Grading High Moisture Farmer Stock Peanut Lots[1]

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ABSTRACT

Farmers in the U.S. are required to market peanuts as identity preserved lots with less than or equal to 10.49% moisture content (MC) wet basis. A comparison of peanut grades, weights, and values at moisture contents above (Hmc) and below (Lmc) 10.49% was conducted at 16 buying points during crop year 1998 and at 22 points in 1999. Buying points were located in all three U.S. peanut-producing areas both years. Randomly selected Hmc lots of runner-, spanish-, and virgina-type peanuts were weighed and unofficially graded by Federal State Inspection Serv. personnel with standard procedures. Lots were cured to MC ≤ 10.49% and graded officially for farmer marketing. Data from both years were combined for analysis. Both Hmc and Lmc grades were conducted on 543, 62, and 81 runner-, spanish-, and virginia-type lots, respectively. Moisture contents for runner type averaged 16.3 % at Hmc grading and 8.7% at Lmc grading; for spanish type, 15.8 and 8.7%; and for virginia type, 17.0 and 9.1%. Only 3.8% of all lots evaluated had Hmc moisture contents greater than 25%. Equations were derived that predicted Lmc grade factors, lot weights (LW) and lot values (LV) from measured Hmc factors by peanut type. Equations to estimate Lmc LW and LV for runner-type peanuts had correlation coefficients of 0.998 and 0.997, respectively. Correlation coefficients for spanish type Lmc LW and LV were 0.998 and 0.995 and for virginia type 0.996 and 0.993, respectively. Derived equations for Lmc grade factors, LW, and LV may offer an alternative modification in U.S. peanut grading and farmer marketing allowing an increase in the maximum MC at grading.

Key Words: *Arachis hypogaea* L., marketing, moisture content.

The value of farmer stock (FS) peanuts in the U.S. is based on grade factors in samples extracted from lots at the buying point (1). Except for seed, grading standards require that the average kernel moisture content (MC) (wet basis) of the sample be less than 10.5% (3). Peanut buying points must therefore preserve peanut lot identity until after drying (< 10.5 MC) which limits use of continuous flow dryers and alternative methods of inventory control requiring lot mixing prior to marketing. Grading peanut lots and allowing farmer marketing at MC > 10.49% would remove this barrier and possibly provide more efficient curing and handling procedures.

The objective of this research was to develop mathematical relationships between high moisture content (Hmc) and low moisture content (Lmc) farmer stock peanut grades and lot values.

Materials and Methods

Sixteen peanut buying points in six states during 1998 and 22 buying points in seven states during 1999 participated in data collection for the study (Table 1). Data were collected from all three U.S. peanut-producing areas each year. Participating buying points had an on-site commercial curing facility. Most buying points utilized a Dickey John GAC II or GAC 2000 moisture meter to determine kernel moisture during grading. Cooperating buying points provided lots for the study on as many days as possible during harvest. Each day, the buying point manager selected lots for the study from those arriving at the buying point with MC > 10.49% (Hmc). Selected Hmc lots were "unofficially graded" by Federal State Inspection Serv. (FSIS) personnel with standard grading procedures ignoring the maximum kernel moisture requirement. A pneumatic sampler was used to extract a sample of FS peanuts from each lot. The extracted sample was cleaned, shelled, and graded utilizing an "unofficial FV-95" as the data sheet. Along with the Hmc grade, gross weight of the Hmc lot was obtained prior to curing. Following Hmc grading, each lot was artificially cured to a MC ≤ 10.49% (Lmc) using procedures and equipment normally utilized by the buying point. After curing, the test lots were officially graded (Lmc) and marketed as usual. Following official grading, all grade factors from the official FV-95 (Lmc grades) generated at farmer marketing and the "unofficial FV-95" (Hmc grades) were paired and retained for

Table 1. The number of buying points participating in the study by state and year.

Buying point location	No. of buying points CY 1998	CY 1999
Alabama	3	3
Florida	1	2
Georgia	6	9
North Carolina	2	3
Oklahoma	1	2
Texas	3	1
Virginia	0	2
Total	16	22

[1]Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the USDA and does not imply its approval to the exclusion of other products that may be available.

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comparison and data analysis. These paired data were combined across years for each peanut type in the analysis to provide comparisons with current U.S. marketing regulations by type. Data combined across years also provided a more inclusive evaluation of variances in peanut quality and production environments in prediction equation development. Linear regression equations were derived from Hmc and Lmc data to allow prediction of individual Lmc grade factors, lot weight (LW), and lot dollar value (LV). Grade factors, LW, or LV along with kernel MC from Hmc grading were used as independent variables in the equations (2). The general equation for each Lmc variable was of the form:

$$\text{LmcV} = \text{IC} + (\text{HmcV} * M_1) + (\text{HmcMC} * M_2) + [(\text{HmcV} * \text{HmcMC}) * M_3] \qquad \text{[Eq. 1]}$$

where

V takes on value of the following variables: % foreign material (FM), % loose shelled kernels (LSK), % fancy pods (FP), % extra large kernels (ELK), % sound mature kernels (SMK), % sound splits (SS), % sound mature kernels plus sound splits (SMK + SS), % other kernels (OK), % total kernels (TK), % hulls, % damaged kernels (DK), LW, or LV,

IC = intercept of independent variable V,
HmcV = Hmc variable corresponding with LmcV variable,
M_1 = coefficient for the HmcV term,
HmcMC = kernel MC at Hmc grading,
M_2 = coefficient for HmcMC term,
M_3 = coefficient for the interaction between HmcV and HmcMC terms.

Results and Discussion

A total of 686 lots were graded during the 2-yr study (Table 2). Runner-type peanuts comprised 79.2% of the peanuts used in the study while 9.0% were spanish type, and 11.8% were virginia type (Table 2). The sampling of peanuts included 64.1% from the Southeast, 26.2% from the Southwest, and 9.6% from Virginia/Carolina (Table 2). Though the percentage of peanut lots graded during the study was not exactly the same percentage as current U.S. peanut production by type and area, data collected were assumed adequate for comparative analysis since sampling by type and production followed the same general trends.

Average MC for the runner-, spanish-, and virginia-type peanuts evaluated were within 1.2% for Hmc grading and 0.4% for Lmc grading. Kernel MC for Hmc runner-type peanuts ranged from 11 to 45 with a mean of 16.3% and a standard deviation (SD) of 4.3 (Table 3). For the spanish-type peanuts, Hmc kernel MC ranged from 11 to 26% with a mean of 15.8% and a SD of 3.3 (Table 4). Kernel MC for Hmc virginia-type peanuts ranged from 11 to 31% with a mean of 17.0% and a SD of 4.4 (Table 5). Kernel MC for Lmc runner-type peanuts ranged from 5 to 10% with a mean of 8.7% and a SD of 1.1 (Table 3). For Lmc spanish-type peanuts, kernel MC ranged from 7 to 10% with a mean of 8.7% and a SD of 1.0 (Table 4). For Lmc virginia-type peanuts, kernel MC ranged from 6 to 11% with a mean of 9.1% and a SD of 1.2 (Table 5).

Cumulative frequency distributions for Hmc lots for specific kernel moisture contents by peanut type are presented in Table 6. The distributions indicate that

Table 2. The number of peanut lots evaluated by state, peanut type, and year.

Buying point location	No. of lots evaluated by peanut type and year						
	Runner-type		Spanish-type		Virginia-type		
	1998	1999	1998	1999	1998	1999	Total
Alabama	37	54	--	--	--	--	91
Florida	35	51	--	2	--	--	88
Georgia	107	108	--	45	1	--	261
North Carolina	--	--	--	--	25	30	55
Oklahoma	9	2	4	10	--	--	25
Texas	103	37	1	--	11	3	155
Virginia	--	--	--	--	--	11	11
Total	291	252	5	57	37	44	686

Table 3. Average grade factor, lot weight, and lot value determined during high (Hmc) and low (Lmc) moisture content (MC) grading of runner-type peanuts during the experiment.

Variable	Grade MC	Min.	Max.	Mean[a]	S.D.
		------------ % ----------			
Kernel moisture content (MC)	Hmc	11	45	16.3 a	4.3
	Lmc	5	10	8.7 b	1.1
Foreign material (FM)	Hmc	0	21	4.1 a	3.0
	Lmc	0	17	3.8 a	2.4
Loose shelled kernels (LSK)	Hmc	0	13	2.6 a	1.7
	Lmc	0	10	2.5 a	1.7
Sound mature kernels (SMK)	Hmc	51	80	71.8 a	4.3
	Lmc	44	77	68.0 b	5.4
Sound splits (SS)	Hmc	0	15	1.4 b	1.4
	Lmc	0	14	3.5 a	2.5
SMK + SS	Hmc	55	81	73.2 a	4.3
	Lmc	50	81	71.5 b	5.1
Other kernels (OK)	Hmc	0	12	3.8 b	2.0
	Lmc	0	19	5.1 a	2.7
Total kernels (TK)	Hmc	62	83	77.6 a	2.9
	Lmc	65	83	77.1 b	2.9
Hulls	Hmc	17	39	22.2 b	2.9
	Lmc	17	35	22.7 a	2.9
Damaged kernels (DK)	Hmc	0	8	0.5 a	0.7
	Lmc	0	3	0.5 a	0.6
		------------ t ------------			
Lot net weight (LW)	Hmc	0.7	27.5	7.0 a	5.4
	Lmc	0.7	25.5	6.2 b	4.9
		------------ $ ----------			
Lot value (LV)	Hmc	418	16261	3782 a	3011
	Lmc	409	15871	3589 a	2888

[a]Means for each variable followed by the same letter are not significantly different (P = 0.05).

Table 4. Average grade factor, lot weight, and lot value determined during high (Hmc) and low (Lmc) moisture content (MC) grading of spanish-type peanuts during the experiment.

Variable	Grade MC	Min.	Max.	Mean[a]	S.D.
		%			
Kernel moisture content (MC)	Hmc	11	26	15.8 a	3.3
	Lmc	7	10	8.7 b	1.0
Foreign material (FM)	Hmc	1	10	3.7 a	2.0
	Lmc	1	13	4.3 a	2.4
Loose shelled kernels (LSK)	Hmc	1	6	2.5 a	1.2
	Lmc	1	5	2.6 a	1.1
Sound mature kernels (SMK)	Hmc	61	75	68.9 a	3.3
	Lmc	52	72	65.4 b	4.4
Sound splits (SS)	Hmc	0	8	1.2 b	1.3
	Lmc	0	14	2.8 a	3.3
SMK + SS	Hmc	62	75	70.1a	2.9
	Lmc	61	74	68.3b	2.9
Other kernels (OK)	Hmc	2	10	3.9b	1.4
	Lmc	2	11	5.1a	1.6
Total kernels (TK)	Hmc	67	78	74.8 a	2.5
	Lmc	68	79	74.0 a	2.3
Hulls	Hmc	21	33	24.9 b	2.7
	Lmc	21	32	25.9 a	2.4
Damaged kernels (DK)	Hmc	0	3	0.8 a	0.7
	Lmc	0	2	0.5 b	0.6
		t			
Lot net weight (LW)	Hmc	2.2	14.4	5.1 a	1.7
	Lmc	2.0	13.2	4.6 a	1.5
		$			
Lot value (LV)	Hmc	1120	7546	2622 a	882
	Lmc	1070	7274	2502 a	847

[a]Means for each variable followed by the same letter are not significantly different (P = 0.05).

only 2.9% of the runner type lots and 3.7% of the virginia type lots graded prior to curing had kernel moisture contents greater than 26%. Only 1.6% of the spanish type lots had Hmc kernel moisture contents greater than 23%. Further, since 96.2% of all lots graded at Hmc during this study had kernel moisture contents ranging between 11-25%, inferences relative to equations and conclusions developed from this study outside of this MC range should be limited. Also, it should be noted that efficiencies and shelling rates of shellers currently used by FSIS for grading decrease as kernel MC increases which also limits maximum MCs for grading. Additionally, the accuracy of electronic moisture meters currently on the market may be questionable above 25% (C.L. Butts, unpubl. data, 2000). Some meters in use by the industry do not have calibration curves for peanuts greater than 23% MC.

In addition to kernel MC, comparisons of other grade factors, LW, and LV are presented in Tables 3-5. Unless otherwise noted, means tests were conducted at the (P = 0.05) level. Within the data set for the study, the runner-type HmcLSK varied from 0 to 13% with an average of 2.6% and SD of 1.7% (Table 3). Runner-type LmcLSK varied from 0 to10% with an average of 2.5% and a SD of 1.7% (Table 3). Means for percentage foreign material (FM), percentage loose shelled kernels (LSK), and LV observed when graded at Hmc and Lmc were not significantly different for any of the peanut types (Tables 3-5). Similarly, Hmc and Lmc means for percent damaged kernels (DK) for the runner-type peanuts (Table 3); total kernels (TK), and LW for the spanish-type peanuts (Table 4); and fancy pods (FP), sound mature kernels plus sound splits (SMK +SS), total kernels (TK), hulls, DK, and LW for the virginia-type peanuts (Table 5) were not significantly different. Other Hmc and Lmc variables not detailed above were significantly different (Tables 3-5).

Table 5. Average grade factor, lot weight, and lot value determined during high (Hmc) and low (Lmc) moisture content (MC) grading of virginia-type peanuts during the experiment.

Variable	Grade MC	Min.	Max.	Mean[a]	S.D.
		%			
Kernel moisture content (MC)	Hmc	11	31	17.0 a	4.4
	Lmc	6	11	9.1 b	1.2
Foreign material (FM)	Hmc	2	16	4.5 a	2.7
	Lmc	1	10	4.7 a	2.2
Loose shelled kernels (LSK)	Hmc	1	15	3.6 a	2.9
	Lmc	1	14	3.7 a	2.8
Fancy pods (FP)	Hmc	55	95	75.9 a	11.3
	Lmc	45	95	75.4 a	12.2
Extra large kernels (ELK)	Hmc	29	63	46.4 a	7.8
	Lmc	20	61	38.3 b	9.4
Sound mature kernels (SMK)	Hmc	56	74	68.3 a	3.6
	Lmc	56	73	65.7 b	4.2
Sound splits (SS)	Hmc	0	7	0.8 b	1.1
	Lmc	0	10	3.1 a	2.3
SMK + SS	Hmc	56	75	69.1 a	3.5
	Lmc	57	75	68.8 a	3.6
Other kernels (OK)	Hmc	1	7	2.1 b	1.0
	Lmc	1	6	2.7 a	1.4
Total kernels (TK)	Hmc	62	77	71.8 a	2.8
	Lmc	64	76	72.0 a	2.4
Hulls	Hmc	21	37	27.5 a	2.7
	Lmc	23	35	27.8 a	2.3
Damaged kernels (DK)	Hmc	0	3	0.6 a	0.8
	Lmc	0	3	0.5 a	0.7
		t			
Lot net weight (LW)	Hmc	1.4	23.7	7.0 a	6.0
	Lmc	1.3	22.8	6.1 a	5.6
		$			
Lot value (LV)	Hmc	725	13124	3632 a	3233
	Lmc	617	13996	3458 a	3257

[a]Means for each variable followed by the same letter are not significantly different (P = 0.05).

The runner-type SMK mean for Hmc grading was 3.8% higher than the SMK mean for Lmc grading; SMK + SS was 1.7% higher; TK was 0.5% higher; and LW was 0.8 t higher (Table 3). The spanish-type percentage SMK for Hmc grading averaged 3.5% higher than the mean SMK for Lmc grading; SMK + SS was 1.8% higher; and DK was 0.3% higher (Table 4). In the virginia-type

Table 6. The number (n) and cumulative distribution of lots with kernel moisture contents > 10.49 % (Hmc) graded during the study by peanut type.

Kernel moisture content at HMC grading	Distribution of kernel moisture content at high moisture grading					
	Runner type		Spanish type		Virginia type	
%	n	Cumulative %	n	Cumulative %	n	Cumulative %
11	36	6.6	4	6.5	4	4.9
12	64	18.4	7	17.7	6	12.4
13	70	31.3	9	32.3	9	23.5
14	57	41.8	2	35.5	10	35.8
15	55	51.9	10	51.6	7	44.4
16	50	61.1	9	66.1	5	50.6
17	37	68.0	3	71.0	7	59.3
18	42	75.7	2	74.2	2	61.7
19	27	80.7	8	87.1	9	72.8
20	26	85.5	4	93.6	9	84.0
21	20	89.1	1	95.2	4	88.9
22	9	90.8	1	96.8	3	92.6
23	10	92.6	1	98.4	2	95.1
24	10	94.5	--	--	--	--
25	9	96.1	--	--	--	--
26	5	97.1	1	100.0	1	96.3
27	3	97.6			--	--
28	5	98.5			--	--
29	5	99.5			--	--
30	1	99.6			1	97.5
31	1	99.8			2	100.0
45	1	100.0				

peanuts, the percentage extra large kernels (ELK) for Hmc grading averaged 8.1% higher than for Lmc grading. The SMK was 2.6% higher when graded at Hmc than at Lmc (Table 5). Sound splits (SS) averaged 2.1, 1.6, and 2.3% lower in the runner-, spanish-, and virginia-type peanuts, respectively, at Hmc than at Lmc. Similarly, the percentage OK was about 1% lower for Hmc grading than for Lmc for all three peanut types. Some, but not all, of the differences in the above means may be attributed to changes in pod and kernel physical size associated with moisture loss during curing. Changes in shelling characteristics such as increasing SS from Hmc to Lmc grading agree with established literature (1).

Estimates of intercepts, regression coefficients, and correlation coefficients for runner-, spanish-, and virginia-type peanuts are presented in Tables 7-9, respectively. The significance (P = 0.05, 0.01, 0.001) of each independent variable in each equation is presented also. As an example and utilizing Table 7, the equation derived for predicting Lmc runner-type LSK from a Hmc grade is as follows:

$$\text{LmcLSK} = 0.3962 + (\text{HmcLSK} * 0.5299) + (\text{HmcMC}*0.0263) + [(\text{HmcLSK}*\text{HmcMC})*0.0076] \quad \text{[Eq. 2]}$$

The correlation coefficient (R) for this equation is 0.66 and the HmcLSK term is highly significant (P = 0.001) (Table 7). A comparison of the Type II Sums of Squares (SS) generated during the regression analysis for the LmcLSK substantiated that HmcLSK had a much higher influence on the prediction equation than HmcMC or the interaction between HmcLSK and HmcMC (2). The HmcLSK term accounted for approximately 87.8% of the total Type II SS from the LmcLSK equation regression; HmcMC, 7.3%; and interactions between the two independent variables, 5.9. Equations for the remaining runner-type dependent variables are presented in Table 7.

The equation for LmcFM was significantly affected by both HmcFM and the interaction between HmcFM and HmcMC (Table 7). The equation for LmcSMK was significantly affected by both HmcSMK and the interaction between HmcSMK and HmcMC (Table 7). LmcSMK varied from 44 to 77% with a mean of 68.0% and a SD of 5.4 (Table 3). Similar comparisons as made above for runner-type LSK, FM, and SMK can be made for other runner-, spanish-, and virginia-type LmcV utilizing Tables 3-5 detailing dependent variable means and Tables 7-9 detailing equations developed for Lmc dependent variables. In addition, correlation coefficients are presented in Tables 7-9 and indicate varying degrees of how well the derived linear equations predicted the corresponding Lmc variables collected during

Table 7. Derived intercepts and coefficients for prediction equations for runner-type peanuts for estimating low MC (kernel MC ≤ 10.49%) grade factors, net weight, and lot value from corresponding high MC (kernel MC > 10.49%) grade factors, net weight, and lot value.

Lmc dependent variable	Regression coefficients for Hmc independent variable				Correlation coefficient (R)
	IC	M_1	M_2	M_3	
Foreign material (FM)	1.4876*	0.2914*	0.0094	0.0142*	0.67
Loose shelled kernels (LSK)	0.3962	0.5299***	0.0263	0.0076	0.66
Sound mature kernels (SMK)	-15.3047*	1.2119***	0.6851	-0.0127*	0.82
Sound splits (SS)	1.6554**	0.7544***	0.0698*	-0.0168	0.28
SMK + SS	-13.6206*	1.2036***	0.5743	-0.0104*	0.88
Other kernels (OK)	-0.3992	0.8510***	0.0934*	0.0125	0.78
Total kernels (TK)	-8.6746	1.1214***	1.0223***	-0.0141***	0.87
Hulls	-4.6352**	1.1804***	0.4377***	-0.0163***	0.89
Damaged kernels (DK)	0.3918**	0.6637***	-0.0059	-0.0204**	0.44
Net weight (LW)	0.0659	1.0546***	-0.0088	-0.0094***	0.998
Lot value (LV)	110.93	0.9679***	-8.2467*	-0.0008	0.997

*, **, ***Significant at P = 0.05, 0.01, and 0.001 levels, respectively.

Table 8. Derived intercepts and coefficients for prediction equations for spanish-type peanuts for estimating low MC (kernel MC ≤ 10.49%) grade factors, net weight, and lot value from corresponding high MC (kernel MC > 10.49%) grade factors, net weight, and lot value.

Lmc dependent variable	Regression coefficients for Hmc independent variable IC	M_1	M_2	M_3	Correlation coefficient (R)
Foreign material (FM)	3.1990	-0.1274	-0.1571	0.0670	0.81
Loose shelled kernels (LSK)	3.1948*	0.6168	-0.0737	-0.0261	0.53
Sound mature kernels (SMK)	7.2496	0.9198	-1.8661	0.0222	0.87
Sound splits (SS)	0.9858	-0.1215	-0.0368	0.1565	0.66
SMK + SS	32.9087	0.5569	-1.6671	0.0204	0.83
Other kernels (OK)	-2.0456	1.3994**	0.2460*	-0.0354	0.80
Total kernels (TK)	77.1769*	-0.0203	-4.0688	0.0529	0.86
Hulls	22.6051*	0.0454	-1.0645	0.0486	0.87
Damaged kernels (DK)	-0.3148	1.2605***	0.0282	-0.0487*	0.67
Net weight (LW)	0.8891*	0.8519 ***	-0.0593**	0.0042	0.998
Lot value (LV)	-5.88	0.9618 ***	0.0603	0.0003	0.995

*,**,***Significant at P = 0.05, 0.01, and 0.001 levels, respectively.

Table 9. Derived intercepts and coefficients for prediction equations for virginia-type peanuts for estimating low MC (kernel MC ≤ 10.49%) grade factors, net weight, and lot value from corresponding high MC (kernel MC > 10.49%) grade factors, net weight, and lot value.

Lmc dependent variable	Regression coefficients for Hmc independent variable IC	M_1	M_2	M_3	Correlation coefficient (R)
Foreign material (FM)	-1.8260	1.1172**	0.2393*	-0.0332	0.67
Loose shelled kernels (LSK)	0.9553	0.6942*	-0.0056	0.0059	0.83
Extra large kernels (ELK)	-11.8288	1.3377***	0.2097	-0.0195	0.86
Fancy Pods (FP)	27.5862	0.6411*	-1.5311	0.00196	0.89
Sound mature kernels (SMK)	-27.8264	1.3985***	1.5582	-0.0246	0.82
Sound splits (SS)	-0.6859	2.3879**	0.1785*	-0.0944	0.53
SMK + SS	-3.3495	1.0518***	0.5034	-0.0078	0.89
Other kernels (OK)	0.9504	0.3162	-0.0189	0.0368	0.75
Total kernels (TK)	3.2458	0.9545***	0.9047	-0.0125	0.82
Hulls	6.2606	0.7666**	0.1680	-0.0050	0.77
Damaged kernels (DK)	-0.4620	0.7950**	0.0403*	-0.0147	0.64
Net weight (LW)	-0.1760	1.0743***	-0.0026	-0.0102***	0.996
Lot value (LV)	-193.20	1.0183***	1.3775	0.0012	0.993

*,**,***Significant at P = 0.05, 0.01, and 0.001 levels, respectively.

the study.

The correlation coefficient (R) for the runner-type LmcFM (0.67) indicates a much better fit of the equation to the data set than the LmcSS (0.28) (Table 7). The R for the runner-type LmcDK equation (0.44) also indicates limited linear correlation between Hmc values for DK and kernel MC (Table 7). Other R values for the runner-type equations were above 0.66 with the R for the equation for LW at 0.998 and for LV at 0.997 indicating exceptional linear correlation between derived equations and corresponding Hmc variables. A comparison of runner-type LW for each lot versus predicted LW from the derived equation (Table 7) is presented in Fig. 1. A similar comparison for runner-type LV versus predicted LV is shown in Fig. 2. Regression analyses of the data in Figs. 1 and 2 substantiated the reliability of the prediction equations for runner-type LW and LV. The R for the spanish-type equation for LW was 0.998 and for LV 0.995 (Table 8). Virginia-type equations were similar with the R for LW at 0.996 and for LV at 0.993 (Table 9). Though not presented, comparisons of LW and LV versus

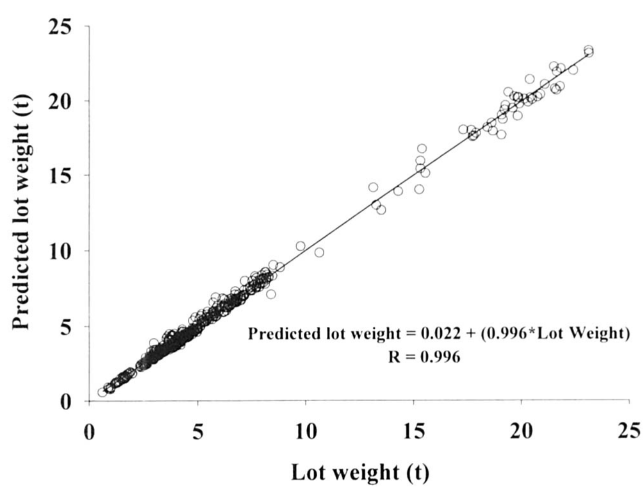

Fig. 1. Comparison of runner-type lot weight and predicted lot weight.

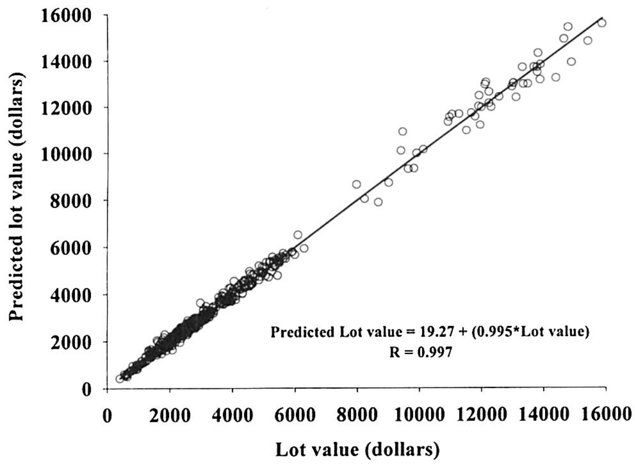

Fig. 2. Comparison of runner-type lot value and predicted lot value.

predicted LW and LV as shown in Figs. 1 and 2 for runner-type lots were made for spanish-type and virginia-type lots. Similar results substantiating equation reliability were obtained.

Marketing of FS peanuts at harvest is extremely important to all segments of the peanut industry. Correct grading and establishment of peanut dollar value affects profitability for farmers, shellers and manufacturers. Changing options for established grading procedures mandate close scrutiny.

Allowing grading of lots at MC > 10.49% could benefit the farmer, buying points, and shelling segments of the U.S. peanut industry. Increased peanut harvest capacity has increased the demand for transport vehicles for FS peanuts from the field to buying points. Buying points would be allowed to mingle lots prior to curing, thus increasing management capabilities and possibly reducing the time required for return of transport vehicles to the field, which would reduce harvest interruptions.

Utilizing equations to estimate Lmc grade factors, LW, and LV based on Hmc variables indicated that Hmc grading is possible without significantly affecting peanut marketing within the limits of the presented data set. Predicted grade factors, LW, and LV were within standard errors (P = 0.05) of the Lmc factors. Thus, significant changes in mean grade factors, LW, or LV would not result from grading at MC > 10.49%. FS grading at MC > 10.49% as an option to current grading procedures would increase harvest management capabilities but have no effect on current grading practices.

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Literature Cited

1. Davidson, J.I., Jr., T.B. Whitaker, and J.W. Dickens. 1982. Grading, cleaning, storage, shelling and marketing of peanuts in the United States, pp. 571-623. *In* H.E. Pattee and C.T. Young (eds.) Peanut Science and Technology. Amer. Peanut Res. Educ. Soc., Inc., Yoakum, TX.
2. SAS Institute Inc. 1993. Statistical Analysis System, Vers. 6.1. Cary, NC.
3. USDA. 2000. AMS Farmers Stock Peanuts Inspection Instructions, Updated. U.S. Govt. Print. Ofc., Washington, DC.