Potential Markets for Oklahoma Produce:

A Market Window Analysis*

by:

Shida Rastegari Henneberry
Associate Professor
Department of Agricultural Economics
Oklahoma State University
Stillwater, OK

Taehoon Kang
Graduate Assistant
Department of Agricultural Economics
Oklahoma State University
Stillwater, OK

Abstract

Market windows were examined in five wholesale markets for Oklahoma bell peppers, broccoli, cantaloupes, cauliflower, sweet potatoes and watermelons. "Market window" refers to a period of time when the prices received by producers for selected crops are greater than the production costs. The analysis is based on price-cost comparisons in major wholesale markets. Price risk associated with price variability and yield risk was incorporated into the analysis. The Denver and New Orleans wholesale markets provide excellent market windows for all six crops. The Chicago and Dallas wholesale markets show good market potential for most of the crops.

Problem Statement and Objectives

Oklahoma experienced a decline in its farm economy during the past decade. Cash receipts from traditional crops such as wheat and cattle have decreased or remained at low levels since the early 1980s. Cash receipts from marketing of cattle and calf in nominal values have decreased from $1.84 billion in 1980 to $1.79 billion in 1990, while cash receipts from the marketing of winter wheat (Oklahoma's main crop) have decreased from $712 million in 1980 to $492 million in 1990 (Oklahoma Department of Agriculture). To supplement farm income, many Oklahoma producers sought alternative enterprises. Among these enterprises was horticultural crop production, namely, the production of fruits and vegetables.

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Horticultural crop production is not new to Oklahoma. These crops generally provide higher returns per acre than traditional crops. However, growing fruits and vegetables can be risky, and intensive production and marketing management are required. Marketing has been a significant concern for many Oklahoma growers (Henneberry and Willoughby). Identifying available outlets and outlet locations has been a major challenge in expanding production of Oklahoma produce.

In general, economic feasibility depends on the availability of outlets for the produce, the market price, and the cost of production (Colette and Wall, p. 189). The main objective of this study is to investigate potential wholesale markets for selected fruits and vegetables that are suitable for production in Oklahoma. Market window analysis is used to examine potential markets. "Market window" can be defined as a period of time during the harvest when the prices received by producers for selected crops are greater than the production costs. Although being a relatively simple method, market window analysis is a reliable evaluation technique for screening potential markets (Jermolowicz and Stafford, p. 22).

Market window analysis has been used to help producers identify potential markets for selected crops grown in various regions of the United States (see Colette and Wall; Hinson and Lanclos; Mizelle; Mook and Anthony; O'Rourke; Venturella, et al.; and Zwingli, et al.) Most of these studies compare expected market prices with expected production costs. Market window has been defined in several ways: periods of time when historical average weekly price exceeds estimated unit cost of production (Hinson and Lanclos, p. 3); the period of time for a given crop and market during which prices are generally at or above the producer's break-even or "at market" cost (Zwingli, et al.); the period when expected market prices are greater than the production cost for a long enough period (at least two months) to justify a reasonable production scale (O'Rourke); or a particular period of time during which a commodity can be sold at a profit in an existing market (Venturella, et al.). The Hinson and Lanclos definition of market windows was used in this report.

Procedures

In this study, the market window analysis was applied to six produce items that may have potential for production expansion in Oklahoma: bell pepper, broccoli, cantaloupe, cauliflower, sweet potato, and watermelon. The target markets were then identified for each crop based on their population (which is assumed to determine the level of demand for fresh produce), distance from Oklahoma, and the availability of data. The selected markets included: Chicago, Dallas, Denver, New Orleans, and St. Louis.

Market windows are determined by comparing the expected prices received by producers with the expected production costs. Expected prices were assumed to be a simple mean of the past five years' wholesale prices in the target markets. The wholesale prices were then adjusted by the marketing margin to obtain an estimate of prices received by farmers. The marketing margin is assumed to include transportation costs and brokerage fees. Most previous studies have assumed the marketing margins to be equal to 15 percent of the wholesale prices (see Zwingli, et al.; Mook and Anthony; Hinson and Lanclos).

In this study, a telephone survey of Oklahoma produce brokers was conducted in order to directly obtain the marketing margins as a percentage of wholesale prices. The marketing margins were also calculated as the sum of brokerage and handling fees and transportation and unloading costs. Transportation cost per mile (also obtained from the brokers' survey) was multiplied by the distance between each of the examined markets and Oklahoma City. The total marketing margin as a percentage of price was then calculated for each of the studied produce items. These figures were compared with the figures used in the literature and the ones obtained directly from the brokers' survey. For most of the markets and produce items, the 15 percent of wholesale prices which has been used in the literature and was established from the brokers' survey more than covered the marketing margins calculated from transportation costs and brokerage fees. For the markets which were significantly closer or the produce items that were lower in price (and therefore the marketing margins were a higher

percentage of their price per pound), the appropriate figure was used.[1]

Both price variability and production risk were considered in this study. First, market windows were analyzed for three ranges of expected prices: a middle range denoting the simple mean of the past five years' prices, a high range denoting the highest price among the past five years' prices, and a low range denoting the lowest price among the past five year's prices. These ranges of prices are represented by the mean, highest, and lowest price lines on subsequent figures. Unless specified otherwise, to be conservative, the lowest and the mean price lines were used to determine market windows.

The second approach to incorporate seasonal price variability involved examining the coefficient of variation during the harvest period. The coefficient of variation for each week is calculated as the standard deviation of prices divided by its mean multiplied by 100 during that week. The average coefficient of variation during the complete harvest period is then calculated as the simple mean of the weekly coefficients of variation. In general, a coefficient of variation below 20 percent is considered to indicate low risk, one of 20 percent to 35 percent is considered moderate risk, and one of over 35 percent is considered high risk (Venturella, et al.). The coefficients of variation for individual crops during the complete harvest period at each wholesale market are shown in Table 1. Harvest periods are shown in Table 2.

Risk associated with yield declines was also incorporated in this analysis. Corresponding increases in the production cost per acre at 100 percent, 90 percent, 80 percent, and 70 percent yield levels are shown in Table 2. Higher yields under good management and favorable growing conditions may considerably reduce the production cost.

The market windows are identified by comparing the expected prices (low, mean, and high) with production costs under the 100 percent, 90 percent, 80 percent, and 70 percent yield scenarios. A wholesale market is defined as having a strong market window for Oklahoma produce if the low price is higher than the production cost at 100 percent yield level and/or if the mean price covers the production cost under the 20 percent or 30 percent yield reduction scenarios for the specified period within Oklahoma's harvest time.

If Oklahoma growers are to sell their products to terminal market wholesalers, they must discover periods when the products of one large producing area are declining and those of another large producing area are beginning to enter the market (Runyan, et al., p. 10). Seasonal patterns of crop arrivals at target wholesale markets were reviewed to determine when supply shortages in large producing areas exist.

In this study, it is assumed that the expansion of Oklahoma's produce supplies in the targeted markets will not have any price-depressing impacts in these markets. This is a reasonable assumption as Oklahoma is a small producer of the studied crops compared to total supplies in the targeted markets. Currently, much of Oklahoma's fresh produce is being distributed through direct marketing outlets such as farmers' markets, roadside stands, and pick-your-own operations. A 1988 survey of Oklahoma produce growers showed that the growers had a definite preference for direct marketing (Henneberry and Willoughby).

Additionally, given the increased demand for fruits and vegetables in the United States, it is unlikely that the increased marketing of Oklahoma produce will have any depressing impacts on prices. In the United States, demand for fresh fruits and vegetables has been growing at a fast pace. Over time, American consumers have shifted away from diets rich in animal products and towards fruits and vegetables, cereals, and crop products. From 1970 through 1988, per capita consumption of red meats decreased by 13 percent, while consumption of fresh fruits and vegetables increased by 23 and 40 percent, respectively (Putnam, 1990). Oklahoma consumers have followed the national trends. Therefore, Oklahoma's consumption levels can support significant increases in Oklahoma's fruit and vegetable production.

Table 1

The Average Price (Adjusted for Marketing Margins) and the Average Coefficient of Variation for Selected Crops during the Complete Harvest Period (1984-1988)

Commodities	Chicago	Dallas	Denver	New Orleans	St. Louis
		---------- Price ($/unit) and Coefficients of Variation ----------			
Bell Pepper	8.70	10.09	11.08	10.25	7.97
	(11.97)[a]	(12.29)	(10.83)	(11.43)	(11.82)
Broccoli Spring	7.19	7.24	7.88	12.08	6.88
	(11.86)	(10.33)	(10.56)	(11.79)	(11.23)
Broccoli Fall	8.14	8.67	9.73	10.46	8.46
	(17.18)	(9.98)	(11.28)	(17.01)	(19.31)
Cantaloupe	7.40	6.67	7.89	8.76	6.08
	(18.37)	(11.80)	(14.96)	(11.73)	(18.16)
Cauliflower Spring	9.22	8.77	9.97	10.52	8.27
	(11.80)	(11.05)	(11.37)	(12.37)	(14.55)
Cauliflower Fall	10.02	10.00	10.77	11.45	6.53
	(13.83)	(18.78)	(13.01)	(13.14)	(28.61)
Sweet Potato	8.60	10.18	10.81	10.68	7.58
	(16.56)	(13.56)	(14.33)	(6.08)	(19.38)
Watermelon	8.14	6.49	9.53	-	5.01
	(18.90)	(23.18)	(14.28)	-	(23.18)

[a]Figures in parentheses represent coefficients of variation in percentages.

Source: Based on data from USDA.

Table 2

Estimated Production Cost at Various Yield Levels and Harvest Periods, Selected Products Grown in Oklahoma, 1989.

Commodities	Operating Cost ($/acre)	Fixed Cost ($/acre)	Total Cost ($/acre)	Yield (unit/acre)	Cost ($/unit) 100%yld	90%yld	80%yld	70%yld	Unit	Harvest period
Bell Pepper	2149.98	334.92	2484.90	300	8.28	9.20	10.35	11.83	30lb cart	7/8 - 8/19 (wks27-33)
Broccoli Spring	1911.17	259.96	2171.13	375	5.79	6.43	7.24	8.27	22lb cart	5/6 - 6/24 (wks18-25)
Broccoli Fall	1979.81	266.72	2246.53	400	5.62	6.24	7.02	8.02	22lb cart	10/21-11/25 (wks42-47)
Cantaloupe	1806.07	279.10	2085.98	370	5.64	6.26	7.05	8.05	38lb cart	7/1-10/21 (wks26-42)
Cauliflower Spring	2676.96	281.41	2958.37	425	6.96	7.73	8.70	9.94	21lb cart	10/21-11/25 (wks19-23)
Cauliflower Fall	2829.97	263.17	3093.14	475	6.51	7.24	8.14	9.30	21lb cart	5/13-6/10 (wks42-47)
Sweet Potato	2106.75	399.51	2506.26	300	8.35	9.28	10.44	11.93	50lb cart	8/26-10/21 (wks34-42)
Watermelon	503.60	265.45	769.05	14000	0.05	0.06	0.07	0.08	lb	7/15-10/21 (wks28-42)

Source: Calculated from data compiled by Oklahoma State University.

Data

Weekly data for wholesale prices and arrivals data for the 1984-1988 period in target markets were obtained from USDA publications. The production costs per unit of selected commodities were calculated from a comprehensive enterprise budget prepared by the Department of Agricultural Economics faculty at Oklahoma State University.

Results

The potential market windows for watermelon, cantaloupe, sweet potato, bell pepper, broccoli, and cauliflower are identified in this section. The discussion of the results are accompanied by corresponding figures for each crop. A summary of the results is presented in Table 3.

Watermelon

Watermelon is a long season crop and is the second largest acreage vegetable crop in Oklahoma. The central, east central, and south central areas are the dominant production areas in Oklahoma. The supply of watermelon from various states is concentrated from May through September at the wholesale markets.

In the Chicago market, the lowest price line does not cover the production costs at 100 percent yield level during the harvest period except for weeks 28 through 30 and 38 through 42 (Figure 1-a). The coefficient of variation for the same period is less than 20 percent (Table 2). At 80 percent yield level, the five year mean prices (the middle line in Figure 1-a) exceed the production costs only for weeks 38 through 42. Since deliveries from major suppliers such as Florida, Georgia, Indiana, Missouri, and Texas peak at the first half of the marketing period (June through August), marketing opportunities for Oklahoma crops are far better during the second half (September through October).

In the Dallas wholesale market, the lowest price line for watermelons during the past five years does not cover the production costs at 100 percent yield level during Oklahoma's harvest period (Figure 1-b). Moreover, the costs at 80 percent yield level exceed the five year mean prices. Therefore, it can be concluded that a good market window does not exist for Oklahoma watermelons at the Dallas wholesale market during Oklahoma's harvest period. (Note that this conclusion is based on the assumption that marketing margins constitute 30 percent of the price of watermelons transported to Dallas.)

The lowest price line at the Denver market is higher than the production costs at 100 percent yield level (Figure 1-c). The five year mean prices exceed the production costs at 70 percent yield level. The adjusted average price (adjusted for marketing margins) during the harvest period is as high as 9.5 cents per pound (Table 1). In addition, the coefficient of variation is also far lower than 20 percent. Therefore, it can be concluded that the Denver market has a highly profitable and stable market window for Oklahoma watermelons.

In the St. Louis market, the five year mean prices do not cover the production costs at 100 percent yield level, and the lowest price line is not high enough to guarantee a profitable market window. Moreover, the coefficient of variation is greater than 20 percent. Hence, the price and production risk for Oklahoma watermelons are very high in the St. Louis wholesale market (Figure 1-d).

Because of the lack of complete data on watermelons, the New Orleans market was not analyzed.

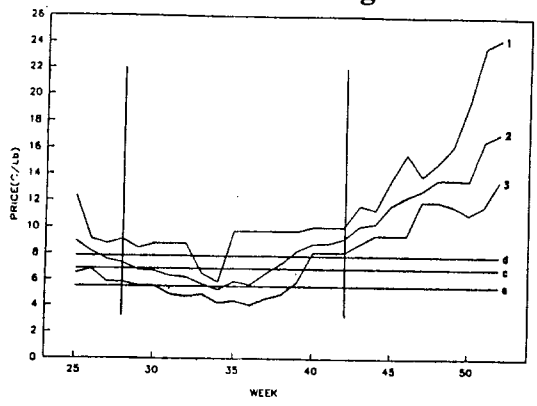
Cantaloupe

Cantaloupe is the major variety of muskmelon grown in Oklahoma. The harvest period lasts from June through October. California, Arizona and Texas are the predominant shippers, and in the winter, some cantaloupes are imported from Mexico.

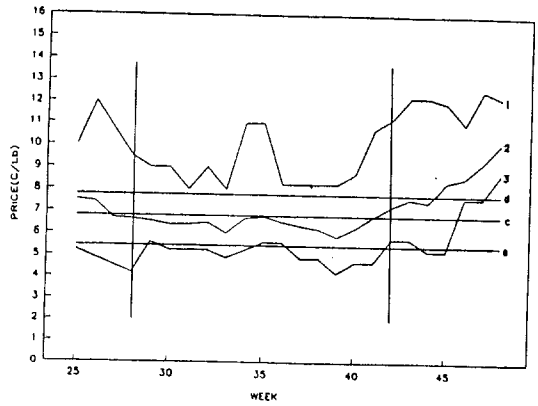
Weeks 26 through 42, the Oklahoma harvest period, are presented for cantaloupe. In the Chicago wholesale market, the lowest price line exceeds the production costs at 100 percent yield level only during the latter part of Oklahoma's harvest season (weeks 36 through 42) (Figure

Figure 1. Market Window for Oklahoma Grown Watermelons, Major Wholesale Markets (1984-1988)

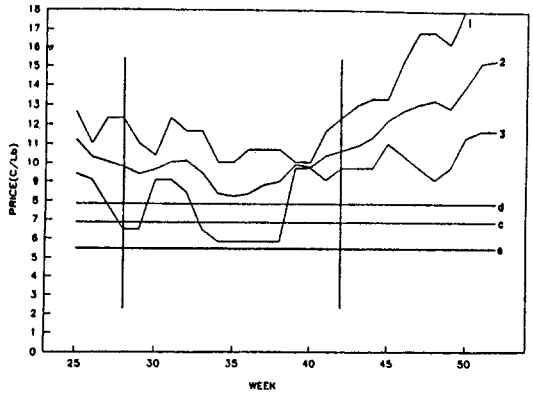
1-a Chicago



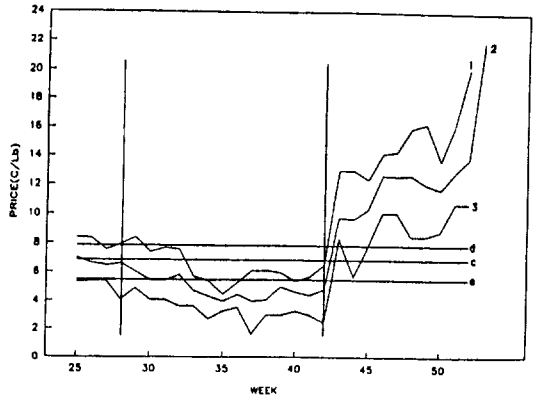
1-b Dallas



1-c Denver



1-d St. Louis



Source: Based on data from USDA, 1=highest adjusted price, 2=mean adjusted price, 3=lowest adjusted price; a=production cost (p.c.) at 100% yield level, b=p.c. at 90% yield level, c=p.c. at 80% yield level, d=p.c. at 70% yield level. Period between vertical lines is the Oklahoma harvest season. Adjusted prices are wholesale prices minus the marketing margins. For marketing margins refer to Footnote 1 of the text.

2-a). The five year mean prices cover the production costs at 80 percent yield level during weeks 26 through 32 and weeks 37 through 42 of the harvest season. The peak of arrivals in Chicago are weeks 33 through 37, July through early August, and the coefficient of variation is less than 20 percent which indicates that Chicago is a stable market in terms of price variability.

In the Dallas market, the five year mean prices exceed the production costs at 90 percent yield level (except weeks 32 and 33). Throughout the first half (weeks 26 through 36) of the harvest period, the lowest price line is not high enough to guarantee a market window for Oklahoma cantaloupes, but during the second half (weeks 37 through 42), it exceeds the production costs at 100 percent yield level (Figure 2-b). Therefore, the Dallas market provides a market window, but the production risk is high.

Denver and New Orleans markets show the greatest market potential for the complete harvest period. The lowest price line is higher than the production costs at 100 percent yield level (with the exception of weeks 34 and 35 for Denver), and the five year mean prices cover the increase in production costs at 80 percent yields (except for weeks 34 and 35 for Denver) (Figures 2-c and 2-d). With coefficients of variation far lower than 20 percent, these two markets are considered to be stable. However, New Orleans market shows a greater market potential than Denver.

St. Louis market, however, shows less market potential for Oklahoma cantaloupe than the other markets. In this market, the lowest price line, as well as the five year mean prices, is below the production costs at 100 percent yield level (Figure 2-e).

Sweet Potato

With good marketing management, sweet potatoes can be one of the most profitable vegetable crops grown in Oklahoma. In the Chicago market, Oklahoma's harvest period (weeks 34 through 42) coincides with numerous arrivals from North Carolina's large and declining market prices (Figure 3-a). With current marketing practices, the mean price is below Oklahoma's production costs at 80 percent yield level for most of the harvest season. The lowest price line is above the production costs at 100 percent yield level only for the first week. However, if Oklahoma growers harvested sweet potatoes earlier (before North Carolina's arrivals), they could find a more profitable market potential in the Chicago market. Nevertheless, the risk associated with price variability is low with the coefficient of variation less than 20 percent for the harvest period.

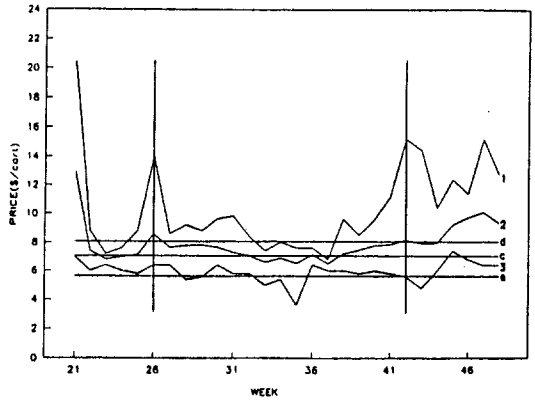
The Dallas market shows less profitable potential based on both price-cost criteria and the risk associated with production. The five year mean prices cover the production costs at 90 percent yield level (except for the last two weeks of harvest). However, the lowest price line is below the production costs at 100 percent yield level except for the first three weeks (weeks 34 through 36, Figure 3-b). The main suppliers are California and Texas, and their supply periods are April through June and September through April, respectively. Therefore, if harvested a few weeks earlier, Oklahoma sweet potatoes can compete profitably in the Dallas market.

Denver and New Orleans markets show better market windows for Oklahoma sweet potatoes based on price-cost criteria and risk associated with both price and production. In the Denver market the lowest price line exceeds the production costs at 100 percent yield level for the first half of the harvest period (weeks 34 through 37), and the five year mean prices are above the production costs at 80 percent yield level for weeks 34 through 37 (Figure 3-c). In the New Orleans market, the five year mean prices are above the production costs at 80 percent yield level for weeks 34 through 37 (Figure 3-d). However, the lowest price line exceeds the production costs at 100 percent yield level for the entire Oklahoma harvest period. The coefficients of variation are lowest among all markets analyzed. Therefore, Denver and New Orleans markets are highly profitable and stable markets for Oklahoma sweet potatoes during the second part of Oklahoma's harvest period.

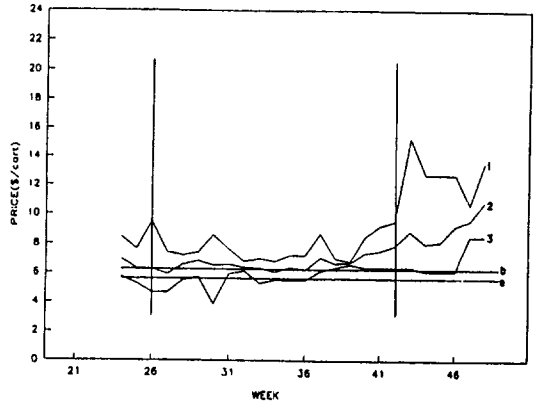
Compared with the other markets, the St. Louis market has the lowest market potential.

Figure 2. Market Window for Oklahoma Grown Cantaloupes, Major Wholesale Markets (1984-1988)

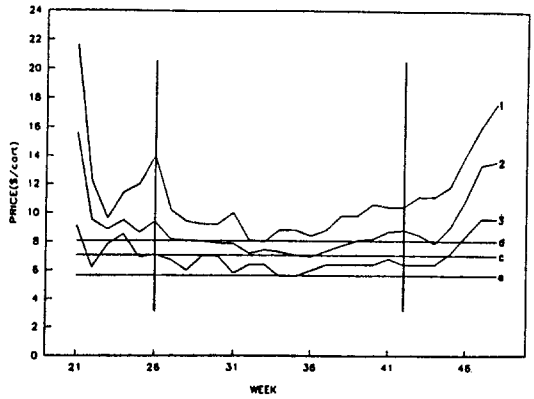
2-a Chicago



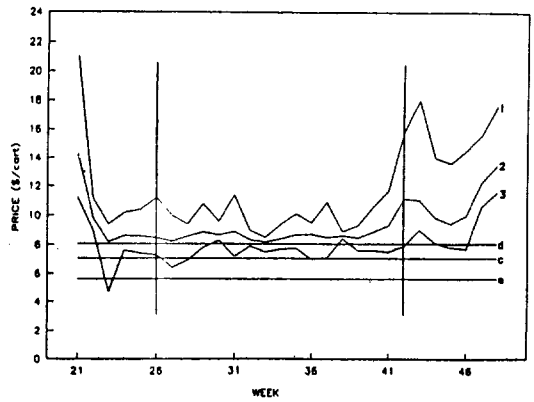
2-b Dallas



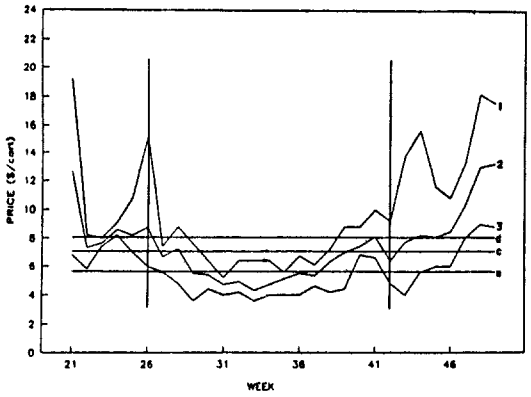
2-c Denver



2-d New Orleans



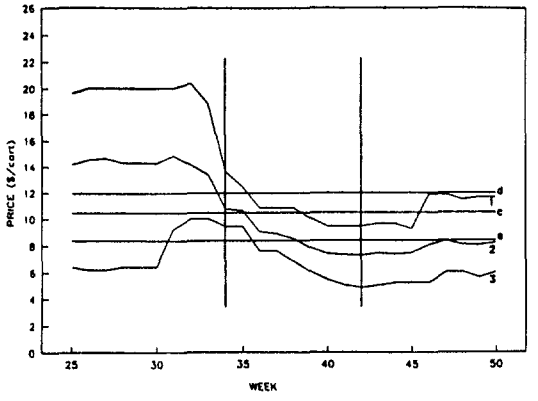
2-e St. Louis



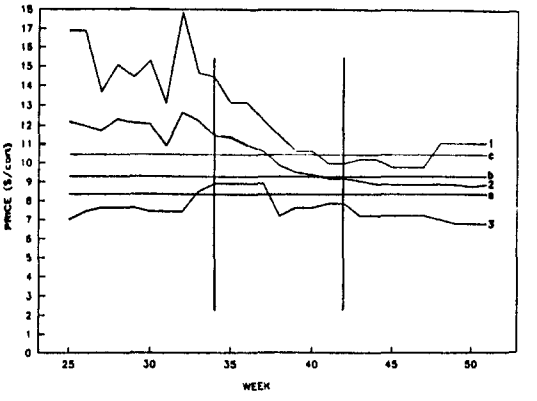
Source: Based on data from USDA, 1=highest adjusted price, 2=mean adjusted price, 3=lowest adjusted price; a=production cost (p.c.) at 100% yield level, b=p.c. at 90% yield level, c=p.c. at 80% yield level, d=p.c. at 70% yield level. Period between vertical lines is the Oklahoma harvest season. Adjusted prices are wholesale prices minus the marketing margins. For marketing margins refer to Footnote 1 of the text.

Figure 3. Market Window for Oklahoma Grown Sweet Potatoes, Major Wholesale Markets (1984-1988)

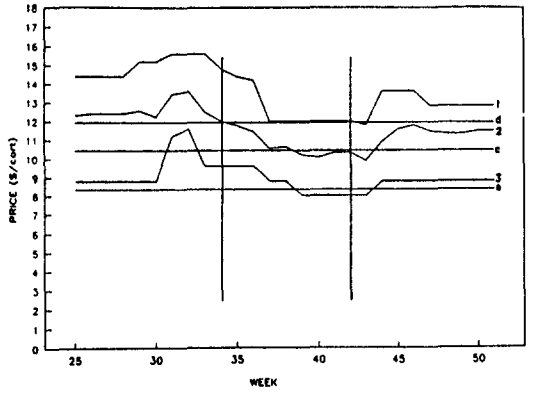
3-a Chicago



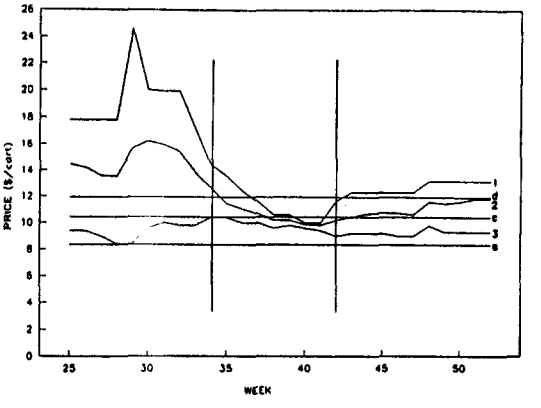
3-b Dallas



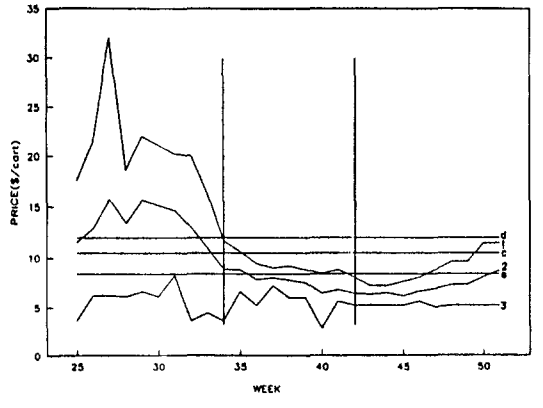
3-c Denver



3-d New Orleans



3-e St. Louis



Source: Based on data from USDA, 1=highest adjusted price, 2=mean adjusted price, 3=lowest adjusted price; a=production cost (p.c.) at 100% yield level, b=p.c. at 90% yield level, c=p.c. at 80% yield level, d=p.c. at 70% yield level. Period between vertical lines is the Oklahoma harvest season. Adjusted prices are wholesale prices minus the marketing margins. For marketing margins refer to Footnote 1 of the text.

The lowest price line is far below the production costs at 100 percent yield level, and the five year mean prices are too low to cover the increase in production costs with 10 percent yield decline (Figure 3-e).

Bell Pepper

Bell peppers are a warm season crop which are very sensitive to temperature fluctuations. The average prices, which are generally highest in the spring, tend to decline in the summer and then level off during September and October. Arrival data show there is a stable supply of bell peppers throughout the year at the five wholesale markets. Florida is the dominant supplier from April through June, California from July through October, Texas from October through November, and Mexico from December through March.

The Chicago and Dallas wholesale markets have shown similar tendencies in bell pepper prices. The averages of the five year mean prices during the Oklahoma harvest season at the Chicago and Dallas markets have been $8.70 and $10.09 per carton, respectively (Table 1). Since the production costs at 100 percent yield level are $8.28, the efficient producers apparently will be able to use the market windows which exist in these markets. In Chicago, the lowest price line is below the production costs at 100 percent yield level which indicates that the price risk is high (Figure 4-a). In Dallas, the lowest price slightly exceeds production costs at 100 percent yield level only during weeks 28 through 30. The five year average price exceeds production cost at 80 percent yield level during weeks 29 through 30. During the Oklahoma harvest period, the coefficients of variation indicate low risk in the Chicago and Dallas markets.

During the last five years, the five year mean prices for the Oklahoma harvest season at the Denver and New Orleans markets have averaged $11.08 and $10.25 per carton, and coefficients of variation are 10.8 percent and 11.4 percent, respectively (Table 1). The lowest price line in the Denver market covers the production costs at nearly 90 percent yield level, and that of the New Orleans market covers the production costs at 100 percent yield level (except for the first couple of weeks). In the Denver market, the five year mean price is above the production costs at 80 percent yield level (Figure 4-c).

Therefore, it appears that Oklahoma would have market windows for bell peppers during the complete harvest period (July and August) with low levels of price risk and yield risk.

As with other crops, the St. Louis market does not provide a potential market window for Oklahoma bell peppers. The average of mean prices during the harvest period is as low as $7.97 per carton which is not high enough to cover the production costs at 100 percent yield level (Table 1). The lowest price is far lower than the costs (Figure 4-e).

Broccoli

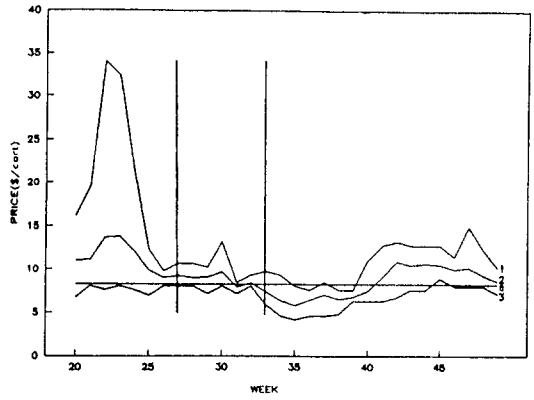
Broccoli is currently very popular and is a profitable crop in Oklahoma. Broccoli can be harvested in the spring and in the fall. The average prices are higher in the winter and stable throughout the year; clearly, the market windows for Oklahoma broccoli extend through most of the year. Arrival data show that California accounts for the largest portion of the supply for all wholesale markets.

The averages of five year mean prices in the spring and fall harvest seasons at the Chicago market are $7.19 and $8.14 per carton which cover the production costs assuming 10 percent and 30 percent yield reduction, respectively (Tables 1 and 2). The lowest price lines of both seasons cover the production costs at 100 percent yield level (Figure 5-a), and the coefficients of variation of both seasons are lower than 20 percent. The Chicago market provides relatively profitable and stable market windows for spring and fall broccoli from Oklahoma.

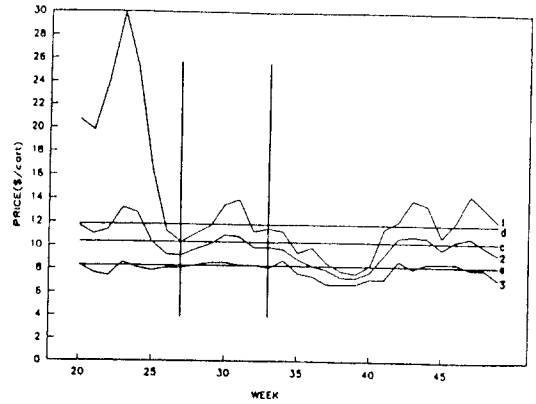
During the spring and fall harvest seasons, the five year mean prices at the Dallas market have averaged $7.24 and $8.67 per carton which cover the production costs at 90 percent and 70 percent yield levels, respectively (Tables 1 and 2). The lowest price line during both seasons is above the production costs at 100 percent yield level (Figure 5-b), and the coefficients of variation for

Figure 4. Market Window for Oklahoma Grown Bell Peppers, Major Wholesale Markets (1984-1988)

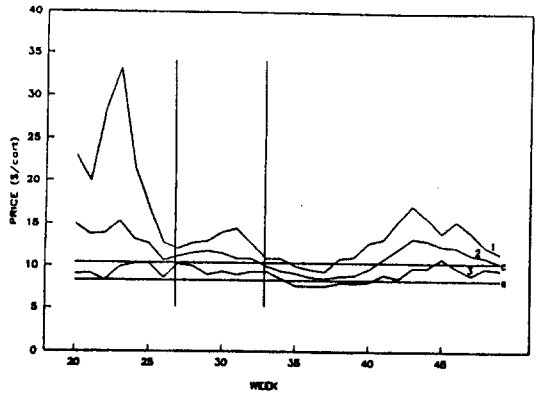
4-a Chicago



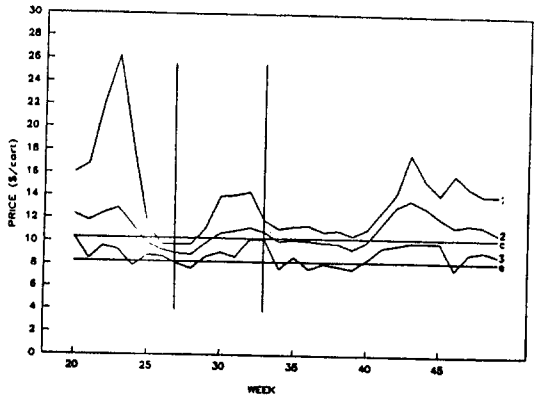
4-b Dallas



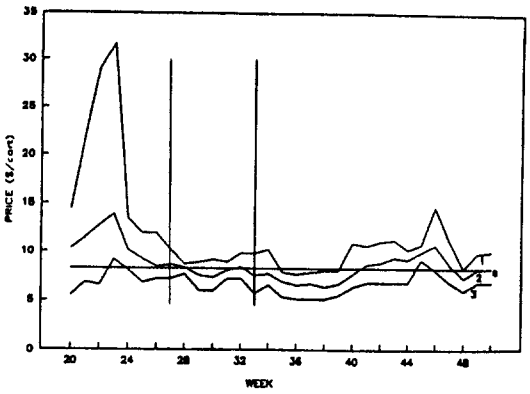
4-c Denver



4-d New Orleans



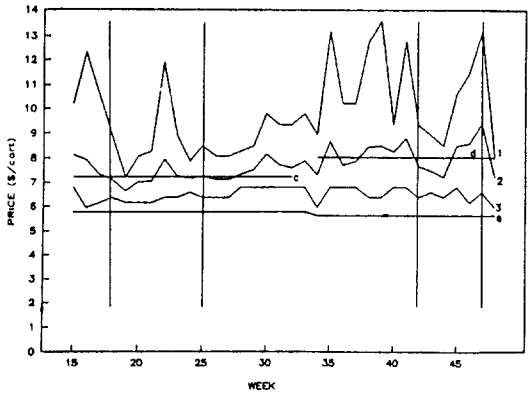
4-e St. Louis



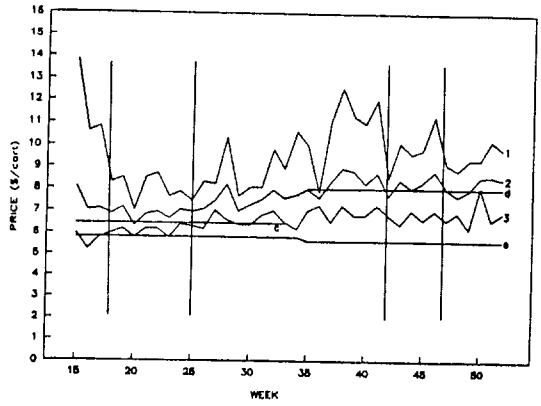
Source: Based on data from USDA, 1=highest adjusted price, 2=mean adjusted price, 3=lowest adjusted price; a=production cost (p.c.) at 100% yield level, b=p.c. at 90% yield level, c=p.c. at 80% yield level, d=p.c. at 70% yield level. Period between vertical lines is the Oklahoma harvest season. Adjusted prices are wholesale prices minus the marketing margins. For marketing margins refer to Footnote 1 of the text.

Figure 5. Market Window for Oklahoma Grown Broccoli, Major Wholesale Markets (1984-1988)

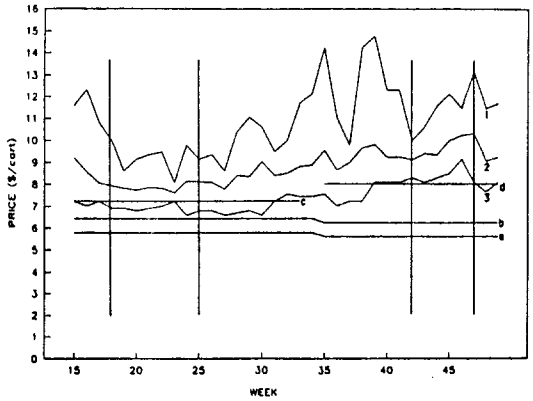
5-a Chicago



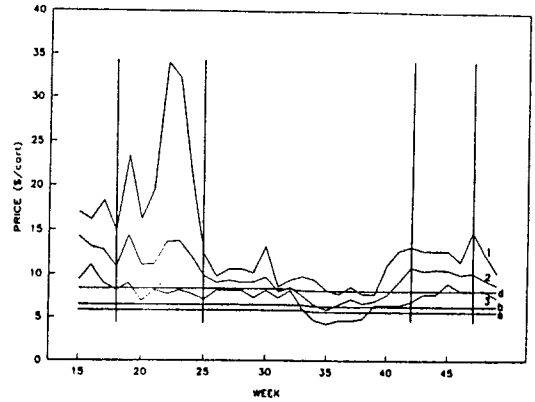
5-b Dallas



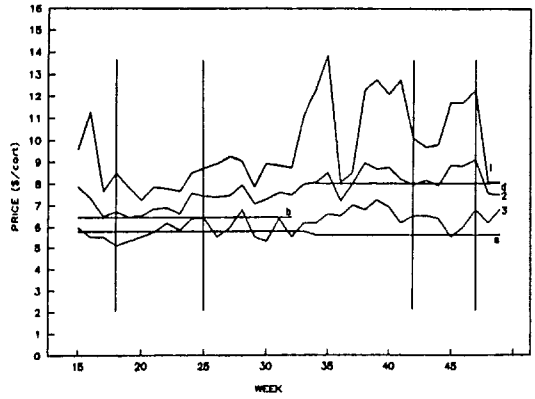
5-c Denver



5-d New Orleans



5-e St. Louis



Source: Based on data from USDA, 1=highest adjusted price, 2=mean adjusted price, 3=lowest adjusted price; a=production cost (p.c.) at 100% yield level, b=p.c. at 90% yield level, c=p.c. at 80% yield level, d=p.c. at 70% yield level. Period between vertical lines is the Oklahoma harvest season. Adjusted prices are wholesale prices minus the marketing margins. For marketing margins refer to Footnote 1 of the text.

both seasons are less than 20 percent. Therefore, two market windows exist in the Dallas market -- one in the spring harvest season and one in the fall harvest season. However, the fall crop has a stronger market potential.

The Denver and New Orleans markets also show potential market windows for Oklahoma broccoli during both the spring and fall harvest seasons. In both markets, the averages of the five year mean prices are all high enough to cover the production costs at 80 percent or 70 percent yield levels. In addition, the lowest price lines are all considerably higher than the production costs at 90 percent yield level (Figures 5-c and 5-d), and the coefficients of variation are all far lower than 20 percent. Therefore, it can be concluded that Oklahoma broccoli, like other crops, has market potential at the Denver and New Orleans markets in both harvest periods.

Even in the St. Louis market, broccoli, unlike other crops, shows a relatively good market potential for Oklahoma in both harvest seasons. The averages of the five year mean prices are $6.88 per carton in the spring harvest season and $8.46 in the fall harvest season which cover the production costs at 10 percent and 30 percent yield declines, respectively (Tables 1 and 2). The lowest price line covers the production cost at 100 percent yield level for fall broccoli (Figure 5-e). However, for spring broccoli, the lowest price line exceeds the production cost at 100 percent yield level only during the second half of Oklahoma's harvest season. With the coefficient of variation less than 20 percent, the St. Louis market shows low risk.

Cauliflower

Like broccoli, fresh cauliflower shows a great profit potential. California is the predominant shipper throughout the year. Over the last few years, Oklahoma growers have not been able to deliver fresh cauliflower in large marketable quantities in the spring or fall. However, research has indicated the potential if managed correctly.

The averages of the five year mean prices at the Chicago market are $9.22 per carton during the spring harvest season and $10.02 per carton during the fall harvest season which cover the production costs assuming 20 percent and 30 percent yield declines, respectively. Moreover, the lowest price lines in both periods are far higher than the production costs at normal yield levels, and the coefficients of variation are 11.8 percent and 13.8 percent, respectively (Figure 6-a). Consequently, Oklahoma fresh cauliflower could be competitive in the Chicago wholesale market for the complete harvest seasons if the expected yields can be obtained.

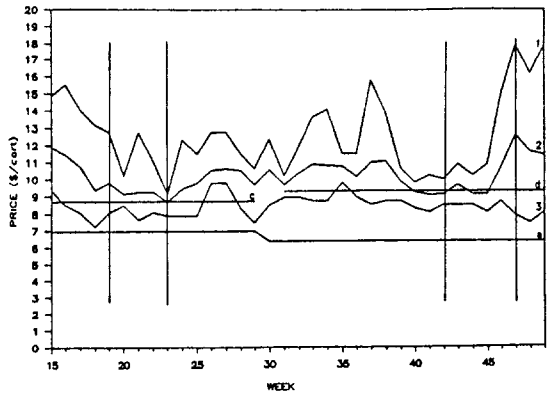
The profit potential in the Dallas market is similar to that of the Chicago market. In the Dallas wholesale market, the averages of five year mean prices are higher than the production costs at 90 percent yield level during the spring harvest season and at 80 percent yield level during the fall harvest season. The lowest price line is higher than production costs at 100 percent yield level during the fall harvest season. However, for spring cauliflower, the lowest price line covers the production cost at 100 percent yield level only during the first two weeks of Oklahoma harvest season (Figure 6-b). The lower than 20 percent coefficient of variation indicates that the price and production risk are not high in the Dallas wholesale market.

Favorable market windows can be found in the Denver and New Orleans wholesale markets during both the spring and fall harvest seasons. Even at 70 percent of normal yield level, fresh cauliflower from Oklahoma can be competitive in both wholesale markets. The averages of five year mean prices during both harvest seasons are all close to $10.00 per carton and the production costs at 70 percent yield level are $9.94 in the spring and $9.30 in the fall harvest season. Moreover, the lowest price lines cover the production costs assuming 10 percent yield decline during the spring and fall harvest seasons at both wholesale markets (Figure 6-c and 6-d). The coefficients of variation for each harvest season in both wholesale markets are very low.

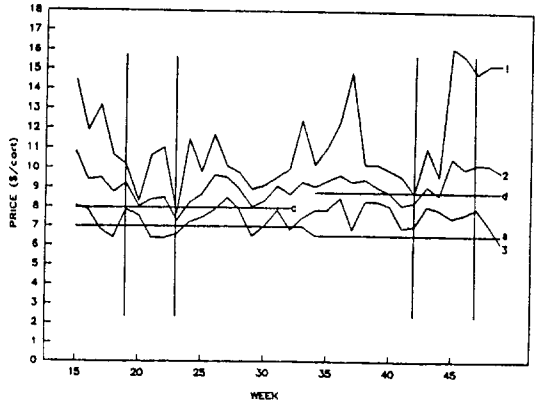
A market window has been identified for cauliflower during the spring in the St. Louis wholesale market. The five year mean prices have averaged $8.27 per carton in the spring harvest season, which covers the production costs

Figure 6. Market Window for Oklahoma Grown Cauliflower, Major Wholesale Markets (1984-1988)

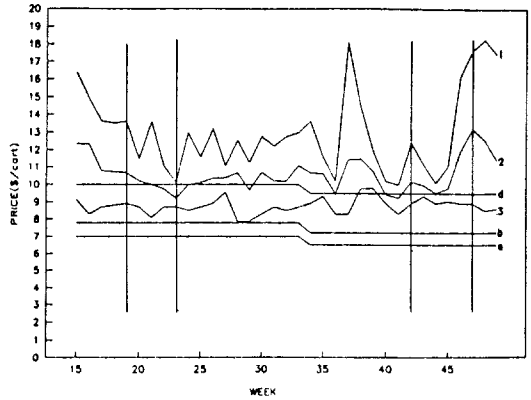
6-a Chicago



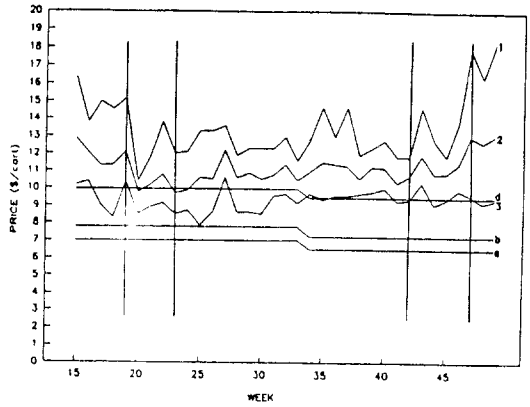
6-b Dallas



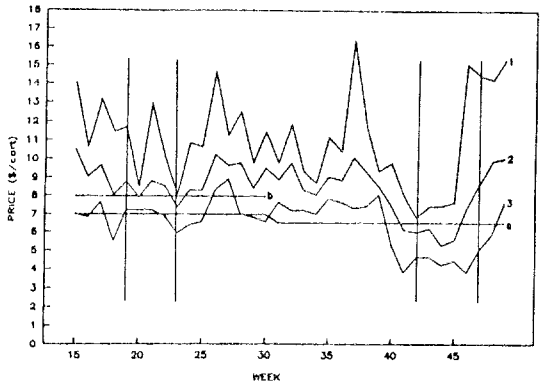
6-c Denver



6-d New Orleans



6-e St. Louis



Source: Based on data from USDA, 1=highest adjusted price, 2=mean adjusted price, 3=lowest adjusted price; a=production cost (p.c.) at 100% yield level, b=p.c. at 90% yield level, c=p.c. at 80% yield level, d=p.c. at 70% yield level. Period between vertical lines is the Oklahoma harvest season. Adjusted prices are wholesale prices minus the marketing margins. For marketing margins refer to Footnote 1 of the text.

at 90 percent yield level, the lowest price line covers the production costs at normal yield level (except for the last week of harvest season), and the coefficient of variation is less than 20 percent. However, the fall market window is not apparent for Oklahoma cauliflower at the St. Louis wholesale market since the five year mean prices as well as the lowest prices do not cover the production costs at 100 percent yield level (Figure 6-e).

Implications and Conclusions

Currently, the majority of Oklahoma growers are marketing their produce in the state and via direct marketing channels such as farmers' markets, roadside stands, and pick-your-own operations. In this study, a market window analysis is conducted to identify alternative marketing opportunities for Oklahoma's fresh produce industry. Market profitability for six Oklahoma produce items in five large wholesale markets outside the state of Oklahoma is analyzed. The wholesale markets may offer lucrative marketing channels to Oklahoma growers. Market window refers to a period of time when the prices received by producers for selected crops are greater than the production costs.

While the market window analysis is a relatively simple and reliable evaluation technique for screening potential markets, it has several disadvantages. According to Adrian et al., market window analysis does not take into account highly influencing conditions such as climate and other production areas entering the target market. It is also argued that no cost data exist for a crop in the precise production conditions confronted by a new grower or production area, and the probabilities associated with yields and prices are unknown. Formulation of price expectation introduces an additional limitation. A majority of the market window studies, including this study, assume the expected prices to be a simple mean of past nominal prices. This formulation of price expectations ignores the impact of inflation on expected produce prices. A more elaborate study may consider giving higher weights to immediate past prices. Moreover, the market window analysis does not take into account the economic impacts, such as the possible price depressing effects, of increased production and marketing. Even with such limitations, the market window analysis is a simple and inexpensive device for evaluating market potential for selected crops.

Crop summaries

1. Market windows exist for Oklahoma watermelons only during a few weeks of the Oklahoma harvest period in the Chicago market, and for the entire harvest period in the Denver market.

2. For cantaloupe, market windows exist throughout the entire Oklahoma harvest season in the Denver and New Orleans markets. In the Chicago market, there exists a market window from mid-September through mid-October. The Dallas market is profitable for Oklahoma cantaloupe in September and October, but the production risk is high.

3. The Dallas and Chicago markets show less profitable potential markets; however, if Oklahoma sweet potatoes are harvested a few weeks earlier, these markets will be more profitable. The Denver and New Orleans markets show potential market windows during the first half of the Oklahoma harvest period based on price-cost criteria and risk associated with both price and production. The St. Louis market has the lowest market potential for all crops.

4. Oklahoma has market windows for bell peppers during the harvest period (July and August) at the Denver and New Orleans wholesale markets.

5. Broccoli and cauliflower can be the most profitable crops for Oklahoma. For broccoli, all five wholesale markets provide highly profitable and stable market windows in both the spring and fall harvest seasons. For cauliflower, the Chicago, Dallas, Denver, and New Orleans wholesale markets are potential markets for both the spring and fall harvest seasons. The St. Louis wholesale market extends a brief market window for cauliflower during the spring harvest season.

Table 3 summarizes the results of the market window analysis.

Table 3

Summary of Results of the Market Window Analysis for Six Oklahoma Grown Produce Items in the Five Wholesale Markets

Commodities Harvest Period	Chicago	Dallas	Denver	New Orleans	St. Louis
	---(Potential Market Windows (in weeks) and Marketing Margins, as a Percentage of Wholesale Price) - - - - -				
Watermelon wks 28-42	38-42 (35%)[2]	None[1] (30%)	The entire harvest period (35%)	-	None (35%)
Cantaloupe wks 26-42	36-42 (20%)	37-42 (15%)	The entire harvest period (20%)	The entire harvest period (20%)	None (20%)
Sweet Potato wks 34-42	None (20%)	34-36 (15%)	34-37 (20%)	34-37 (20%)	None (20%)
Bell Pepper wks 27-33	None (15%)	29-30 (10%)	The entire harvest period (15%)	29-33 (15%)	None (15%)
Broccoli (Spring) wks 18-25	The entire harvest period (15%)	The entire harvest period (10%)	The entire harvest period (15%)	The entire harvest period (15%)	21-25 (15%)
Broccoli (Fall) wks 42-47	The entire harvest period (15%)	The entire harvest period (10%)	The entire harvest period (15%)	The entire harvest period (15%)	The entire harvest period (15%)
Cauliflower (Spring) wks 19-23	The entire harvest period (15%)	19-20 (10%)	The entire harvest period (15%)	The entire harvest period (15%)	19-21 (15%)
Cauliflower (Fall) wks 42-47	The entire harvest period (15%)	The entire harvest period (10%)	The entire harvest period (15%)	The entire harvest period (15%)	None (15%)

[1]None: Refers to no market windows exist.

[2]The figures in parentheses represent marketing margins. Marketing margins are assumed to cover transportation costs, unloading and handling costs, and brokerage fees. The wholesale prices in the target market were adjusted by these margins to calculate the adjusted prices given in Table 1 (see footnote 1 in the text).

Endnote

[1]The marketing margins as a percentage of wholesale prices used in this study are: For bell peppers, broccoli, and cauliflower transported to Chicago, St. Louis, New Orleans, and Denver, they were assumed to be 15 percent, and 10 percent for Dallas. For cantaloupe and sweet potato transported to Chicago, St. Louis, New Orleans, and Denver, they were assumed to be 20 percent; and for Dallas, 15 percent of the wholesale price. For watermelon transported to Chicago, Denver, and St. Louis, they were assumed to be 35 percent, and 30 percent for Dallas.

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