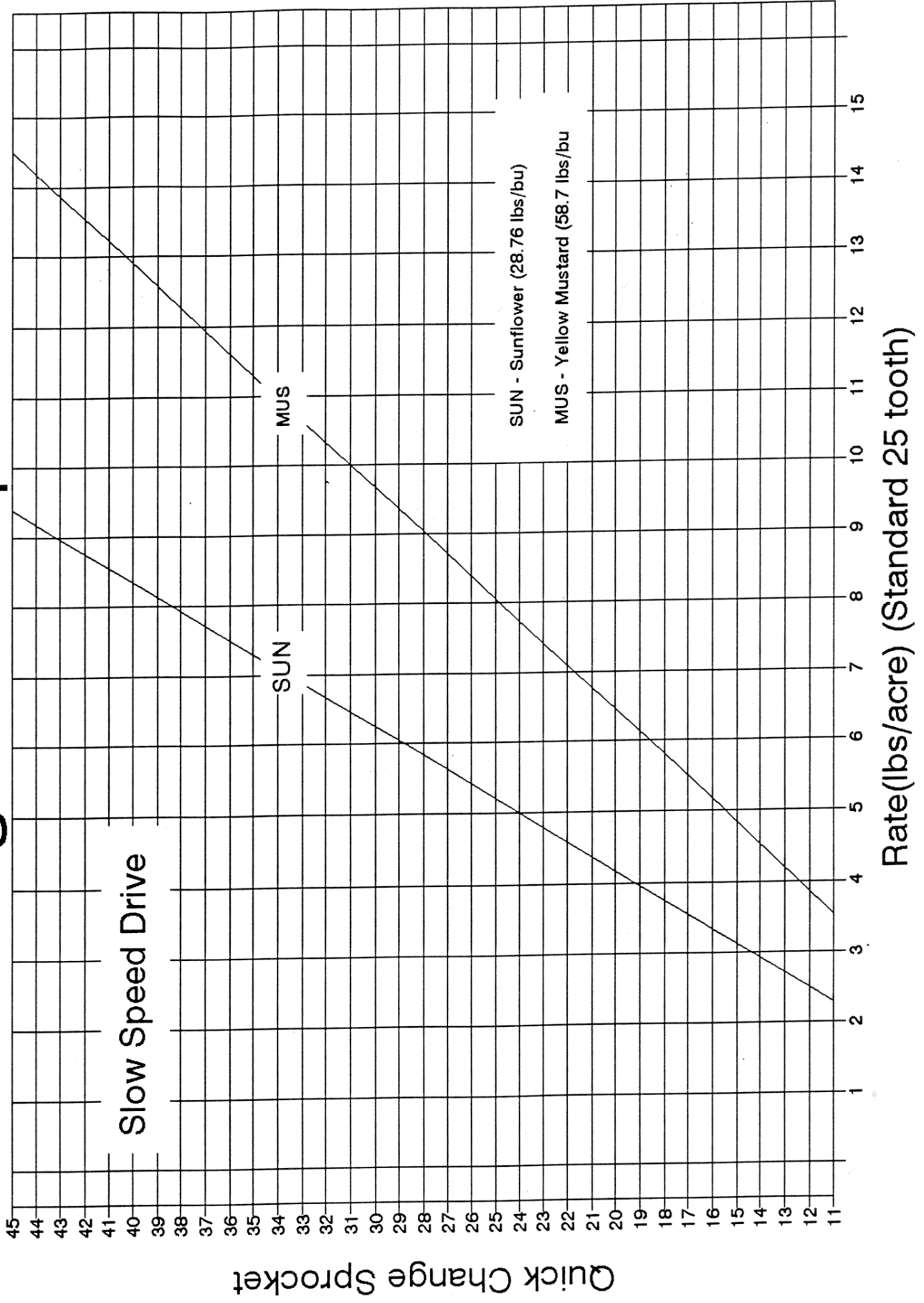
Sprocket Size (Teeth Number)

lbs/acre (slow)	lbs/acre	MUSTAR (slow) set A	SUNFLO (slow) set C	CANARY (stan.) set A	CARAWA (stan.) set A	SAFFLOW (stan.) set B	BUCKWH (stan.) set B	PINTO (stan.) set D
	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	5	3.1	4.8	1.7	2.6	2.2	2.0	1.3
2	10	6.2	9.6	3.5	5.3	4.4	3.9	2.5
3	15	9.3	14.4	5.2	7.9	6.6	5.9	3.8
4	20	12.4	19.2	6.9	10.6	8.7	7.8	5.0
5	25	15.5	24.0	8.7	13.2	10.9	9.8	6.3
6	30	18.6	28.8	10.4	15.8	13.1	11.7	7.5
7	35	21.7	33.6	12.1	18.5	15.3	13.7	8.8
8	40	24.8	38.4	13.9	21.1	17.5	15.6	10.0
9	45	27.9	43.2	15.6	23.8	19.7	17.6	11.3
10	50	31.0	48.0	17.3	26.4	21.9	19.5	12.5
11	55	34.1	52.8	19.1	29.0	24.1	21.5	13.8
12	60	37.2	57.6	20.8	31.7	26.2	23.4	15.0
13	65	40.3	62.4	22.5	34.3	28.4	25.4	16.3
14	70	43.4	67.2	24.3	37.0	30.6	27.3	17.5
15	75	46.5	71.9	26.0	39.6	32.8	29.3	18.8
16	80	49.6	76.7	27.7	42.3	35.0	31.2	20.0
17	85	52.7	81.5	29.5	44.9	37.2	33.2	21.3
18	90	55.8	86.3	31.2	47.5	39.4	35.1	22.5
19	95	58.9	91.1	32.9	50.2	41.5	37.1	23.8
20	100	62.0	95.9	34.7	52.8	43.7	39.0	25.0
21	105	65.1	100.7	36.4	55.5	45.9	41.0	26.3
	110	0.0	0.0	38.1	58.1	48.1	42.9	27.5
	115	0.0	0.0	39.9	60.7	50.3	44.9	28.8
	120	0.0	0.0	41.6	63.4	52.5	46.8	30.1
	125	0.0	0.0	43.4	66.0	54.7	48.8	31.3
	130	0.0	0.0	45.1	68.7	56.8	50.7	32.6
	135	0.0	0.0	46.8	71.3	59.0	52.7	33.8
	140	0.0	0.0	48.6	73.9	61.2	54.6	35.1
	145	0.0	0.0	50.3	76.6	63.4	56.6	36.3
	150	0.0	0.0	52.0	79.2	65.6	58.5	37.6
	155	0.0	0.0	53.8	81.9	67.8	60.5	38.8
	160	0.0	0.0	55.5	84.5	70.0	62.4	40.1
	165	0.0	0.0	57.2	87.1	72.2	64.4	41.3
	170	0.0	0.0	59.0	89.8	74.3	66.4	42.6
	175	0.0	0.0	60.7	92.4	76.5	68.3	43.8
	180	0.0	0.0	62.4	95.1	78.7	70.3	45.1
	185	0.0	0.0	64.2	97.7	80.9	72.2	46.3

# Seeding rate for Special seeds



# Seeding rate for Special seeds





## **APPENDIX VII**

### **NEW NOBLE CALIBRATION DATA AND REGRESSIONS**

# Special Crops Metering

Meter: New Noble Services  
Type: Fine

Date: June 1992  
Seed: Sunflower

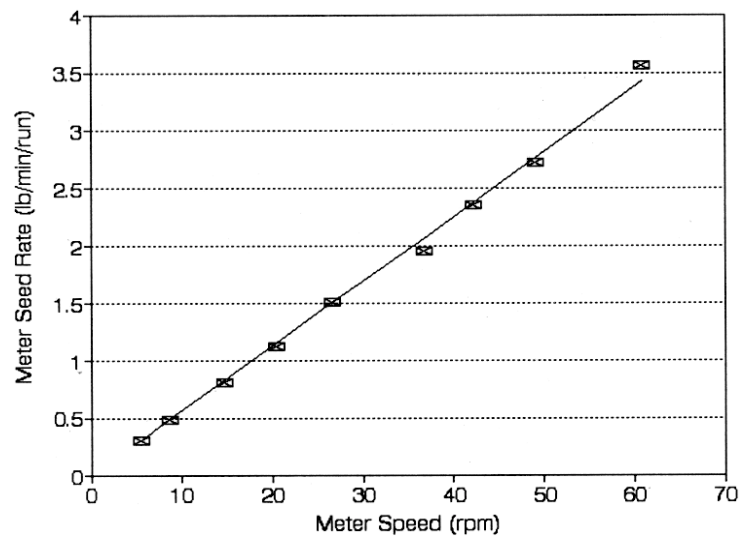
RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
--------------------	-----------------------------	-----------------------------	-----------------------	------------------------------

5.5	0.89	0.40	2.95	0.30
8.7	1.43	0.65	2.95	0.48
14.7	2.02	0.92	2.50	0.81
20.4	1.71	0.78	1.53	1.12
26.7	1.45	0.66	0.96	1.51
36.7	3.15	1.43	1.61	1.96
42.2	2.31	1.05	0.98	2.36
49.1	1.58	0.72	0.58	2.72
60.9	3.21	1.46	0.90	3.57

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.06562
R Squared	0.996415
No. of Observations	9
Degrees of Freedom	8
X Coefficient(s)	0.056375
Std Err of Coef.	0.000634



# Special Crops Metering

Meter: New Noble Services  
Type: Fine

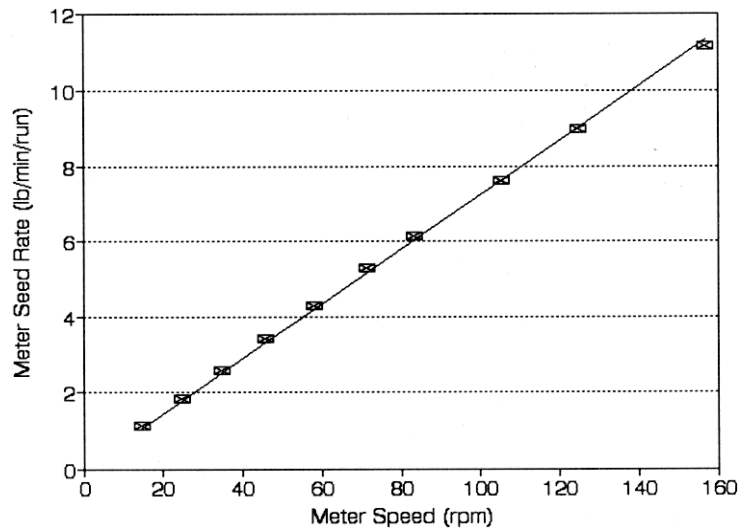
Date: June 1992  
Seed: Caraway

RL0692

Meter Speed rpm	Sample Seed Weight		Sample Time min	Meter Seed Rate lb/min
	lb	kg		
14.9	2.63	1.19	2.32	1.13
24.6	2.55	1.16	1.37	1.86
34.9	2.94	1.33	1.14	2.58
46.0	3.89	1.76	1.14	3.41
58.0	4.20	1.91	0.98	4.29
71.4	3.81	1.73	0.72	5.29
83.3	3.98	1.81	0.65	6.12
105.3	4.64	2.10	0.61	7.61
125.0	4.58	2.08	0.51	8.98
157.0	4.58	2.08	0.41	11.17

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.100853
R Squared	0.999038
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.072238
Std Err of Coef.	0.000379



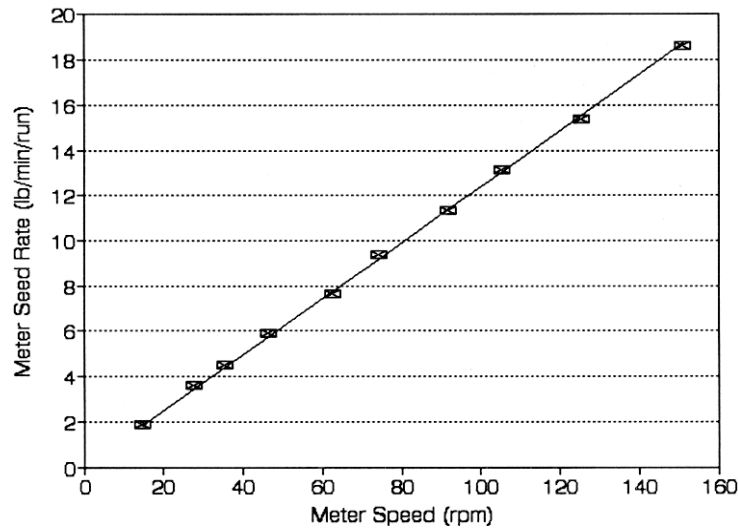
# Special Crops Metering

Meter: New Noble Services	Date: June 1992	RL0692
Type: Fine	Seed: Mustard (Yellow)	

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
14.9	3.80	1.72	2.00	1.90
27.8	7.02	3.18	1.95	3.60
35.4	7.15	3.24	1.58	4.53
46.5	6.44	2.92	1.09	5.91
62.5	7.44	3.37	0.97	7.67
74.1	6.96	3.16	0.74	9.41
91.7	7.25	3.29	0.64	11.33
105.3	7.89	3.58	0.60	13.15
125.4	7.06	3.20	0.46	15.35
151.0	10.05	4.56	0.54	18.61

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.141813
R Squared	0.99932
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.123875
Std Err of Coef.	0.000529



# Special Crops Metering

Meter: New Noble Services  
Type: Fine

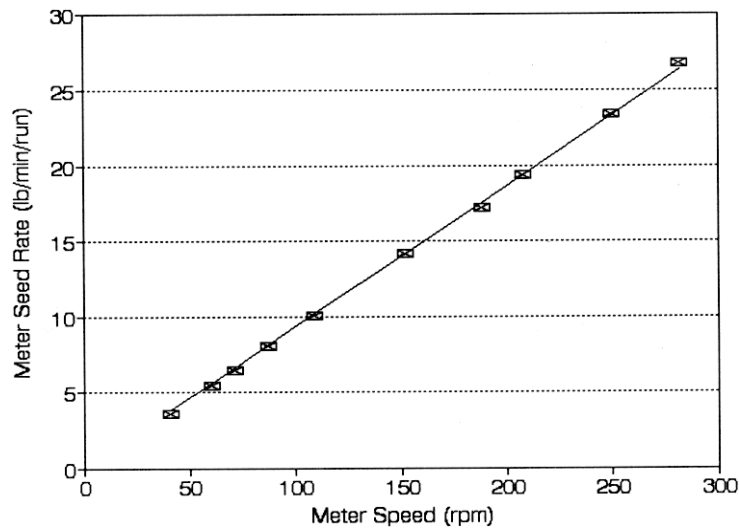
Date: June 1992  
Seed: Safflower

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
41.0	5.92	2.69	1.64	3.61
60.0	6.86	3.11	1.27	5.40
71.0	6.45	2.93	1.00	6.45
87.0	6.40	2.90	0.80	8.00
109.0	7.52	3.41	0.75	10.03
152.0	7.63	3.46	0.54	14.13
188.0	8.61	3.91	0.50	17.22
208.0	7.35	3.33	0.38	19.34
250.0	8.19	3.71	0.35	23.40
282.0	8.01	3.63	0.30	26.70

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.214952
R Squared	0.999278
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.093257
Std Err of Coef.	0.000411



# Special Crops Metering

Meter: New Noble Services  
Type: Coarse

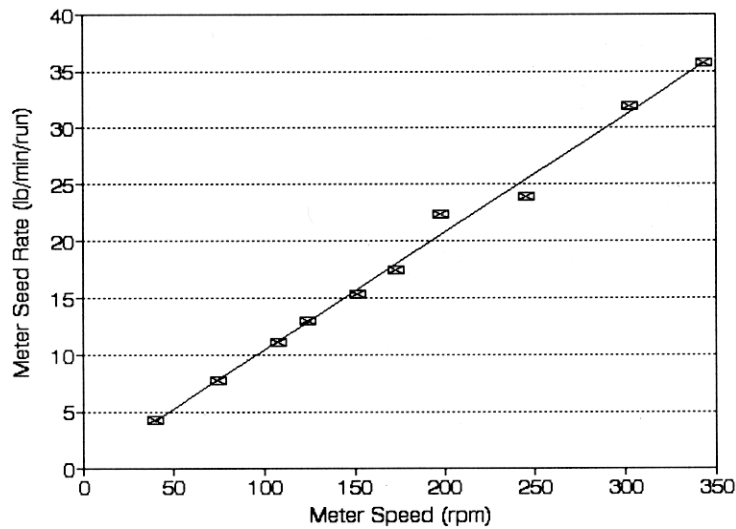
Date: June 1992  
Seed: Safflower

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
40.1	5.65	2.56	1.37	4.12
53.0	6.70	3.04	1.27	5.28
67.1	7.57	3.43	1.19	6.36
88.0	7.99	3.62	0.97	8.24
103.0	7.67	3.48	0.80	9.59
133.0	7.41	3.36	0.61	12.15
160.4	7.20	3.27	0.49	14.69
190.5	7.77	3.52	0.47	16.53
220.8	7.88	3.57	0.41	19.22
260.0	8.52	3.86	0.37	23.03

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.440422
R Squared	0.995157
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.089269
Std Err of Coef.	0.000932



# Special Crops Metering

Meter: New Noble Services  
Type: Fine

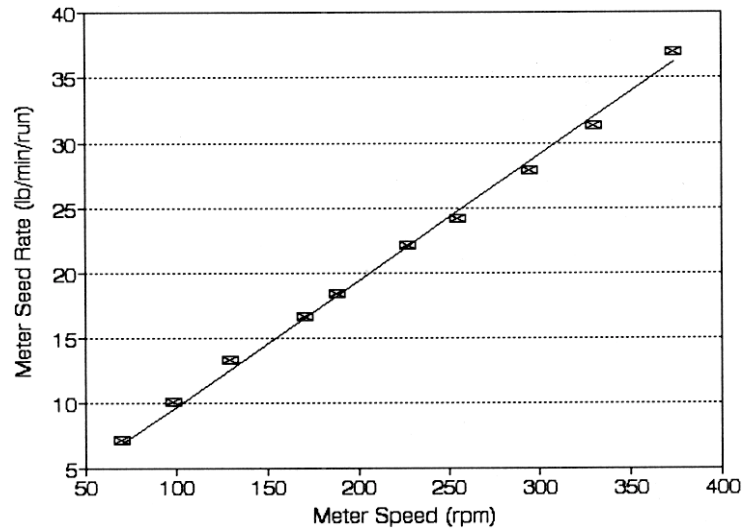
Date: June 1992  
Seed: Buckwheat

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
344.0	9.66	4.38	0.27	35.78
303.0	9.58	4.35	0.30	31.93
245.0	10.04	4.55	0.42	23.90
198.0	9.16	4.15	0.41	22.34
173.0	9.06	4.11	0.52	17.42
152.0	9.22	4.18	0.60	15.37
124.0	9.65	4.38	0.74	13.04
108.0	8.00	3.63	0.72	11.11
75.0	7.50	3.40	0.97	7.73
40.0	6.17	2.80	1.47	4.20

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.834341
R Squared	0.993323
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.10381
Std Err of Coef.	0.001325



# Special Crops Metering

Meter: New Noble Services  
Type: Coarse

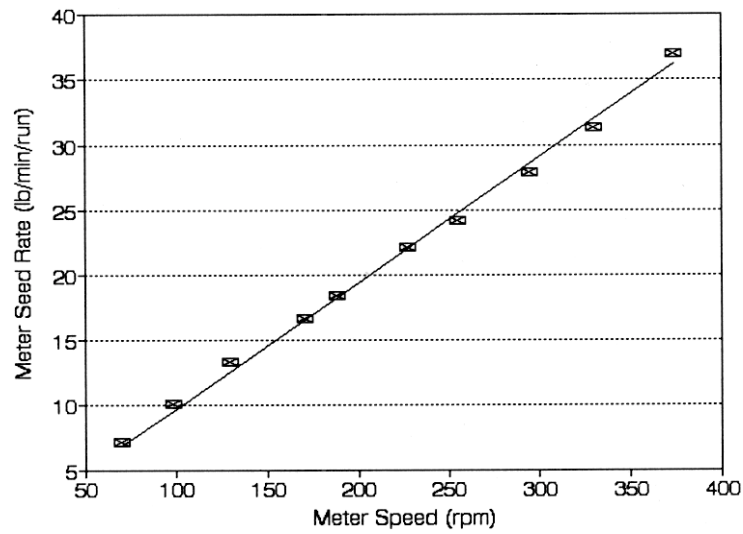
Date: June 1992  
Seed: Buckwheat

RL0692

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
70.2	7.85	3.56	1.09	7.20
98.3	8.16	3.70	0.81	10.07
129.3	8.13	3.69	0.61	13.33
170.5	8.65	3.92	0.52	16.63
188.1	9.20	4.17	0.50	18.40
227.3	9.93	4.50	0.45	22.07
255.3	8.94	4.06	0.37	24.16
294.8	9.76	4.43	0.35	27.89
330.6	9.38	4.25	0.30	31.27
373.6	10.35	4.69	0.28	36.96

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.587005
R Squared	0.996185
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.096772
Std Err of Coef.	0.000793





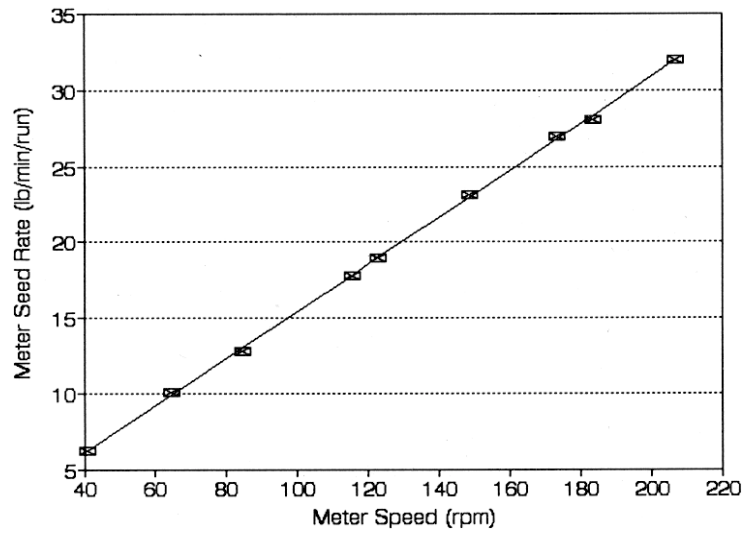
# Special Crops Metering

Meter: New Noble Services	Date: June 1992	RL0692
Type: Coarse	Seed: Canary Seed	

Meter Speed rpm	Sample Seed Weight		Sample Time min	Meter Seed Rate lb/min
	lb	kg		
40.7	9.75	4.42	1.55	6.29
64.4	11.52	5.23	1.14	10.11
84.5	13.45	6.10	1.05	12.81
115.3	13.16	5.97	0.74	17.78
123.0	12.28	5.57	0.65	18.89
148.5	13.87	6.29	0.60	23.12
173.5	12.94	5.87	0.48	26.96
183.5	13.75	6.24	0.49	28.06
207.0	13.13	5.96	0.41	32.02

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.17122
R Squared	0.999615
No. of Observations	9
Degrees of Freedom	8
X Coefficient(s)	0.154383
Std Err of Coef.	0.000415



# Special Crops Metering

Meter: New Noble Services  
Type: Fine

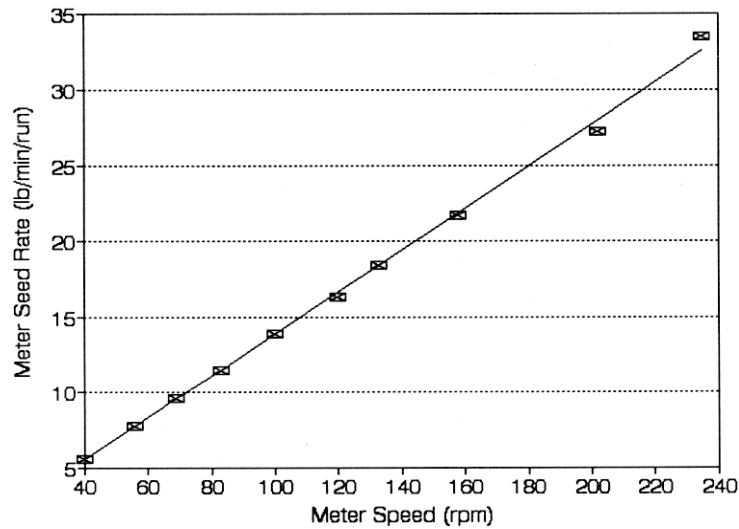
Date: June 1992  
Seed: Canary Seed

RL0692

Meter Speed rpm	Sample Seed Weight		Sample Time min	Meter Seed Rate lb/min
	lb	kg		
40.0	6.74	3.06	1.20	5.62
56.0	8.47	3.84	1.09	7.77
69.0	11.56	5.24	1.21	9.55
83.0	11.89	5.39	1.04	11.43
100.0	13.84	6.28	1.00	13.84
120.0	13.10	5.94	0.80	16.38
133.0	12.88	5.84	0.70	18.40
158.0	14.51	6.58	0.67	21.66
202.0	15.22	6.90	0.56	27.18
235.0	14.74	6.69	0.44	33.50

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	0.430271
R Squared	0.99765
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.138456
Std Err of Coef.	0.001016



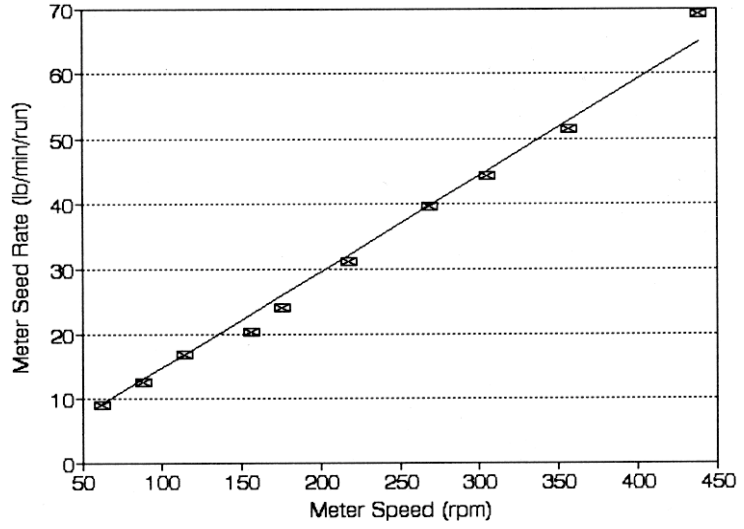
# Special Crops Metering

Meter: New Noble Services	Date: June 1992	RL0692
Type: Coarse	Seed: Pinto Beans	

Meter Speed rpm	Sample Seed Weight lb	Sample Seed Weight kg	Sample Time min	Meter Seed Rate lb/min
62.0	10.42	4.73	1.17	8.91
88.0	10.89	4.94	0.87	12.52
114.0	11.36	5.15	0.68	16.71
156.0	12.62	5.72	0.62	20.35
176.0	12.48	5.66	0.52	24.00
218.0	11.51	5.22	0.37	31.11
269.0	12.22	5.54	0.31	39.42
305.0	12.35	5.60	0.28	44.11
357.0	13.38	6.07	0.26	51.46
439.0	16.60	7.53	0.24	69.17

Meter Speed vs Seed Rate  
Regression Output:

Constant	0
Std Err of Y Est	1.943793
R Squared	0.989722
No. of Observations	10
Degrees of Freedom	9
X Coefficient(s)	0.147692
Std Err of Coef.	0.002483



**APPENDIX VIII**

**NEW NOBLE SEED DATA TABLES**

FRONT TANK TRIPLE FLYTE AUGER - SPECIAL SEEDS

RANGE	Sunflower		Caraway			Mustard		Safflower			Buckwheat			Canary		Wheat			11-51-00			
	1	2	3	4	5	1	2	3	4	5	4	5	6	4	5	4	5	6	3	4	5	6
S 64	4.5	9.0	31	8	15	9.9	20	40	10	20	11	22	44	15	29	14	28	57	67	17	33	67
P 32	2.2	4.5	15	15	31	4.9	9.9	20	20	40	22	44	89	29	59	28	57	114	33	33	67	133
R 31	2.2	4.3	15	16	32	4.8	9.5	19	20	41	23	46	91	30	61	29	59	118	32	34	69	138
O 30	2.1	4.2	14	16	33	4.6	9.2	19	21	42	24	47	94	31	63	30	61	122	31	36	71	142
C 29	2.0	4.1	14	17	34	4.5	8.9	18	22	44	24	49	98	32	65	31	63	126	30	37	74	147
K 28	2.0	3.9	13	18	35	4.3	8.6	17	23	45	25	51	101	34	67	33	65	130	29	38	76	152
E 27	1.9	3.8	13	18	36	4.2	8.3	17	23	47	26	52	105	35	70	34	68	135	28	40	79	158
T 26	1.8	3.6	12	19	38	4.0	8.0	16	24	49	27	55	109	36	72	35	70	140	27	41	82	164
S 25	1.8	3.5	12	20	39	3.8	7.7	15	25	51	28	57	113	38	75	36	73	146	26	43	85	171
E 24	1.7	3.4	12	20	41	3.7	7.4	15	26	53	30	59	118	39	78	38	76	152	25	44	89	178
L 23	1.6	3.2	11	21	43	3.5	7.1	14	28	55	31	62	123	41	82	40	79	159	24	46	93	186
C 22	1.5	3.1	11	22	45	3.4	6.8	14	29	58	32	64	129	43	85	41	83	166	23	49	97	194
E 21	1.5	2.9	10	23	47	3.2	6.5	13	30	60	34	67	135	45	90	43	87	174	22	51	102	203
T 20	1.4	2.8	10	25	49	3.1	6.2	12	32	63	35	71	142	47	94	46	91	182	21	53	107	213
I 19	1.3	2.7	9	26	52	2.9	5.9	12	33	67	37	75	149	49	99	48	96	192	20	56	112	225
J 18	1.3	2.5	9	27	55	2.8	5.5	11	35	70	39	79	157	52	104	51	101	203	19	59	119	237
O 17	1.2	2.4	8	29	58	2.6	5.2	11	37	74	42	83	167	55	111	54	107	214	18	63	126	251
N 16	1.1	2.2	8	31	61	2.5	4.9	10	40	79	44	89	177	59	117	57	114	228	17	67	133	267

REAR TANK DOUBLE FLYTE AUGER (WITHOUT TRIPLE SHOOT)

RANGE	Safflower			Buckwheat			Canary		Pinto		Wheat			11-51-00			
	3	4	5	4	5	6	4	5	5	6	4	5	6	3	4	5	6
S 64	38	9	19	10	21	41	16	33	31	63	18	37	73	77	19	38	77
P 32	19	19	38	21	41	82	33	65	63	125	37	73	146	38	38	77	154
R 31	18	20	39	21	42	85	34	68	65	129	38	75	151	37	40	79	159
O 30	18	20	40	22	44	88	35	70	67	134	39	78	156	36	41	82	164
C 29	17	21	42	23	45	91	36	72	69	138	40	81	161	35	42	85	170
K 28	17	22	43	23	47	94	37	75	72	143	42	83	167	34	44	88	176
E 27	16	22	45	24	49	97	39	78	74	149	43	87	173	32	46	91	182
T 26	15	23	47	25	51	101	40	81	77	154	45	90	180	31	47	95	189
S 25	15	24	48	26	53	105	42	84	80	160	47	94	187	30	49	99	197
E 24	14	25	51	27	55	109	44	87	84	167	49	97	195	29	51	103	205
L 23	14	26	53	29	57	114	46	91	87	174	51	102	203	28	54	107	214
C 22	13	28	55	30	60	119	48	95	91	182	53	106	213	26	56	112	224
E 21	12	29	58	31	63	125	50	100	95	191	56	111	223	25	59	117	235
T 20	12	30	61	33	66	131	52	105	100	201	58	117	234	24	62	123	246
S 19	11	32	64	35	69	138	55	110	106	211	62	123	246	23	65	130	259
E 18	11	34	67	36	73	146	58	116	111	223	65	130	260	22	68	137	274
O 17	10	36	71	39	77	155	62	123	118	236	69	138	275	20	72	145	290
N 16	9	38	76	41	82	164	65	131	125	251	73	146	292	19	77	154	308