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PAPERS

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ABSTRACTS

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Factors Affecting Land Prices in Several Florida Counties/*Langlois*
U.S. Bittersweet Sugar Policy/*Mckinnell*
Optimum Input Levels for Cotton Production/*Morrow*
Economic Analysis of Plumbism in the Bald Eagle/*Pryor*
Impacts of Grazing Fee Increases on Two Nevada Counties/*Wood*

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RASPBERRY PRODUCTION: A VIABLE ALTERNATIVE FOR UTAH FARMERS

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ABSTRACT

The Utah raspberry industry was examined from the perspective of a typical producer using a capital budgeting modelling framework to determine the economic feasibility of engaging in raspberry production in Utah. It was determined that raspberry production in Utah was economically feasible and provided normal returns to land, labor, capital, and management under a variety of price and production levels. The constraints facing producers at both the micro and macro levels were identified and discussed. None of the identified constraints were binding. Using two estimated values of the price elasticity of demand, it was determined that the industry may grow between 23 percent and 144 percent before the typical producer could no longer earn a normal return on all factors of production. The market potential for Utah raspberries was examined using the market window technique which showed open markets exist for Utah raspberries in several major markets.

Key Words: Raspberry production, Capital budgeting, Market window

INTRODUCTION

The agricultural industry throughout Utah and the United States has been facing a financial crisis unprecedented since the Great Depression. Many farmers are searching for agricultural enterprises that will yield a normal return to land, labor, capital, and management. Glover and Snyder (1985) suggested that raspberry production in Utah may have the potential of being such an enterprise for some farmers.

OBJECTIVES

In order to determine if raspberry production is a viable alternative for Utah farmers, several objectives must be met. These objectives include the following:

1. Describe the general characteristics of the Utah raspberry industry.

2. Define the "typical" raspberry producer.

3. Determine a general crop cash flow budget for the typical raspberry producer in Utah.

4. Determine the economic feasibility of entering the industry as a typical producer.

5. Determine the micro and macro constraints facing the Utah raspberry industry.

6. Estimate the market growth potential for Utah raspberries.

Each of these objectives will be met by following the procedures outlined in the methodology section below.

METHODOLOGY

In order to meet these objectives, a variety of economic tools must be used. The tools to be used include: a survey, a cash flow budget, a discounted cash flow analysis, a linear programming model, an estimation of a demand function, and a market window analysis. Each of these tools will be used following general accepted procedures.

RESULTS AND DISCUSSION

The Utah Raspberry Industry and the Typical Producer

A survey was conducted in order to obtain the information necessary to determine the state of the raspberry industry in Utah and to define the typical Utah raspberry producer. A questionnaire developed for this project was sent to each of the 17 identified producers. Two of the identified producers were no longer engaged in the production of raspberries. Of the 15 remaining producers, 13 completed the survey and returned the information via mail or telephone. This yielded a 86.7 pecent response rate. In the questionnaire, questions were asked about production, marketing, variable and fixed costs, grower characteristics, the future of the producer's enterprise, and the future of the Utah raspberry industry. The survey results are summarized in table 1.

The Utah raspberry industry, concentrated in northern Utah, was relatively small (less than 100 acres) and undeveloped when compared to other agricultural industries in the state. More than 98 percent of all Utah raspberries were marketed fresh. Nearly 70 percent of Utah raspberries were marketed at the retail level by the producers themselves although some Utah raspberries were sold to wholesalers by the larger producers. Fifty percent of the producers responding to the questionnaire mentioned the profitability of raspberries as a major consideration in their choosing to enter the raspberry industry.

Defining the typical Utah producer proved to be a challenging task. The information collected from the survey was analyzed in terms of the mean and the mode for each question. In the sense that average is defined as the mean, no truly average producers existed in Utah. Defining the typical producer in terms of the mode of the data collected became both the intuitive and the practical approach to the problem.

The typical producer in Utah was a part-time farmer operating a very small acreage. The typical producer owned less than three acres of land valued at $4,154 per acre. Of these three acres, one acre that was previously unused and idle was planted into summer bearing raspberry plants of the Canby cultivar. The raspberries were sold in ten pound cases directly to the consumer from the home of the producer. The raspberry enterprise was 100 percent owner financed. The typical Utah producer had a large family with five children. The reasons most commonly cited for engaging in raspberry production were to provide summer employment for the children and the profitability of

Table 1

Characteristics of Raspberry Producers in Utah, 1985.

	Mean	Range
Acres operated	15.2	.5 - 75.0
Acres of Raspberries in Production	7.3	.04- 50.0
Production in Pounds Per Acre*	3088.0	1150.0 -7000.0
Percent of Raspberries Sold at Retail	68.5	10.0 - 100.0
Percent of Raspberries Sold at Wholesale	20.0	0 - 75.0
Percent of Raspberries Sold through Other Markets	11.5	0 - 20.0
Price Received Per Ten Pound Case	15.24	12.00- 19.29
Family Picking Labor (hours per season)	64.3	0 - 180.0
Family Marketing Labor	529.6	1 -2880.0
Family General Labor	397.8	0 -1750.0
Picking Wage Per Ten Pound Case	3.89	3.00- 4.25

* 1985 production levels were not indicitive of normal levels of production due to the exceptionally high level of winter kill.

TABLE 2

TYPICAL UTAH RASPBERRY ENTERPRISE
CASH FLOW BUDGET

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
INVESTMENT										
Land Preparation (plowing, etc.)	25.00									
Plants ($.40 per cane)	900.00	90.00								
Roto-Tiller (reconditioned)	800.00									
Sprinkling System (permanent overhead)	1000.00									
Miscellaneous Tools (sprayers, hoes, etc.)	175.00									
Increase or Decrease in Working Capital	500.00	350.00								-850.00
Total Investment	3400.00	440.00	.00	.00	.00	.00	.00	.00	.00	-850.00
RECEIPTS										
Raspberry Sales ($1.50 per pound)	.00	.00	3750.00	7500.00	7500.00	7500.00	7500.00	7500.00	7500.00	7500.00
Total Receipts	.00	.00	3750.00	7500.00	7500.00	7500.00	7500.00	7500.00	7500.00	7500.00
CASH OUTFLOWS										
Fertilizer (21-0-0)	15.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Herbicide (Devrinol, Surflan)	25.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Pesticide (Diazonon, Sevin, Malathion)	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Fuel (gasoline)	51.60	51.60	51.60	51.60	51.60	51.60	51.60	51.60	51.60	51.60
Oil	22.50	22.50	22.50	22.50	22.50	22.50	22.50	22.50	22.50	22.50
Repairs	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00
Packaging ($.40 per case including cups)	.00	.00	100.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Picking ($.40 per pound)	.00	.00	1000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00
Advertising (newspaper, signs)	.00	.00	190.00	140.00	140.00	140.00	140.00	140.00	140.00	140.00
Water (pressurized irrigation)	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
Miscellaneous	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00	125.00
Total Cash Outflows	3799.10	884.10	1734.10	2784.10	2784.10	2784.10	2784.10	2784.10	2784.10	1934.10
NET CASH FLOW BEFORE TAXES	-3799.10	-884.10	2015.90	4715.90	4715.90	4715.90	4715.90	4715.90	4715.90	5565.90
TAXES										
Regular Income Tax	-171.03	-215.53	372.16	1032.20	1032.20	1134.09	1134.09	1178.98	1178.98	1178.98
Less Investment Tax Credit	200.00		99.00							
Total Taxes	-371.03	-215.53	273.16	1032.20	1032.20	1134.09	1134.09	1178.98	1178.98	1178.98
NET CASH FLOW	-3428.08	-668.58	1742.74	3683.70	3683.70	3581.81	3581.81	3536.93	3536.93	4386.93

* All prices are real prices with year one as the base year.
**Full production is assumed to be 5,000 pounds.
Sources of Information: Survey results, Carkner and Scheer, O'Dell

the enterprise. With the exception of picking labor, all labor used in the raspberry enterprise was family labor. The typical producer derived 71 percent of family agricultural income from raspberries while only a very small pecentage of the total family income was earned from the enterprise. This description of the typical producer in Utah provides a basis for the analyses presented throughout the remainder of the paper.

Cash Flow Budget

The cash flow budget, as depicted in table 2, was used to illustrate the actual inflows and outflows of cash from the typical one-acre raspberry enterprise over its entire expected life.

Every attempt was made to make this budget as realistic as possible for conditions which are prevalent in Utah. Whenever a question arose concerning which value to use as an expense, revenue, or yield, the pessimistic value was chosen. However, many assumptions were made in the development of this cash flow budget. In order to avoid the difficulty and uncertainty of projecting nominal prices into the future, real prices were used for both prices received and prices paid with year one as the base year. As mentioned previously, the typical producer put idle land into the production of raspberries. All property taxes and land values were considered sunk costs and irrelevant to the cash flow analysis. The full life of the raspberry enterprise was assumed to be ten years. It was assumed that production in years one and two was zero, year three was 50 percent of full production, and years four through ten were years of full production. Full production was assumed to be 5,000 pounds per acre. It was also assumed that all machinery, equipment, and plants were fully depreciated with no salvage value at the end of year ten. The original increases in working capital in years one and two were salvaged at the end of year ten. For tax purposes it was assumed that the producer took the full investment tax credit available, depreciated all depreciable assets using the five year ACRS schedule, and had a 25 percent marginal tax rate. These assumptions provided the basic framework of the cash flow budget. For further details of the development and assumptions used in the cash flow budget see the forthcoming publication "Raspberry Production in Utah: Producer Characteristics and Market Potential" by Leishman and Godfrey.

Capital Budgeting Analysis

The capital budget procedures outlined in Barry, Hopkins, and Baker were used in this section. A discounted cash flow analysis using both net present value and internal rate of return was used to detemine the economic feasibility of entering the Utah raspberry industry as a typical producer. A real discount factor of five percent was used in conjunction with the real prices used in the cash flow budget. The cash flow from year one was discounted one year and each subsequent year was also discounted according to the number of years elapsed from time period zero.

Following the above procedures, the net present value and internal rate of return were determined and a sensitivity analysis was conducted. The net present value of the stream of

the cash flows (at five percent) presented in the cash flow budget in table 2 was determined to be $16,136.44. This net present value should be considered as the present value of returns to land, labor, and management. The corresponding value for the internal rate of return is 49.7 percent. A net present value of returns to land and management was obtained by treating the value of family labor as a negative cash flow in the years in which it was expended. By assigning an opportunity cost of $4.50 an hour to all family labor, a net present value of $10,128.39 was obtained with a corresponding internal rate of return of 32.3 percent. Holding all other things constant, family labor was assigned an opportunity cost of up to $12.09 per hour before a negative net present value was obtained. By additionally assigning a value of $150 per acre per year to return to management and treating it as a negative cash flow in each year, a net present value of the returns to land was obtained. The net present value of the returns to land was $8,970.13 with a corresponding internal rate of return of 28.8 percent. Holding all other things constant, the return to management was increased to $1,311.68 per year before a negative net present value was obtained. These results show that entering the industry as a typical producer is economically feasible based on the assumptions relied upon in the cash flow budget and the opportunity costs assigned to labor and management.

Using a computer spreadsheet, a net present value breakeven table was developed using price and full production yield as variables. This breakeven table, presented in table 3, shows the net present value of returns to land, labor, and management at various prices and yields. The line acts as a breakeven barrier separating positive net present values on the upper side from negative net present values on the lower side. At the assumed full production yield of 5,000 pounds per acre per year, the breakeven price was $.71 per pound. This amount was less than half of the price received by the typical producer. The breakeven full production yield at the assumed $1.50 per pound price was 1,263 pounds. This was approximately one-fourth of the expected yield. These results suggest that price and yield may vary substantially from expectations and still provide a margin for a positive net present value.

Constraints Faced by Producers

Constraints on production are faced by producers in Utah at both a micro and macro levels. The micro level constraints are those constraints that individual producers face at the firm level. The macro constraints are those constraints which face the Utah raspberry industry as a whole. That is, how big can the Utah raspberry industry grow before factors of production are no longer available in the necessary amounts or prices move to a level at which the individual producer can no longer earn a normal return on land, labor, capital, and management. The micro and macro constraints faced by Utah producers will be discussed individually.

Micro Constraints. One of the primary purposes for which the survey of the Utah raspberry producers was conducted was to determine the various constraints facing the individual producer.

TABLE 3

NET PRESENT VALUE BREAK-EVEN TABLE--
Including Net Present Values for Given
Combinations of Price and Quantity

Full Production Yield (Pounds)

Price Per Pound	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
$2.00	904	7,258	13,611	19,965	26,318	33,672	39,026	45,379	51,733	58,086
1.90	497	6,443	12,389	18,336	24,282	30,228	36,175	42,121	48,067	54,013
1.80	90	5,629	11,168	16,707	22,246	27,785	33,324	38,863	44,402	49,941
1.70	-318	4,814	9,946	15,078	20,209	25,341	30,473	35,604	40,736	45,868
1.60	-725	3,999	8,724	13,448	18,173	22,897	27,622	32,346	37,071	41,795
1.50	-1,132	3,185	7,502	11,819	16,136	20,454	24,771	29,088	33,405	37,772
1.40	-1,540	2,370	6,280	10,190	14,100	18,010	21,920	25,830	29,740	33,650
1.30	-1,947	1,556	5,058	8,561	12,064	15,566	19,069	22,571	26,074	29,577
1.20	-2,354	741	3,837	6,932	10,027	13,123	16,218	19,313	22,409	25,504
1.10	-2,761	-73	2,615	5,303	7,991	10,679	13,367	16,055	18,743	21,431
1.00	-3,169	-888	1,393	3,674	5,954	8,235	10,516	12,977	15,078	17,358
.90	-3,576	-1,702	171	2,045	3,918	5,792	7,665	9,539	11,412	13,285
.80	-3,983	-2,517	-1,051	415	1,882	3,348	4,814	6,280	7,746	9,213
.70	-4,390	-3,799	-2,273	-1,214	-155	904	1,963	3,022	4,081	5,140
.60	-4,798	-4,146	-3,494	-2,843	-2,191	-1,540	-888	-236	415	1,067
.50	-5,205	-4,961	-4,716	-4,472	-4,228	-3,983	-3,739	-3,494	-3,250	-3,006

* Line indicates break-even points
**Net present value of returns to land, labor, and management

TABLE 4

SEASONAL RASPBERRY PRICES--NET OF TRANSPORTATION
DIFFERENTIAL FROM SALT LAKE CITY
(dollars per ten pound case)

Market

Month/Week	Salt Lake City	Eastern Idaho	Montana	Wyoming	Los Angeles	Albuquerque	Denver
July 27	15.50				17.82		
28	15.00				15.32		
29	15.00	18.30	17.90	17.80	16.32		15.99
30	15.00	16.80	16.40	17.80	14.82	16.10	16.99
31	13.50	15.80	15.90	16.80	16.32	16.10	16.49
Aug. 32	13.50	14.80	14.40	16.80	15.32	16.10	15.99
33	13.75	13.30	13.40	14.80	16.82	16.10	13.99
34	10.80				15.82	16.10	
35					13.32		

* Prices listed are 1984 prices
** Prices listed for Albuquerque are averages for the time period.
***Source: (Glover, et al, 1985)

It was anticipated that these constraints would be used to develop a linear programming model. However, the analysis of the data collected in the survey revealed that a linear programming model was not necessary and that the constraints limiting Utah raspberry producers were very obvious. The constraints limiting Utah producers under various levels of production were determined by the quantity of each factor of production that the typical producer family was able and willing to contribute before purchasing those factors from nonfamily sources. The constraints that limited the Utah producers, listed in the order in which they became constraints, were family picking labor, family marketing labor, land, and family general labor. The typical producer, along with his/her spouse and five children, was willing and able to devote the time necessary to pick the estimated production from three-tenths of one acre. The limitation on family marketing labor was the next consideration. The typical producer and family was willing and able to devote the time to marketing necessary to market the estimated production from one acre. With only three acres of land available, the typical producer and family may have operated up to three acres of raspberry plants before seeking additional land through a rent, lease, or purchase. The last constraint that was identifiable within the scope of this study was the availabilty of family labor for the general care of the raspberry plants. The typical producer and family was willing and able to devote the time to general care that was necessary to operate four acres of raspberry plants. It may be noted that all factors of production including land and nonfamily labor were readily available. Therefore, none of these constraints were binding at the micro or the macro level.

Macro Constraints. The macro constraint facing the Utah raspberry industry as a whole was the demand for Utah raspberries. In other words, how much could the Utah raspberry industry have grown and still maintained a normal return to land, labor, and management for the individual producer. Estimating a demand function for Utah raspberries would be the next logical step. Investigation of available sources of data indicated that it was not possible to estimate a demand function for either the nation or Utah raspberries. However, much of the necessary data was available for the state of Washington which produces about 50 percent of the red raspberries in the nation. Several alternative functional forms were estimated, but the following function was judged to be the best (see the criteria outlined in Kennedy).

Rpr = -107.2
-.0033Rpd (1.98)
+.039Bpd (1.43)
+.025I (1.90)
-3.04T (1.52); where

Rpr = Raspberry Price
Rpd = Raspberry Production
Bpd = Blackberry Production
I = Income
T = Time

The numbers beside the coefficients are t-statistics. All income and price variables were adjusted to 1984 levels using the Consumer Price Index. The coefficients in the equation had all of the expected signs and were statistically significant at the 90 percent confidence level,

but several problems existed in the estimation of this equation. First, the Durbin-Watson statistic suggests that some autoregression exists. Secondly, data were not available over the time period for some variables (e.g. strawberries) that theory suggests would be important. Third, price data for fresh and processed berries was not available. As a result, an average price for fresh and processed berries was used. This would cause some error because the proportion of fresh versus frozen berries has not remained constant over time. This equation does however give us some idea of the elasticity of demand for Washington raspberries. Using this equation, a price flexibility coefficient of -1.046 was estimated. The reciprocal of the price flexibility coefficient, which is .96, sets the lower limit of the price elasticity of demand (Tomek and Robinson, 1981). It is recognized that the price elasticity of demand for Utah raspberries will probably be more elastic than -0.96 because Washington's production is the primary substitute for Utah raspberries, and Utah produces a relatively small quantity when compared to Washington.

Snyder (1986) estimated that if raspberry production in Utah were to increase by five times, price would decrease by 20 percent. This relationship would hold only if Utah producers continued to utilize current export markets and if a processing facility was constructed to handle the excess quantity in any given time period. Using Snyder's estimate, a rough estimate of the price elasticity of demand for Utah raspberries was determined. Using an arc elasticity formula, the price elasticity of demand for Utah raspberries was estimated to be -6.0, which is extremely elastic.

Using the estimated elasticities and the mathematical definition of price elasticity of demand, a range of estimates was determined of how much Utah raspberry production may grow while continuing to return a normal return to land, labor, capital, and management. Several assumptions were made to simplify this analysis. If land was not a sunk cost, a rent or normal return should have been obtained. A normal return of five percent to land, of $4.50 per hour for family labor, and $150 per acre per year for management was assumed. Treating these assumptions as negative cash flows in the respective years, the price of raspberries could drop to as low as $1.14 per pound before a negative net present value was realized. Using this break-even price and the price elasticity of demand of -0.96, it was determined that the Utah raspberry industry could increase production by 23 percent while still maintaining a price level at which the typical Utah raspberry producer could earn a normal return on all factors of production. Using the price elasticity of demand of -6.0, it was determined that production could increase by as much as 144 percent before price would drop to the $1.14 per pound break-even level. Thus, the demand constraint on the industry as a whole was not binding, nor does it appear that it will become binding in the near future.

Marketing Opportunities

The growth of individual producers and the Utah raspberry industry is heavily reliant upon the marketing opportunities for

Utah raspberries. The two general classifications of markets for raspberries are the fresh market and the processed market. The marketing opportunities in each of these areas appeared to be favorable.

The fresh market marketing opportunities may be evaluated using the market window technique. In using the market window technique, the break-even cost including transportation to a given market is determined and compared to the price that may be received in that market. The market price would have to exceed the break-even price in order for an open market to exist for shipping to any specific market (Glover, et al, 1985). The markets that were considered are the wholesale markets in Salt Lake City, Eastern Idaho, Montana, Wyoming, Los Angeles, Albuquerque, and Denver. These markets were evaluated using the break-even cost of $1.14 per pound or $11.40 per ten pound case. Transportation costs from Salt Lake City to each of these markets were obtained from Glover and Snyder (1985). The 1984 prices, net of transportation costs, received in each of the markets to be considered are listed in table 4 for the normal harvest season of Utah raspberries.

The data in table 4 clearly show that an open market window existed in each of the markets in question during the entire Utah harvest period, with the exception of Salt Lake City in week 34. The market for fresh Utah raspberries appears to exist, although the quantities that each of these individual markets can absorb is unknown. Utah raspberries can compete in terms of price with Washington raspberries in the fresh market in the markets considered.

The processed raspberry market for Utah raspberries has been essentially nonexistent. Only one producer grew any berries for processing in 1985. According to Norton Fruit Company in Ogden, Utah (1986), a market exists for frozen Utah raspberries that are packed in uniform packs that meet industry standards. In a conversation with Olsen (1986), it was learned that the market for raspberries processed into various snacks, desserts, and toppings is open. It is doubtful that most Utah producers can compete with Washington producers in terms of price for processing raspberries because considerable economies of size exist for producers entering the processing market. The potential for a considerable market exists if Utah producers can take advantage of the technology and economies of size that many of the Washington producers have adopted.

Growth Potential

Of the Utah raspberry producers questioned, 83 percent commented that the future of the raspberry industry in Utah looked good and 50 percent had plans for increasing production. Individual producers and the industry have several avenues to follow which could lead to profitable growth. Individual producers may potentially increase the production and profitability of their raspberry enterprises by increasing the acreage devoted to raspberry production and by adopting new technologies which are presently available. Utah raspberry production may increase between 23 percent and 144 percent while still maintaining a normal return to the typical Utah producer. This increased production may be brought about by the

forseeable growth of current producers and the entrance of new producers into the industry. The construction of a processing facility and the formation of a small fruit producer's cooperative may also stimulate growth. Farmers entering or expanding in the Utah raspberry industry may find an opportunity to earn a living in agriculture without facing the necessity of subsidizing the farm with income earned from an off-farm job.

SUMMARY

The raspberry industry in Utah is relatively small in comparison to other agricultural industries in the state. This size is also carried over to the typical producer. The typical Utah raspberry producer operates and maintains one acre of raspberry plants. The operation is largely operated by family labor.

The Utah raspberry industry offers the farmer an opportunity in agriculture to earn a normal or greater than normal return on his/her land, labor, capital, and management. Yields and prices could fluctuate substantially and the farmer could still earn a normal or greater than normal return.

Both micro constraints and macro constraints face Utah raspberry producers. The micro constraints are those constraints which the individual producer faces. The order in which the identified micro constraints affected production is: family picking labor, family marketing labor, land, and family general care labor. The macro constraint facing Utah raspberry producers is the demand for Utah raspberries. The demand for Utah raspberries may become a binding constraint when production increases to the point which causes price to move to a level at which producers can no longer receive a normal return on their land, labor, capital, and management. It was determined that production in Utah could increase between 23 percent and 144 percent before producers would no longer be able to earn a normal return on land, labor, capital, and management.

Opportunities for both the fresh raspberry market and processed raspberry market exist. It was determined that fresh Utah raspberries can profitably be sold in several major wholesale markets including Salt Lake City, Eastern Idaho, Montana, Wyoming, Los Angeles, Albuquerque, and Denver. The processed market in Utah remains largely untouched but may be exploited in the future by innovative producers. These factors suggest that considerable growth potential exists in Utah for red raspberry production.

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