Factors Affecting Fresh Potato Price in Selected Terminal Markets

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Monthly, quarterly, and annual cross-sectional and time-series data for the period 1982–85 were analyzed to identify factors affecting terminal market price for four types of fresh potatoes. Results indicated that state of origin, terminal market package type, and season of marketing were significant quality variables affecting price. Price differences among potato types because of season of marketing and stocks of fall potatoes were evident. These results suggest that cultivar selection, cultural practices, planting and harvesting schedules, packaging, and market selection—factors which are ultimately controlled by growers and grower/shippers—can be utilized effectively as mechanisms to increase price and expand markets.

Key words: fresh potato prices, potato marketing, pricing factors, market information.

From 1960 to 1984 U.S. per capita consumption of potatoes has increased roughly 16%, from 108 pounds in 1960 to 125 pounds in 1984 (Buckley and Mai, Schoenemann). A variety of factors have contributed to the renewed popularity of potatoes. Primary among these has been the development of alternative product forms through processing. A trend toward increased consumption of processed versus fresh potatoes has continued through the 1980s caused in part by work force participation by women and the popularity of fast foods and restaurant eating (Estes, Blakeslee, and Mittelhammer). Increased promotional efforts and incorporation of baked potato bars in fast food restaurants are factors which will continue to contribute positively to fresh potato demand (Jones, Schoenemann, Goodwin).

In view of consumption trends and the perception of the potato as a cropping option with a potential of yielding high returns in comparison to many traditional field crops, growers and shippers in the Texas High Plains have become interested in identifying market opportunities for their production. Preliminary analysis of the market by High Plains growers and shippers indicated (*a*) greater marketing opportunities in June and July than August and September, (*b*) price discounts for Texas potatoes relative to those from competing areas, and (*c*) potential for expanding current regional markets.

Based on interviews with wholesale, retail, and chain buyers at major buying locations in Texas and in the Dallas and Houston terminal markets, key factors influencing purchasing patterns were quality, consistency, dependability, and shelf-life. Buyers indicated preference for the "new crop" potato because of quality; improved hydrocooling was suggested to extend shelf-life and to enhance quality of Texas potatoes. Texas potatoes were favored over competing regions because of lower prices. Poor marketing by Texas shippers and packers results in low prices according to those interviewed. Buyers seemed willing to pay for consumer packs, stating that marketing margins were being forfeited to repackers. These opinions were reinforced by results of a 1986 United Fresh Fruit and Vegetable Association national survey of retailers and shippers.

Early in 1986 a group of industry leaders began investigating the establishment of a

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All programs and information of the Texas Agricultural Experiment Station are available without regard to race, ethnic origin, religion, sex, and age.

The authors wish to thank Ron Lacewell, Carl Shafer, Grant Vest, and the anonymous referees for helpful comments in earlier drafts.

marketing order for High Plains potatoes (Texas and northeastern New Mexico). This effort has gained impetus, and currently preparations are being made to conduct the necessary hearings associated with the creation of such an order. The results of the foregoing analysis should be beneficial in the process. Answers to questions associated with quality, market identification and timing, pricing, and type of potato desired are consequently important.

Objectives

In this light, the general objective of this study is to identify and assess factors affecting fresh potato price at terminal markets. Specific objectives are to determine the influence of (*a*) potato type on price, (*b*) package type on price, (*c*) potato origin and terminal potato market on price, and (*d*) the level of fall fresh potato stocks on price.

Little work addressing different varieties of potatoes exists to date. In previous studies, continuous, quantitative variables such as quantity or income were utilized to estimate potato price at various levels (Hee, Shuffett, Simmons). Primary attention was given to estimation of retail price, farm price, or retail-farm price spreads (Cox, Ziemer, and Chavas; Hee; Waugh). This study differs from previous efforts in that consideration is also given to qualitative factors such as potato type and package. Increased demand for convenient prepackaged "consumer packs" of three, five, and ten pounds has come about, in part, as a result of changing family sizes and eating habits (*The Packer*; Bergman; personal interview with G. Neuse, Regional Procurement Manager, Kroger Co., McAllen, TX, May 1986).

There are indications that prices may differ by potato type, with some types of potatoes lending themselves to higher-value end uses than others (Estes, Blakeslee, and Mittelhammer; Jones; Schoenemann; McRae, Fleming, and Fisher). For example, the russet potato is best suited for restaurants, steak houses, and fast-food chains featuring potato bars. Accordingly, different sizes of the russet are preferred by different end-users.

Previous Research

Cox, Ziemer, and Chavas utilized tobit analysis in a disaggregated cross-sectional study of potato consumption in the western United States. Their primary objective was to investigate price effects including close substitutes for fresh potatoes, socioeconomic variables to measure lifestyle changes, and newly important economic factors. Capps and Love noted definite effects of socioeconomic characteristics on vegetable consumption. Among their considerations were alternative product forms. Their analysis did not include disaggregate treatment of many vegetables and treated all types of potatoes homogenously.

Ladd and Suvannunt showed the retail price paid for a particular good to be a weighted linear combination of the products' yields of characteristics, each being the marginal implicit price of that characteristic. Further, they supposed consumers can decide how much of product *i* to buy but not the amount of each characteristic to be contained in or provided by one unit of product *i*. Consumer demands are therefore affected by characteristics of goods. A hedonic price approach was employed by Jordan et al. to determine the marginal implicit prices of quality factors in fresh tomatoes. They analyzed cross-sectional data on quality characteristics of vine-ripened tomatoes estimated monthly during the season. Waugh had previously used wholesale price to address the quality issue.

A study of acceptance of cartoned and bagged potatoes by English consumers revealed a preference and higher price for carton packaging (McRae, Fleming, and Fisher). Estes, Blakeslee, and Mittelhammer suggest there may be differences in prices attributable to region of production (originating state) and regional market. Seasonality and stock levels have long been known to be factors in price determination.

Model Development

A general model was developed for purposes of evaluating the effect of a set of product characteristics, shipment quantity, and stock level on wholesale fresh potato prices at selected terminal markets. The model specification builds on the theoretical framework of Ladd and Suvannunt and the hedonic price approach employed by Jordan et al.

The data include four potato types, eighteen originating states, four terminal markets, three package types, quantities received monthly at each of four terminal markets, and monthly stocks of fresh fall potatoes for each of the years 1982 through 1985.

Four statistical models, one for each of the four potato types, were estimated for purposes of determining the effect of selected variables on fresh potato prices. They were as follows:

$$P^k_{ijlt} = \beta_0 + \beta_1 Q_{it} + \beta_2 O^k_j + \beta_3 M^k_i + \beta_4 PA^k_l + \beta_5 STK_t + \beta_6 SD_n + U^k_{ijlt},$$

where P^k_{ijlt} is price of the kth fresh potato type per hundredweight (cwt.) in the ith terminal market in the month t from the jth origin packed in the lth package type; k is red round, russet 10-ounce minimum, russet 80-count, russet unsized; Q_{it} is quantity of potatoes in cwt. traded per month in the ith market; O^k_j is origin j ($j = 1, \ldots, 18$) for potato type k; M^k_i is terminal market i ($i = 1, \ldots, 4$) for potato type k; PA^k_l is package type PA ($l = 1, \ldots, 3$) for potato type k; STK_t is U.S. fall fresh potato stocks in 1,000 cwt. in month t. December–May are actual, June–November are estimates. SD_n is quarter of the year of potato marketing ($n = 1, \ldots, 4$), winter, spring, summer, fall; and U^k_{ijlt} is the disturbance term.

A tabular presentation of the variable structures is given in table 1. Signs connected with variable coefficients are hypothesized to follow theoretical expectations when such theory exists. That is, the terminal market price for fresh potatoes should be negatively related to both quantity of potatoes traded and fall potato stocks. With respect to season, price is expected to be lowest in the fall quarter during the harvest period, rising to its peak in the winter and spring quarters based in part on storage costs and limited high value fresh production, and then declining somewhat in the summer quarter because of quality loss of stored potatoes and the increased volume of fresh potatoes in the market. Relative base prices of potato types, as represented by the intercept terms, are expected to be, from highest to lowest, russet 80-count, russet 10-ounce minimum, red round, and russet unsized, as indicated by inspection of the mean market prices across markets and packs. No hypotheses are made regarding origin, market, or type of pack.

Table 1. Listing of Explanatory Variables

Variable	Variable Name	Description
Quantity	Q	1,000S of cwt traded monthly, by market
State of origin	O	$O1$ Alabama
		$O2$ Arizona
		$O3$ California
		$O4$ Colordao
		$O5$ Florida
		$O6$ Idaho
		$O7$ Michigan
		$O8$ Minnesota
		$O9$ Montana
		$O10$ Nebraska
		$O11$ Nevada
		$O12$ North Dakota
		$O13$ Oklahoma
		$O14$ Oregon
		$O15$ Texas (base category)
		$O16$ Washington
		$O17$ Wisconsin
		$O18$ Wyoming
Terminal market	M	$M1$ Chicago
		$M2$ Dallas (base category)
		$M3$ Denver
		$M4$ St. Louis
Package type	PA	$PA1$ Consumer bale, prepackaged
		$PA2$ Fifty pound sacks or cartons
		$PA3$ One hundred pound sacks (base category)
Fall stocks	STK	STK 1,000s hundredweights fall potato stocks, by month
Season marketed	SD	$SD1$ January–March
		$SD2$ April–June
		$SD3$ July–September (base category)
		$SD4$ October–December

Data and Procedures

Secondary data from *Fresh Fruit and Vegetable Unloads in U.S. Cities, Fresh Fruit and Vegetable Market Wholesale Prices, Potatoes and Sweetpotatoes,* and *Potato Stocks* were utilized. Quantity data were collected from the unload series; import, export, and stock data were obtained from *Potatoes and Sweetpotatoes* and *Potato Stocks.* All other data were collected from the wholesale price publications.

Monthly quantity information was given for all fresh potato unloads in each market but was unavailable for specific types and packs of potatoes. Therefore, all quantity data are for unloads of all fresh potato types for each month. Prices were for U.S. Department of Agriculture (USDA) No.1 grade washed table potatoes.

Table 2. Summary of Descriptive Statistics, by Market and for All Markets, Continuous Variables Only

	Red Round				Russet, 10 ounce			
Market	μ	σ^2	min	max	μ	σ^2	min	max
Chicago								
Price	14.79	39.66	5.50	32.00	13.35	.14	13.00	14.00
Quantity[a]	238.76	2,793.82	53.00	403.00	242.00	0.0	242.00	242.00
Stocks[b]	1.08E8	9.00E15	0.00	3.44E8	1.79E8	0.0	1.79E8	1.79E8
	N = 346				N = 5			
Dallas								
Price	15.36	25.24	6.25	29.00	19.66	21.21	9.50	36.50
Quantity	216.70	1,445.23	133.00	309.00	223.83	1,213.69	152.00	309.00
Stocks	1.17E8	1.08E16	0.00	3.44E8	1.18E8	9.43E15	0.00	3.03E8
	N = 803				N = 365			
Denver								
Price	13.27	10.46	7.00	27.00	20.16	20.49	10.00	32.00
Quantity	69.95	681.21	40.00	322.00	69.82	742.07	40.00	322.00
Stocks	1.20E8	1.02E16	0.00	3.44E8	1.32E8	9.86E15	0.00	3.44E8
	N = 196				N = 175			
St. Louis								
Price	12.20	2.72	5.50	32.00	16.32	33.45	6.00	31.50
Quantity	127.90	254.40	61.00	173.00	129.29	225.79	86.00	162.00
Stocks	1.13E8	9.74E15	0.00	3.44E8	1.31E8	1.15E16	0.00	3.44E8
	N = 598				N = 490			
All Markets								
Price	14.08	2.72	5.50	32.00	18.13	33.45	6.00	36.50
Quantity	178.51	4,466.96	40.00	403.00	153.19	3,907.87	40.00	322.00
Stocks	1.14E8	1.01E16	0.00	3.44E8	1.27E8	1.05E16	0.00	3.44E8
	N = 1,943				N = 1,035			

Note: Price is expressed in dollars, quantity, and stocks in thousands of hundredweights.
[a] Mean and variance for each potato type represent quantities of all potatoes arriving at each market during months when the particular potato type was offered.
[b] U.S. stocks of fall table potatoes in thousands of hundredweights.

Table 2. Continued.

Market	Russet, 80-count				Russet, Unsized			
	μ	σ^2	min	max	μ	σ^2	min	max
Chicago								
Price	22.77	27.55	11.25	36.00	16.44	20.73	8.00	31.00
Quantity	251.36	2,695.83	53.00	403.00	227.03	2,569.44	134.00	403.00
Stocks	1.38E8	8.30E15	0.00	3.03E8	1.36E8	1.04E16	0.00	3.44E8
	N = 217				N = 346			
Dallas								
Price	23.42	26.16	12.87	43.00	12.69	26.47	5.75	30.50
Quantity	221.96	1,311.62	148.00	309.00	204.20	1,340.20	133.00	309.00
Stocks	1.17E8	8.60E15	0.00	3.03E8	1.24E8	1.31E16	0.00	3.44E8
	N = 579				N = 495			
Denver								
Price	27.81	32.04	17.50	44.00	24.62	24.53	15.50	31.00
Quantity	69.37	554.14	40.00	322.001	71.12	195.11	44.00	100.00
Stocks	1.27E8	9.92E15	0.00	3.44E8	1.34E8	1.28E16	0.00	3.44E8
	N = 188				N = 49			
St. Louis								
Price	25.00	40.50	16.00	31.00	9.83	6.53	5.75	20.25
Quantity	133.00	512.00	121.00	173.00	131.26	248.12	86.00	173.00
Stocks	1.77E8	1.13E16	7.56E6	3.03E8	1.31E8	1.15E16	0.00	3.44E8
	N = 5				N = 456			
All Markets								
Price	24.12	40.50	11.25	44.00	13.12	6.53	5.75	31.00
Quantity	198.98	5,590.44	40.00	403.00	180.53	3,262.88	44.00	403.00
Stocks	1.24E8	8.86E15	0.00	3.44E8	1.30E8	1.18E16	0.00	3.44E8
	N = 989				N = 1,346			

Four terminal markets were selected for analysis—Chicago, Dallas, Denver, and St. Louis—because they received roughly 70% of all recorded Texas unloads to reporting terminal markets in the study years (Goodwin). Based on the Estes, Blakeslee, and Mittelhammer model, it was determined that a regional study rather than national study was appropriate. Therefore, unload totals at each market, rather than national unload totals, were employed.

Fresh fall potato stock figures were available from *Potato Stocks* for the months December through May; production figures were also available. Estimates were made for fresh potato stocks for the months October and November and June through September. October stocks were set at the production level for fall potatoes to remain consistent with USDA crop season divisions. November stocks were estimated at the midpoint between October and December stocks. June through September stocks were estimated based upon within- and among-season declines in potato stocks for the December through May period, then subtracted from the May figure to derive June, and so on until stocks reached zero. This method prohibited the inclusion of new crop potatoes in the spring and summer seasons; these potatoes do not enter the storage stocks which are drawn on throughout the year and therefore are consumed relatively near harvest.

In considering the appropriate analytical techniques, cross-sectional, time-series pooling was examined; but unequal numbers of observations per time-series were present for each potato type in each market because of the nature of the price data. No advantages could be realized utilizing seemingly unrelated regression since each dependent variable was a function of the same set of independent variables. Therefore, ordinary least squares regression was employed and estimates of the four models as previously specified were made.

Descriptive statistics of the continuous variables for each potato type appear in table 2. The number of observation for each potato type and market, as well as the mean, variance, minimum, and maximum appear for each variable as classified. Unload quantities by potato type were unavailable; however, quantities of all potatoes unloaded at each terminal market were recorded. Inspection of these statistics lend insight as to the expected differences in price as related to potato type, market, quantity received, and fall stocks. Overall, 80-count russets are highest in price, followed by russet 10-ounce, red round, and russet unsized. Denver is generally the highest priced market, followed by Dallas, Chicago, and St. Louis.

Empirical Results

Regression estimates for the models as previously specified appear in table 3. The equations had adjusted R^2 values of .64, .62, .47, and .62 and, in general, the signs and magnitudes of the estimated parameters appear plausible. Durbin-Watson statistics indicated the residuals in all four models to be serially correlated. However, because the data for each potato type are not equal in the number of cross-sectional observations per time series—an assumption of all available appropriate autocorrelation adjustment techniques—it was not possible to correct for any nonspherical disturbances which may have been present. Such disturbances affect only the efficiency of the parameter estimates; other desired parameter properties are unaffected. However, the presence of positive autocorrelation tends to bias the diagnostic statistics t, F, and R^2 upward (Judge et al.).

Estimates of the intercept term represent the price of Texas potatoes marketed in the summer quarter of 1985 at the Dallas terminal market in 100-pound sacks. The coefficients associated with the quantity variable were statistically significant in two of four models; signs were as expected a priori in all four models. Coefficients associated with the stock variable were highly significant and consistent with theory in all four models. Because the stock and quantity variables are not highly correlated, this result suggests that prices are determined more on the basis of U.S. potato stocks than on the quantity taken each month at the particular markets concerned.

Price differences among types appear to be due as much or more to origin, package, and market destination than to type itself. Estimated intercept values vary relatively little in magnitude across the four models. Differences among all intercepts were found to be statistically different at the $\alpha = .01$ level, however. Results indicate that origin has a greater effect on price of red rounds than for 10-ounce russets, 80-count russets, and unsized russets. Consumer bales ($P1$) are consistently lower

Table 3. Summary of Regression Estimates of Fresh Potato Price, by Type, 1982-85

	Red Round	Russet, 10-Ounce	Russet, 80-Count	Russet, Unsized
N	1,943	1,036	990	1,346
adj. R^2	.6359	.6169	.4716	.6167
D-W	1.242	0.911	0.892	1.426
β_0	18.5815	19.9600	20.6709	18.4243
	(34.65)	(16.55)	(20.56)	(27.35)
Q	−5.524E−6	−6.7622E−6	−1.01E−6	−1.137E−6
	(−2.52)	(−1.57)	(−0.29)	(−4.112)
*0*1 (AL)	−1.0823	NA[a]	NA	−0.0682
	(−2.41)			(−0.04)
*0*2 (AZ)	2.2701	NA	5.8123	−1.9625
	(4.73)		(1.41)	(−0.82)
*0*3 (CA)	4.2534	3.4148	2.7698	0.3169
	(12.02)	(3.28)	(2.79)	(0.53)
*0*4 (CO)	−0.1117	2.6860	0.7529	1.2141
	(−0.20)	(3.14)	(0.918)	(2.61)
*0*5 (FL)	7.0280	2.8197	NA	4.0697
	(20.46)	(0.81)		(2.03)
*0*6 (ID)	0.8442	7.1882	5.6719	2.7728
	(0.88)	(8.918)	(7.46)	(7.04)
*0*7 (MI)	−4.6091	3.5619	−1.2099	1.8578
	(−11.54)	(3.29)	(−1.14)	(2.85)
*0*8 (MN)	−3.3670	−0.9876	−0.0208	−0.7721
	(−9.69)	(−0.96)	(−0.01)	(−1.06)
*0*9 (MT)	3.4048	6.8281	4.6153	−3.2822
	(1.47)	(5.96)	(5.091)	(−0.97)
*0*10 (NB)	−2.8146	−0.9958	−1.7577	−0.5808
	(−4.19)	(−0.88)	(−0.43)	(−0.50)
*0*11 (NV)	−4.1635	2.0484	3.9250	NA
	(−10.91)	(0.59)	(2.32)	
*0*12 (ND)	−3.0010	0.4678	−1.4166	−4.4731
	(−8.69)	(0.22)	(−0.35)	(−2.24)
*0*13 (OK)	NA	1.7269	2.5182	1.3258
		(1.00)	(0.61)	(1.52)
*0*14 (OR)	0.9835	4.0022	2.0930	1.8881
	(0.43)	(4.45)	(2.61)	(1.93)
*0*16 (WA)	−2.9213	2.9299	2.1194	1.5065
	(−0.90)	(3.53)	(2.70)	(2.96)
*0*17 (WI)	−5.8653	0.4894	0.6975	0.7977
	(−11.09)	(0.558)	(0.69)	(1.51)
*0*18 (WY)	−1.1203	1.5497	−1.2897	−0.2405
	(−0.34)	(1.40)	(−1.28)	(−0.22)
*M*1 (Chicago)	−1.9906	−9.5628	−0.8418	2.2363
	(−8.46)	(−6.21)	(−1.79)	(6.28)
*M*3 (Denver)	−4.6256	−1.9772	2.2452	5.8566
	(−7.68)	(−2.65)	(3.29)	(8.79)
*M*4 (St. Louis)	−4.0729	−1.3034	1.1585	−4.6926
	(−14.34)	(−2.61)	(0.62)	(−12.98)
*P*1 (BALE)	−4.9245	−9.0651	−1.4901	−4.0407
	(−13.74)	(−3.60)	(−0.52)	(−13.47)
*P*2 (50#)	−0.1022	−5.0734	4.1589	−4.4246
	(−0.16)	(−22.11)	(14.35)	(−18.54)
STOCKS	−4.902E−9	−1.4520E−8	−2.017E−8	−1.185E−8
	(−5.83)	(−12.73)	(−13.07)	(−12.46)
*SD*1	−0.0536	−0.2121	−1.3859	0.6309
	(−0.20)	(−0.530)	(−3.14)	(1.81)
*SD*2	0.2429	0.4571	−0.7358	1.9258
	(0.86)	(1.04)	(−1.47)	(4.97)
*SD*4	−0.1716	−1.1571	−0.3473	−1.5217
	(−0.58)	(−3.15)	(−0.71)	(−4.81)

Note: Numbers in parentheses represent the *t*-test values $H_0:\beta_j = 0$.
[a] NA is not available.

priced, *ceteris paribus,* than 50-pound sacks and cartons (*P*2) or 100-pound sacks for all potato types except russet unsized; the 50-pound unit is lowest priced in that instance. These relationships can most probably be attributed to generally lower quality and size inconsistency of the potatoes marketed in bales. Season of marketing was a significant factor in about half the cases.

Differences from the base categories included in the intercept have been previously identified. To test relevant hypotheses about all pairwise comparisons of binary variables, the Newman-Keuls procedure is employed. Newman-Keuls is a sequential multiple range test structured to circumvent the problem of changing significance levels of conventional statistical tests when identifying differences in paired nonorthogonal parameters. The procedure involves ranking of all coefficients within each class of variables to be paired from highest to lowest. The difference from each pair of coefficients is then compared to the value obtained from the product of the studentized range values and the standard error of the coefficient differences. Essentially, this test systematically adjusts for the "inflated" significance levels obtained in hypothesis tests which do not account for the number of coefficients involved in the comparison. That is, the Newman-Keuls tests, unlike pairwise *t*-tests, incorporate experiment-wide error rates (Steel and Torrie, Scheffé).

A summary of results from the regression and Newman-Keuls analyses is presented in table 4. Within this table are displayed general information with respect to selected characteristics. For each potato type, relevant states, markets, packages, and seasons are grouped in tiers of like categories (based upon the Newman-Keuls analysis) from highest to lowest coefficients and are ranked from highest to lowest within each tier based upon coefficient magnitudes as estimated. An asterisk identifies each variable whose coefficient is statistically different at the $\alpha = .05$ level from the base category coefficient.

Origin

The estimated coefficients for originating state variables measure the average price difference between the identified origin and Texas after controlling for the effect of terminal markets, package type and season. Inspection of table 4 reveals origin to be an important determinant of price for red round and russet 10-ounce minimum potatoes but comparatively insignificant for russet 80-count and russet unsized potatoes. Four tiers of prices were found for red round potatoes. Florida and California are principal suppliers of new season potatoes in the first and second quarters when most potatoes are coming from storage. As such, they receive premiums. Quality considerations may be present here and in the second tier of origins as well as earliness.

Idaho clearly supplies the superior priced russet ten-ounce potato. Four additional price tiers were identified and, in general, prices are highest in the northwest United States, with lower prices associated with producing regions in the south and east. The analysis showed no origin groupings for the remaining two potato types. This suggests that for the russet 80-count (generally thought to be the premium potato type) and the russet unsized potato (generally considered the lowest quality russet) that the originating state on the average is not a major factor in price determination. As will be observed later, price differences for these two potato types seem to be associated with the terminal market destination, package type, and seasonality.

The relative price position of Texas with respect to competing states *ceteris paribus* is in the upper third of origins for red round potatoes, in the middle position for russet unsized potatoes, and near the bottom for russet ten-ounce and russet 80-count potatoes. This is more important in the case of the russet ten-ounce because of the presence of price tiers; the 80-count prices were generally statistically equivalent or unaffected by origin on an experiment-wide basis.

Terminal Market

Each potato-type equation includes terminal market variables whose estimated coefficient measures the average price difference between the identified market (Chicago, Denver, St. Louis) and Dallas after controlling for the effects of season, package type, and origin. Based on these coefficients and the Newman-Keuls procedure, the following intermarket price rankings were established for each potato type:

Red Round prices: Dallas > Chicago > Denver = St. Louis;

Russet, ten ounce prices: Dallas > Denver

Table 4. Summary Presentation of Coefficients for Pertinent Characteristics on Fresh Potato Price, by Potato Type

Char-acter	Potato Type			
	Red Round	Russet, Ten-Ounce	Russet, 80-Count	Russet, Unsized
Origin	FL*, CA* MT, AZ*, OR, *TX* ID, CO, AL*, WY, NB*, WA ND*, MN*, NV*, MI*, WI*	ID* MT*, OR*, MI*, CA*, WA* FL*, CO*, NV OK, WY, WI, ND, *TX* MN, NB	AZ, ID*, MT*, NV*, CA*, OK, WA*, OR*, CO, WI, *TX*, MN, MI, WY, ND, NB	FL*, ID*, OR*, MI*, WA*, OK, CO*, WI, CA, *TX*, AL, WY, NB, MN, AZ, MT, ND*
Market	*DAL* CHI* STL*, DEN*	*DAL* STL*, DEN* CHI*	DEN*, STL[2] STL, *DAL*, CHI	DEN* CHI* *DAL* STL*
Package	*100 lb*, 50 lb bale*	*100 lb* 50 lb*, bale*	50 lb*, *100 lb*, bale	*100 lb* bale*, 50 lb*
Season	Sp, *Su*, W, F	Sp, *Su*, W[a] W, F*	*Su* F, Sp, W*	Sp* W* *Su* F*

Note: All statements displayed within this table are ordered in tiers (groupings as determined by the Newman-Keuls procedure) from highest to lowest and ordered by coefficient magnitude from left to right within tiers. An asterisk denotes a coefficient which is statistically different at the $\alpha = .05$ level from the base categories shown in italic type.

[a] The presence of a variable in more than one tier is a result of the pairwise comparisons utilized in the Newman-Keuls procedure and indicates, for example, Sp = *Su* = W; W = F; Sp, *Su* ≠ W.

= St. Louis > Chicago; Russet, 80-count prices: Denver > Chicago = Dallas = St. Louis; Russet, unsized prices: Denver > Chicago > Dallas > St. Louis.

These rankings show no consistency in terminal market prices across potato type. The inconsistent ranking of terminal market prices across potato types suggests that the availability of each potato type relative to its demand differs in each terminal market and that there are limits to which potato types substitute for each other. An examination of terminal market unload data offers some credence to this notion. The unload information shows the four terminal markets are served equally by Idaho (20% market shares), a national supplier, and then by a large number of regional suppliers. As an example, regional suppliers North Dakota, Michigan, Minnesota, and Wisconsin have about a 50% market share in Chicago and St. Louis markets but a comparatively small share of the Dallas or Denver markets. Therefore, if regions in proximity to a terminal market tend to specialize in the production of one or two potato types, it follows that the relative supplies of a particular type may be great (small) in a specific terminal market and the associated price relatively low (high). Thus, because of unequal regional potato type supplies relative to the demands of nearby terminal markets and because of limitations on substitutability between potato types, terminal market price rankings differ by type.

Package

In general, the analysis shows that potatoes packed in hundredweight sacks receive higher prices irrespective of potato type. The exception is russet 80-counts, where, based on the Newmen-Keuls test, no significant differences among package types were found. This finding once again emphasizes the apparent universally held notion that the russet 80-count is a consistently high-quality potato.

The package type coefficients reflect implicit quality characteristics which are imputed to different types of potatoes based upon package type. For example, russet 80-count potatoes receive the highest price when sold in fifty-pound cartons. This is expected since this pack often goes to hotels, restaurants, and institutional outlets who are primarily concerned with quality and uniformity. Russet unsized potatoes are higher priced in 100-pound sacks, possibly because of the large numbers of this type sold to repackers and retail chains for resale in their own consumer packs, thereby possessing a greater potential for profit for handlers. In all instances, potatoes sold in consumer bales (5- and 10-pound bags baled in 50-pound units) are lower priced because of the presence of potatoes which barely meet grading standards and to the lack of uniformity of potato size.

Seasonality

The seasonality dummies showed the ten-ounce and unsized russet potato prices to be lowest in the fall quarter and highest in the spring period. There was no statistical evidence that red round or russet 80-count carton potato prices varied by season in the four terminal markets. An analysis of national average potato prices by month (for years 1968–86) showed prices to be lowest in the fall, when about 80% of the nation's annual supply is harvested; then prices increase through the winter and peak in the late spring or early summer months when new supplies force an easing in price levels. Thus, the unsized and ten-ounce russet prices in the four terminal markets tend to parallel national seasonality trends. Because the four estimated equations are based on 1982–85 data only, it is not a troubling finding that surprisingly little evidence of seasonality for the red round and 80-count russet potato types was observed.

Implications

These results have key implications for growers and shippers of Texas potatoes. They suggest several mechanisms which could be utilized to increase the price received for their potatoes. There are distinct components of cultural and marketing practices which may be altered to achieve benefits to the Texas industry.

From the standpoint of cultural practices, additional production of the large russets and red rounds deserves consideration. Both red and russet potato varieties can be produced in many areas of the Texas High Plains. Differences in yield, costs, and price for these potato types could be evaluated to determine the opportunity available in varied plantings and grower response to such opportunity. The potential for increased price through a more substantial presence in markets in the early summer months may be inferred from the response of prices to stock levels. This period corresponds to the lowest levels of fall potato stocks, and in this period Texas does not compete directly with other states producing large volumes of potatoes. Mid-June through early August should be explored as an opportunity for increasing marketings. Such earliness could be accomplished by increasing production in central Texas or by developing earlier varieties for the High Plains. Although week of marketing can be approximately targeted by growers through planting times and cultural practices, weather is the single most important factor in determining harvest date and week of marketing.

Implications for marketing are essentially focused on three areas (*a*) type of pack, (*b*) final market destination, and (*c*) timing of primary marketings. The analysis clearly shows that potato types are priced differentially with respect to package. Similar information may be derived in terms of final market destination, as certain potato types are relatively preferred in the selected markets. Red and 10-ounce russet potatoes bring the highest price in Dallas; Denver is the most favorable market for 80-count and unsized russets. Equally important are which markets to avoid. St. Louis, Denver, and Chicago are the lowest priced markets for red potatoes; Chicago is lowest in price for 10-ounce russets.Chicago also showed a significant difference with regard to lower price for 80-count russets, while St. Louis is just over $8 per cwt. lower than Denver when pricing unsized russets.

Clearly, the price for each type of potato varies across markets and, in many cases, the price advantage in a particular market exceeds the additional transportation cost of reaching that market. This suggests that certain windows of opportunity may be identified by entrepreneurs who can properly identify them. However, such opportunities may disappear as they are uncovered by profit seekers. And too great an entry by such entrepreneurs could quickly turn potential profits into losses.

The current practice of selling fresh potatoes during the season, especially from mid-June to August, rather than selling from storage when stock levels are high, would seem appropriate. From a production standpoint, although the winter and spring quarters are relatively higher priced, limited capability exists for this alternative. However, some advantage might be gained through decreased price vulnerability if storage potatoes for marketing at a later date were available. One additional and somewhat enlightening implication is that the Texas potato industry had fairly accurately assessed its price situation.

[*Received January 1988; final revision received August 1988.*]

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