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Market and Pricing Potential for Extended Season Fresh Produce Sales: An Intermountain West Example

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Abstract

This study assesses the potential for extending the farmers' market season in the Intermountain West by evaluating producer and market manager perceptions regarding product availability, pricing, and marketing realities through web-based surveys conducted in 2011. Potential extended season fresh produce pricing was evaluated through forecasting models using pricing data collected at farmers' markets in the region. Study results show that both producers and market managers perceive potential benefits to extending the market season, but detail potential obstacles, such as location and costs. Produce price premiums in the extended season are likely, but vary by product in magnitude and timing.

Keywords: Direct markets, fresh produce, forecasted pricing, season extension

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Introduction

The growth in direct marketing outlets for fresh produce is evidenced by the increase in the number farmers' markets in the United States, tripling to over 8,000 in the past 15 years (USDA 2014). The surge in direct market popularity can be attributed to a growing consumer interest in fresh, healthy, locally grown foods, as well as concerns regarding food safety and the environmental impacts of the traditional food chain (Curtis and Cowee 2011; Onozaka, Nurse, and Thilmany-McFadden 2010). Farmers' markets provide local producers the opportunity to eliminate the middle man and increase revenues by taking a higher percentage of the product final sales value. Additionally, farmers' markets are relatively easy outlets for small farmers to participate in due to the limited contractual obligations and relatively low vendor fees (LeRoux et al. 2010; Hardesty and Leff 2010). Using direct marketing outlets may reduce producer marketing and sales efforts, especially for those facing additional time constraints due to off farm employment (LeRoux et al. 2010).

The Intermountain West has seen the highest levels of direct market growth, as 38% of direct market outlets have been in existence for fewer than five years (Ragland and Tropp 2009). The region also boasts the second highest average per-capita attendance rate at seasonal farmers' markets (Ragland and Tropp 2009). Although these are positive signs, the long-term sustainability of these markets comes into question when one examines reported producer revenues from farmers' markets. It is estimated that 80% of vendors receive revenues of $5,000 or less and markets are only open on average for four months each year, due to the limited growing season (Ragland and Tropp 2009). Despite recent growth in direct markets, local product availability has been found to be a weakness in multiple studies (Andreatta and Wickliffe 2002; Onozaka, Nurse, and Thilmany-McFadden 2010).

Direct marking presents a new set of complex decision-making choices for producers. The use of season extension techniques in fresh produce production are an important response to low revenues, a short marketing season, and product availability issues. Season extensions allow producers to increase their sales season by lengthening the growing season. For example, techniques such as high tunnels have been shown to lengthen production periods (Gatzke, McCuin, and Nelson 2009), increase yields (Rowley et al. 2010) and improve profitability (Ward, Drost, and Whyte 2011) in the Intermountain West. Studies show that producer revenue increases three-fold when farmers' markets operate seven months or longer as compared to markets operating for five months or less (Ragland and Tropp 2009). Hence, direct markets represent an important source of income, but the availability of direct marketing outlets during extended or nontraditional seasons, as well as the potential for price premiums to support the additional capital investment required for season extension production are equally important concerns.

This study assesses the potential for extending the traditional farmers' market season in the Intermountain West region of the United States through the use of producer and market manager surveys, as well as farmers' market pricing data for eight fresh produce items collected in the 2011 summer season. Study results show that producers and market managers agree there is potential for extending the market season, but detail potential obstacles and challenges. Product pricing premiums in the extended season are likely, but vary by product in magnitude and

timing. Obstacles to market season extension include the costs and availability of indoor space, unknown consumer response, and the cost of season extension production and processing technologies.

Literature Review

The decision to extend the season for fresh and processed produce sales is not made solely by consumers, market managers, or producers. Instead, it represents a mix of the desires, risks, and opportunities available to all three. While there has been a continuum of research relating to consumer motivations for attending farmers' markets, preferences for local foods, as well as season extension techniques on the production side, there is limited research available on the potential for extending the market season. Additionally, there is little information on extended season pricing, or potential price premiums. Pricing represents a particular challenge as direct market prices are not well tracked by current price reporting systems, and hence, data must often be recorded manually (Ward, Drost, and Whyte 2011).

Studies show that consumers purchase fresh produce from direct markets, such as farmers' markets, for similar reasons. Govindasamy, Adelaja, and Italia (2002) showed that 98.5% of consumers expected the quality to be higher at direct markets than at retail outlets and approximately 60% of consumers were motivated by quality and freshness. Curtis (2011) observed that quality, freshness and taste were rated 'very important' or 'extremely important' by consumer supported agriculture (CSA) program customers and farmers' market attendees in Nevada. Pricing and value were also considered 'important' and 'very important' respectively. Similar results were found in California (Wolf, Spittler, and Ahern 2005) and in North Carolina (Andreatta and Wickliffe 2002). The results from these studies show that although consumers expect higher quality from farmers' market outlets, they can be price and value sensitive as well.

The rapid growth in direct markets is convincing evidence that consumers have a preference for the products offered (Govindasamy et al. 2001). Furthermore, it appears that additional growth is possible as a number of studies suggest that the demand for farmers' market products is currently higher than that supplied (Govindasamy, Adelaja, and Italia 2002; Andreatta and Wickliffe 2002; Onozaka, Nurse, and Thilmany McFadden 2010) as the availability of fresh produce is an ongoing consumer concern. In Ragland and Tropp (2009) 44.8% of farmers' market managers in the Intermountain West reported that consumer demand was greater than the supply in the markets they managed.

Previous studies found that many small farms rely solely on farmers' markets as an outlet for their produce (Low and Vogel 2011). Through a case study of producers in New York, LeRoux et al. (2010) concluded that producers should use multiple markets to optimize overall farm performance. Hardesty and Leff (2010) analyzed three organic producers in California and compared their costs and revenue when utilizing direct and wholesale organic produce markets. The study recommended using direct markets as a risk management tool. It should also be noted that the farms in both studies were more than 18 acres and full-time operations. Monson, Kuminoff, and Mainville (2008) confirmed the above findings by analyzing farmer characteristics in Virginia and concluded that the farm size has a considerable impact on the effectiveness of marketing efforts. Brown et al. (2007) estimated that branching out to one

additional farmer's market leads to an estimated $2,681 increase in revenue each month for small farms.

Farmers' markets are not homogenous and the market selected can influence profitability for producers. Low and Vogel (2010) found that a majority of small farms with direct sales were located in metropolitan counties. Ragland and Tropp (2009) similarly concluded that monthly sales in less urban regions were half that of more populated regions, such as the Mid-Atlantic and Far West. Martinez et al. (2010) found that revenues decreased from $10,987 for farms located in metropolitan counties to $6,767 in counties adjacent to metropolitan counties. These findings represent a challenge for direct marketers in the Intermountain West. While cities like Denver and Salt Lake City provide producers some access to metropolitan markets, travel may be prohibitive for producers and larger urban farmers' markets tend to have waiting lists for new vendors. Although the Intermountain West lacks many metropolitan areas for farmers' markets, the higher percentage of consumer attendance may help offset this disadvantage. Bond, Thilmany, and Bond (2009) found that consumers in the Intermountain West are more likely to shop at direct markets rather than retail outlets when compared to the rest of the country.

LeRoux et al. (2010) suggests that part-time farmers with other employment, and thus diverse obligations, face difficult production and marketing decisions. The additional effort to expand production and marketing into other seasons may prove cumbersome. However, the limited studies on market extension show promising results. Brown et al. (2007) predicted that extending the growing season by one week would lead to a $448 increase in sales. Conner et al. (2009) determined that 91% of farmers' market consumers in Michigan would be willing to attend late fall and winter markets, while 69% reported they would be willing to attend markets as early as January or February. The study also found that 91% of consumers were willing to pay premiums for local produce offered at farmers' markets. Therefore, instead of adding increased marketing efforts during the prime growing season, season extension may provide farmers the opportunity to generate revenue in the off-season using familiar distribution strategies, such as farmers' markets.

A common season extension technique, high tunnels, also known as hoop houses or unheated greenhouses, protect crops from adverse weather conditions, and act as a form of temperature and pest control. They allow for both early and late season crop plantings, thus extending the growing season an additional two to three months annually (Gatzke, McCuin, and Nelson 2009). Recent studies show that high tunnels are best suited for use in the production of specialty crops, which are in high demand and commonly sold through direct marketing outlets (Waterer 2003; Black and Drost 2010). The relatively small hoop house size lends itself to the production of labor intensive fruits and vegetables (Rowley at al. 2010). Gent (1991) grew tomato and peppers in high tunnels over a three-year period and found increased yields and extended production for both crops. Waterer (2003) showed that the use of high tunnels increased marketable yield, number of mature fruits, and extended the production season more than other season extension production techniques.

While previous studies such as Gent (1991) focused on the production benefits of high tunnels, only recently have studies addressed the economic impacts of season extension techniques for individual farms. Ward, Drost, and Whyte (2011) conducted a profitability analysis for a one

acre farm in northern Utah using high tunnels and drip irrigation system. The study found that using high tunnels to grow a double crop of tomatoes and summer squash had an 11.49% modified internal rate of return (MIRR) and that investment payback period averaged six years when using typical farmers' market pricing. Rowley et al. (2010) grew strawberries in Utah using both in-ground field and high tunnel systems as a means to compare results. They estimated that high tunnels brought production approximately 4 weeks forward and increased profitability by $\$13/m^2$ when compared to the in-ground field system. The authors stressed the importance of utilizing premium markets to achieve their profitability estimates.

Conner et al. (2011) examined the impact of high tunnels in a multi-year study with nine different producers in Michigan. The results showed that with efficient management skills, the high tunnels had a payback period of two years. Donnell, Biermacher, and Upson (2011) found that breakeven prices for tomatoes, summer squash, strawberries and spinach grown in high tunnels in Oklahoma were highly sensitive to changing yields, percent marketability, and labor costs.

While these studies use farmers' market pricing to project revenues, the pricing is from the normal or summer season. There is very little literature using extended or off season farmers' market prices. Eastwood (1996) provides some qualitative insights into pricing trends and found that 77% of consumers at farmers' markets in Tennessee felt the higher pricing in the early market season was acceptable. From a quantitative perspective, studies in produce pricing using national level data reflect seasonality in prices, and that prices decrease when supply increases. Goodwin et al. (1988) examined factors affecting potato prices in terminal markets and found that prices for a variety of potatoes dropped at harvest time, after which prices increased until the following harvest. Huang and Lin (2006) used a hedonic model to predict prices for tomatoes using information such as region, season, outlet, production method, and packaging. They found that tomato prices were lower in the summer across most of the United States and that prices in general were lower in the Western region.

This study builds on the existing literature by examining the potential for extending the farmers' market season in terms of producer and market manager perceptions/attitudes, potential product offerings and pricing, as well as potential challenges that will need to be addressed. Importantly, this study looks to provide insight into extended season pricing across a variety products. Premium pricing may offset the various producer and market manger costs associated with extended the market season. All data were collected in Utah, Nevada, Colorado, and Idaho, Intermountain West states, and thus, generalizing study results to other regions is not recommended

Survey Data Description

To identify producer capabilities and the marketing realities faced by producers and market managers in an extended season, two online surveys (SurveyMonkey), one to specialty crop producers and one to farmers' market managers were conducted in the fall of 2011. Producers were asked about their farming background, acreage under production, revenues, as well as marketing and production strategies, including usage of and attitudes towards season extension techniques. Farmers' market managers were surveyed on topics related to their current market

season, consumer expectations, and obstacles in extending farmers' market operations, such as location and additional costs.

Producer Survey Results

The producer survey was first tested in-person at farmers' markets and then distributed electronically to producers through the farmers' market managers in Utah, Nevada, and Idaho. All farmers' market managers in Utah, Nevada, and southern Idaho were emailed an invitation to forward the survey request on to their vendors. A total of 57 producers completed the online survey in 2011 with 45 from Utah, four from Idaho, five from Nevada and two with no location given. The majority of the producers in the study, based on the definition provide by the USDA, would be considered small (Low and Vogel 2011), with 71% of producers earning $20,000 or less in annual gross revenues (see Table 1). A high percentage of the respondents (54%) utilized one acre or less for their operation. In line with studies examining farmers' markets, particularly in the Intermountain West (Ragland and Tropp 2009), 60% percent of the survey participants reported having three or more years of direct marketing experience, while 37% reported they had less than three years of direct marketing experience (3% with no response).

Table 1. Producer Reported Producer/Farm Characteristics

Acreage	Percentage	Revenue	Percentage	Experience	Percentage
1: <1/4 Acre	9%	1: <$1000	25%	1: 1 year or less	12%
2: 1/4 to 1 Acre	45%	2: $1,000-$4,999	19%	2: 2 to 3 years	25%
3: 2 to 5 Acres	23%	3: $5,000-$9,999	18%	3: 3 years or more	60%
4: 6 to 10 Acres	4%	4: $10,000-$19,999	9%	4: NA	3%
5: 11 to 50 Acres	5%	5: $20,000-$39,999	5%		
6: 50+ Acres	14%	6: $40,000-$59,999	3%		
		7: $60,000-$99,999	3%		
		8: $100,000-$249,999	2%		
		9: $250,000-$499,999	0%		
		10: $500,00+	9%		
		11: NA	7%		

As the surveys were distributed to farmers' market vendors, an expected 91% of respondents sold at farmers' markets, with 35% of the sample relying on them exclusively. Thirty-nine percent reported using only one market, 19% reported using two markets, and 25% reported using three or more markets (17% did not report this information) (see Table 2). CSA programs, farm stands, wholesale, and grocery store contracts were equally popular direct market avenues for survey respondents. These results are in line with Low and Vogel (2011) finding that small farms rely almost exclusively on direct-to- consumer markets. This may be due to the consistent quantity and quality required by intermediate markets and the relatively low fees and entry costs associated with farmers' markets. Producer familiarity with farmers' markets may make them the most straightforward option to utilize in the extended season.

Table 2. Producer Reported Marketing Efforts and Products Offered

	Description	Percentage		Description	Percentage
Marketing Season Length	1: 3-4 months	10%	Labeling Types	1: Organic	23%
	2: 4-5 months	28%		2: Natural	67%
	3: 5-6 months	14%		3: Local Label	28%
	4: 6-7 months	12%		4: Grass-fed	5%
	5: 7+ months	15%		5: Other	9%
	6: NA	21%		6: None	5%
Number of Market Outlets	1: Farmer's market	91%		7: NA	11%
	2: CSA	23%	Product Types	1: Fruit	65%
	3: Grocery store	21%		2: Vegetables	88%
	4: Farm stand	25%		3: Greens	60%
	5: You pick	11%		4: Flowers	18%
	6: Wholesale	19%		5: Beef	5%
	7: Co-op	5%		6: Lamb	2%
	8: Other	9%		7: Pork	2%
	9: NA	5%		8: Other	12%
Number of Farmers' Markets	1: 1 Market	39%		9: NA	2%
	2: 2 Markets	19%	Processed Products	No:	68%
	3: 3+ Markets	24%		NA:	21%
	4: NA	18%			

The use of labels was common amongst the respondents with 67% using some a natural label, 23% a certified organic label, and 28% a locally-produced label. The length of the marketing season varied among respondents, with 38% of respondents marketing for four months or less, 14% between five and six months, 12% between six and seven months, and 15% at seven months or longer. The produce respondents offered through direct markets included vegetables (88%), fruit (65%), greens (60%), flowers (18%) and other (16%). Only 11% sold processed products. The low supply of fruits, greens, and processed goods was not expected and provides insight into extended season strategies such as the sale of jams, honey, strawberries and spinach (Rowley et al. 2010; Donnell, Biermacher, and Upson 2011). During an extended season, producers considered tomatoes (61%), peppers (48%), herbs, greens (45%) and carrots as viable options. Sweet corn, cherries, berries, apples, pumpkins, potatoes and value-added items were considered less viable (see Figure 1). Thirty-two percent of the producers were already receiving premiums for offering produce when not normally available.

Information about extended season production techniques currently in operation provides insight into the capability of producers for extended season production. Although 33% of producers reported using no techniques, many of the remaining producers used multiple methods to extend their season. Frost cloth was the most popular (35%), while high and low tunnels, raised beds and plastic covers each had similar response rates of about 25%. Considering the potential expense involved (Conner et al. 2011) and the low revenue received by respondents, the 24% adoption rate of high tunnels among the sample was unexpected. When asked why they used season extension techniques, 60% of producers noted extended sales season, 51% increased yields, 39% increased quality, and 14% for other reasons. For those producers who were not using season extension techniques, 39% replied that they would consider it, while 18% were uninterested. Cost was the most notable concern (35%) for producers not interested in extension season techniques, followed by lack of information, lack of previous experience, and unknown access to suppliers (see Table 3).

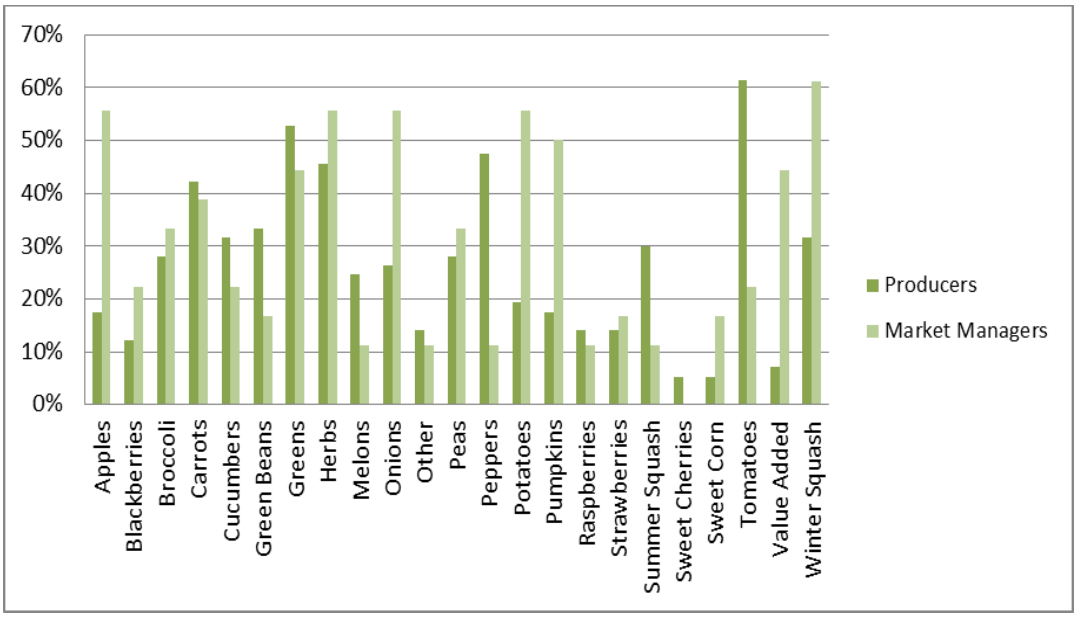

Figure 1. Products Potentially Available in the Extended Season

Table 3. Producer Season Extension Techniques Employed and Motivations

	Description	Percentage
Considering using season extension techniques in the future	1: Yes	39%
	2: NA	44%
Season extension techniques currently used	1: High tunnel	25%
	2: Low tunnel	21%
	3: Raised beds	25%
	4: Plastic cover	26%
	5: Frost cloth	35%
	6: Heating	7%
	7: Other	18%
	8: None	28%
	9: NA	14%
Motivations for using season extension techniques	1: Increased yields	51%
	2: Increased quality	39%
	3: Extended sales season	60%
	4: Other	14%
Motivations for not using season extension techniques	1: Cost	35%
	2: Lack of information	16%
	3: Unknown supplier	16%
	4: Previous experience	16%
	5: Other	7%

The relatively low revenues, direct market experience, and limited acreage of the respondents may provide the motivation to extend direct markets and to invest in season extension production

and/or processing techniques. As previously discussed extending or adding markets can increase farm revenues (Brown et al. 2007). Also, processing or producing value-added products can decrease waste or shrinkage and provide off season income. Incorporating value-added products into small farm offerings has been shown to increase farm profitable (Thistlethwaite 2013).

Manager Survey Results

The farmers' market manager survey was also administered online through SurveyMonkey in the fall of 2011. All farmers' market managers in Utah, Nevada, and southern Idaho were emailed and invitation to complete the survey. Eighteen farmers' market managers responded with 10 from Utah, five from Nevada and three from Idaho. The manager respondents represented markets that were relatively small as 44% had 20 vendors or less and 88% had 50 vendors or less. However, the concentration of fresh produce vendors at the markets was relatively high, as 67% of markets had 40% or more vendors selling fresh produce. As expected, the marketing season results are similar to that of the producer survey as 68% of markets were open for less than six months and 27% were open for six months or longer (see Table 4).

Table 4. Market Manager Reported Farmers' Market Characteristics

	Description	**Percentage**
Market Season Length	1: < 2 months	6%
	2: 2-3 months	6%
	3: 3-4 months	28%
	4: 4-5 months	28%
	5: 5-6 months	0%
	6: 6-7 months	22%
	7: 7+ months	5%
	8: NA	5%
Market Size (Number of Vendors)	1:<20 vendors	44%
	2: 20-50 vendors	44%
	3: 51-100 vendors	0%
	4:101-200 vendors	12%
	5: > 200 Vendors	0%
Concentration of Produce Vendors	1: <20%	11%
	2: 20%-40%	22%
	3: 41%-60%	22%
	4: 61%-80%	11%
	5: >80%	34%
Potential Product Premiums	1: Organic	61%
	2: Local	61%
	3: Natural	56%
	4: Availability	67%
	5: Other	28%
	6: NA	17%

Market managers were interested in extending their market season into the fall/winter or opening earlier in the spring, as 50% of the managers felt their produce vendors would use farmers' markets in an extended season (see Table 5). Thirty-nine percent of the managers were considering extending their market season, while 61% recognized that customers would prefer moving indoors during an extended season. Finding an indoor location could present a challenge as 44% had not yet identified a suitable site and 67% reported an expected cost increase to use indoors facilities. Sixty-seven percent of the managers believed their customers would be willing to pay premiums for produce availability during the extended season.

Table 5. Market Manager Attitudes towards Season Extension

	Percentage	
	Yes	**NA**
Are you considering extending your farmers' market season?	38.9%	5.0%
Would produce vendors want to use your market in an extended season?	50.0%	11.1%
Would customers prefer shopping indoors in the extended season?	61.1%	11.1%
Will extending the market season require moving indoors?	44.4%	12.0%
Do you have a suitable location identified for the extended season market?	27.8%	27.8%
Would there be significant expenses involved in securing a suitable extended season location?	66.7%	27.8%
Are customers willing to pay higher prices in an extended season?	22.2%	16.7%
Have your vendors previously received premiums based on availability?	31.6%	15.8%
Do your vendors process products that may be marketed in the extended season?	10.5%	21.1%

Market managers felt that producers should be able to provide the following products during the extended season: winter squash (61%), greens (55%), apples (55%), onions, potatoes, pumpkins (50%), herbs and carrots, while many berries and warm-season produce such as tomatoes and peppers received a 25% or less response (see Figure 1). Interestingly, 45% of market manager respondents felt producers could provide value-added products in the extended season, but less than 10% of producer respondents felt they could provide value-added products. This may be due to the current lack of value-added production among producer respondents. Also, market managers may have small processed food vendors in mind, rather than fresh produce vendors.

Farmers' market manager are motivated to extend their season due to consumer demand, regardless of season, for fresh, stored and processed local foods. This demand is evidenced by the addition of winter markets in the Salt Lake City and Denver areas on 2013, as well as the addition of winter CSAs, including bread and soup shares, now provided by producers (SLC Downtown Alliance 2014).

Extended Season Pricing

To provide insight into the extended season prices producers might expect to receive for fresh produce, we analyzed fresh produce prices from 14 farmers' markets in the Intermountain West. Data were collected between May and November 2011 through weekly visits to farmers'

markets, in which prices for a number of different produce items were recorded. The average weekly price was determined for eight commonly found goods with similar attributes and used to predict prices in an extended season. The eight items selected were tomatoes, cucumbers, summer squash, potatoes, herbs, greens, carrots, and green peppers as these products were common to all markets. The recorded prices were sorted by week and then averaged across all markets to find a representative price for that week. Each week was numbered based on 52 weeks in a year. Missing data points were filled in using data imputation, the practice of regressing the average weekly price on the week number to estimate a coefficient. The coefficient was then multiplied by the missing week number to provide an estimate for that week's price (Wise and McLaughlin 1980). Consideration also was given to each price as a representative of a varying number of markets, each with their own unique attributes and consumer base. No indicator of quantity supplied was recorded.

Forecasted Pricing Model

Unlike produce sold at the retail level where Nielsen Scanner data and the volume of data allows for complex forecasting models, sales data from farmers' markets often go untracked (Onken, Bernard, and Pesek 2011). The literature on organic produce pricing provides some useful parallels (Darby et al. 2006). For example, Gubanova, Lohr, and Park (2005) found autoregressive-integrated-moving average (ARIMA) models to be the most effective when forecasting produce prices due to their simplicity, which allows for the quick and effective interpretation of results. Also, as farmers tend to market and price their produce based on recent sales prices, ARIMA models make sense from an economic perspective, as they take into consideration changes in past time periods as a means to generate a forecast.

ARIMA models using the EViews software was used to forecast pricing for each produce type into the extended season (see Enders 1995 for general ARIMA specification). A unit root test was used to test for stationarity and then regression was completed taking the first and second difference (when needed) to treat for stationary data. The final model chosen for each produce item was based upon comparison of the Akaike information criterion (AIC) and Schwarz information criterion (SIC) log values (Gujarati 1992). Forecasted pricing model results for each produce item evaluated are provided in Table 6, with sample size noted under product name. Actual and model forecasted prices for all products are provided in Figure 2.

Pricing Results

Tomatoes are commonly found in direct markets and have often been used in both economic and production oriented high tunnel studies (Huang and Lin 2006; Donell, Biermacher, and Upson 2011). The forecast shows early season prices as high as $6.50/pound and then a slow decrease throughout the season to under $3/pound. These results were expected as other studies found that tomato prices decreased when in season (Huang and Lin 2006). Cucumbers, forecasted as high as $2/pound in June, showed a steady decrease as the season progressed. Although cucumbers and tomatoes are both warm season crops, the steep decrease could be attributed to consumer perceptions, increases in supply, and potential decreases in quality.

Table 6. Pricing Model Specifications and Results by Product

Product	Specification	Variable	Coefficient	S.E.	T-stat	Prob	R2	S.E.
Summer Squash	ARMA (0,1,1)	C	0.006101	0.008265	0.738276	0.4725	0.234	0.111
(310)		MA(1)	-0.878383	0.109032	-8.05621	0		
Tomatoes	ARMA (0,1,2)	C	-0.048466	0.047077	-1.02949	0.3162	0.368	0.960
(286)		MA(2)	-0.851589	0.157578	-5.40423	0		
Cucumbers	ARMA (2,1,0)	C	0.071833	0.092307	0.778193	0.4545	0.488	0.416
(290)		AR(1)	-0.711741	0.265099	-2.68481	0.0229		
		AR(2)	-0.528986	0.2365	-2.23673	0.0493		
		MA(1)	0.887108	0.151911	5.839641	0.0002		
Potatoes	ARMA (1,0,0)	C	0.020307	0.042444	0.478429	0.6397	0.361	0.272
(212)		AR(1)	-0.600535	0.213385	-2.81432	0.0138		
Herbs	ARMA (1,0,1)	C	2.223097	0.02478	89.71232	0	0.452	0.181
(189)		AR(1)	0.535974	0.122964	4.358779	0.0008		
		MA(1)	-0.912989	0.107252	-8.51253	0		
Greens	ARMA (2,0,2)	C	3.52361	0.225911	15.59735	0	0.455	0.703
(450)		AR(1)	-0.922431	0.224973	-4.10019	0.0008		
		AR(2)	-0.38816	0.159535	-2.43308	0.0271		
		MA(1)	1.504825	0.097435	15.44441	0		
		MA(2)	0.889717	0.093555	9.51006	0		
Carrots	ARMA (2,0,1)	C	0.071833	0.092307	0.778193	0.4545	0.488	0.416
(195)		AR(1)	-0.711741	0.265099	-2.68481	0.0229		
		AR(2)	-0.528986	0.2365	-2.23673	0.0493		
		MA(1)	0.887108	0.151911	5.839641	0.0002		
Green Peppers	ARMA (0,1,1)	C	2.424277	0.033589	72.17374	0	0.176	0.289
(259)		MA(1)	-0.862393	0.297282	-2.90093	0.0133		

S.E. = Standard errors
(X) = Number of observations
R^2 automatically generated by EViews regression output

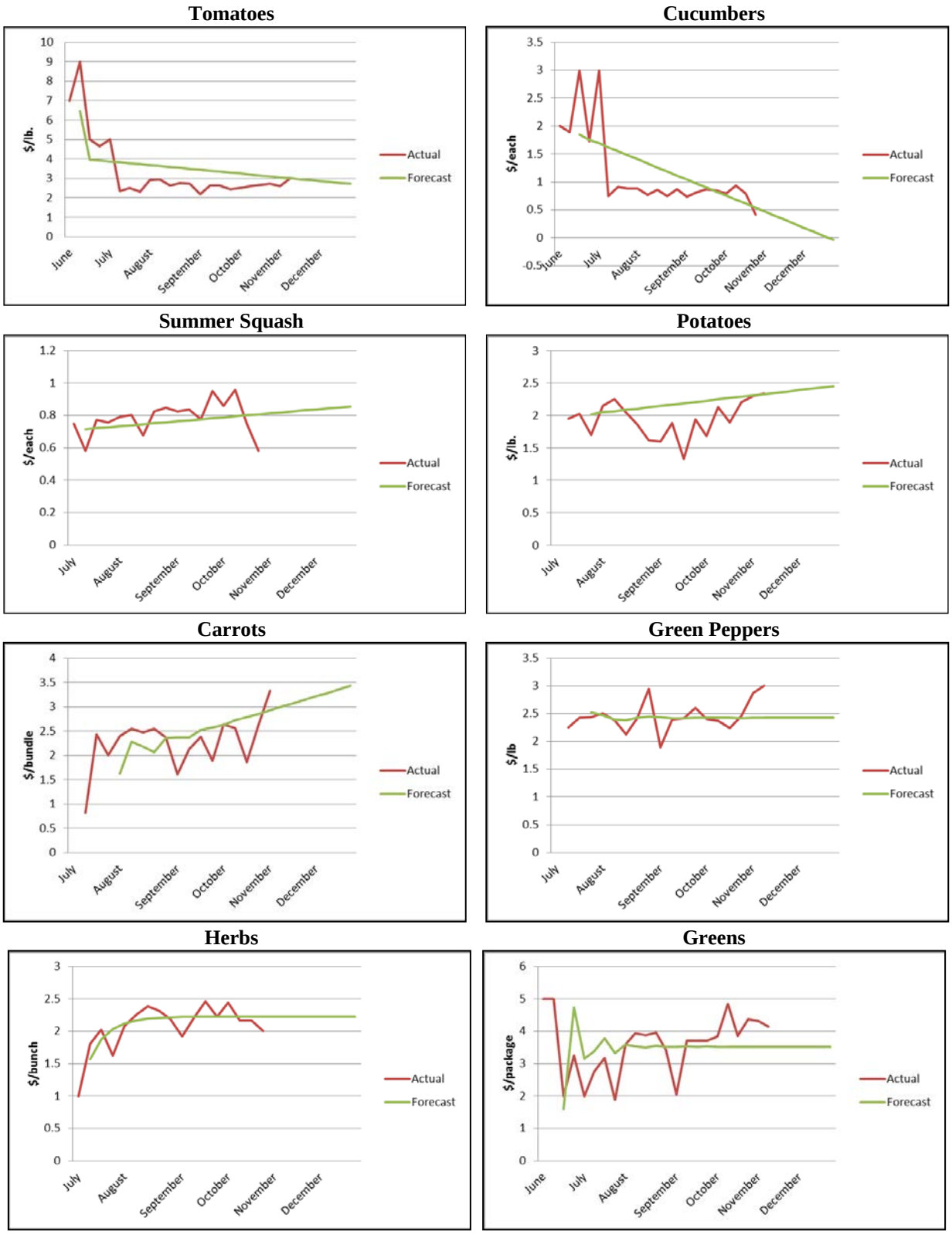

Figure 2. Actual and Forecasted Prices for Produce Items

Summer squash, another warm season crop, was considered for high tunnels in Donell, Biermacher, and Upson (2011). The forecasted price of summer squash increased steadily throughout the season from $.71 to $.85 each. This relatively small change, compared to cucumbers and tomatoes, may suggest a decrease in supply as the season continues, especially considering that summer squash can be harvested continuously and at a range of sizes. In contrast to Goodwin et al. (1988) who found a decrease in potato prices at harvest, the forecast predicted a 25% increase in potato prices per pound from the beginning of the season through the end of December. This result was surprising considering that potatoes can be harvested throughout the later stages of the growing season and can be readily stored.

Carrots are sold almost exclusively per bunch at direct markets leading to differences in package size. This can potentially lead to problems when comparing prices. Furthermore, pricing concerns arise as carrots can be harvested at various sizes throughout the marketing season. Although these attributes can create challenges when providing forecasts, it still provides marketing insight for producers. Typically a late summer and fall crop, price was expected to decrease as the season continued, but the increase may be due to the increase in carrot size and/or bundle size. The forecast for green peppers shows a near constant price throughout the season. Typically considered a warm season crop, seasonality in price was expected.

Due to the number and variety of herbs available in markets, forecasting herb prices presented a challenge. Herbs were found to have an increasing then stable price. Considering herbs are one of the few products available early in the marketing season, the early low prices may be a result of the number of producers offering herbs, as well as a smaller bundle size. The stable prices throughout the rest of the season may suggest similar packaging size amongst producers. Exhibiting the same packaging traits as carrots and herbs, greens represented a difficult product to forecast. Greens include many varieties, such as spinach or cabbage, and are typically sold packaged or by the whole heads. For this analysis, only packaged greens were considered. The forecast shows high variability in the beginning months then stable prices throughout the rest of the season. The variations in price in the early months may be a reflection of the inconsistency in package size and variety.

The forecasts show that these eight items have varying prices. While it was expected that prices would change throughout the season, many of the items changed in an unexpected manner. Potatoes, carrots, and summer squash increased in price as the season continued. Herbs increased for a short time then leveled off for the remainder of season, and greens leveled off in a similar manner, but had early season variability. The forecast for green peppers is unique as the prices are nearly constant throughout the whole of the season. Tomatoes and cucumbers behave as expected, with prices dropping over the course of the season.

Discussion

Likelihood of Extension and Marketing Realities

Producers in the region present themselves as good candidates for market extension as 60% of producer participants had three or more years of experience, had adopted some season extension techniques, and received low revenues under the short marketing season. Obstacles for producers

included narrow marketing efforts, underutilization of high tunnels, and the fear of increased costs. As 91% of producers in the study utilized farmers' markets and 39% relied on a single farmers' market, extending the farmers' market season may be the simplest method for extending the sales season. This is also suggested in Hardesty and Leff (2010), who ask producers to consider using farmers' market season extension as a diversification strategy to supplement other direct market options. However, extending the market season or adding winter markets, for example, exposes both producers and market managers to risk given little information on consumer demand. The incorporation of new marketing and production strategies should be considered to offset this risk, keeping grower production capabilities and time constraints in mind. Producers also may benefit by branching out from fresh produce and including fruit and processed or value-added goods during the extended season.

High tunnels are likely to be a key component of a season extension considering that 25% of producers used high tunnels and 27% of producers were able to market for six months or longer. Lower cost high tunnels (Black et al. 2008) could be a viable option for producers as cost was the main concern in moving towards the use of season extension technology. The adoption of high tunnels has multiple benefits including increased early and total yields, and extended growing and marketing seasons.

As 61% of market managers felt their consumers would prefer an indoor setting for the extended season, and 44% of the manager respondents cited it as requirement, access to facilities could be a significant barrier to season extension. Only 28% had a suitable indoor arena identified and 67% felt that indoor facilities would significantly increase costs. Only 22% of market managers felt their attendees would be willing to pay higher prices. Vendor fees, common in farmer's markets (Brown et al. 2007), may have to be renegotiated to provide revenue to offset market costs such as location rental fees, advertising and other administrative expenses. Both producer and consumer attendance in the extended season would have to be managed.

Produce Offered and Pricing

This study finds mixed results regarding the type of produce that could be offered during the extended season. Items like herbs and greens had relatively high response rates from both market managers and producers. Tomatoes had a low response rate from market managers and a high rate from producers, while green peppers, a crop that requires similar growing conditions, had the exact opposite response.

The pricing model results show expected pricing and potential premiums vary by product throughout the season. First, tomatoes and cucumbers show high premiums in the early season, tomatoes at $3/pound and cucumbers at $1.50/each. Producers looking to take advantage of early season premium pricing should use season extension technologies to harvest and sell products in April and May. Summer squash, potatoes and carrot prices are forecasted to be higher in the late season, with expected premiums at $.50/pound for potatoes, $1.00/bundle for carrots, and $.20/pound for summer squash. Hence, the ability to harvest and provide these products in October and November would be advantageous.

Herbs exhibit low prices in the spring then level off for the remainder of the season and into the winter. Thus, later harvest and sales of herbs would provide higher pricing. The variability in the pricing of greens makes it hard to determine a consistent premium, but producers can expect to receive $3.50/package. The green pepper forecast provides similar insights and producers in the region should base their prices on the $2.48/pound estimate. Green pepper prices are expected to be the same throughout the season. It should be noted that variability in carrot, herb and greens pricing may be related to changes in bundle size. Although these results show optimal times throughout the season to harvest and market certain produce, cost structures, yields, time constraints, and marketing plans should be considered for overall profitability.

Conclusions

This study analyzed the likelihood of extending the farmers' market season in the Intermountain West. The results show that although the producers and market managers in the region could benefit from market season extension, both noted specific difficulties, or challenges in implementing extended season markets. These included increased costs, the potential need to move markets indoors, as well as unknown consumer demand and pricing. Additional educational materials and Cooperative Extension programs may play an important role in educating producers regarding season extension technology use and costs, as well as crop selection and timing.

The pricing model provided forecasted prices for eight produce items in the extended season. These results provide insight to producers regarding production and market timing which could be used to take advantage of potential price premiums in the extended season. Pre-season premiums were more likely for tomatoes and cucumbers, while post-season premiums were likely for summer squash, potatoes, and herbs.

Study results showed some contrast amongst producers and market managers regarding products which could be offered in the extended season. Additionally, diversity in the produce offered was a weakness as few producers utilized certification programs such as local, or organic or sold processed/value-added goods. Improvements in this area could increase offerings at markets, capture premiums, and encourage market attendance.

There are several limitations to this study. First, there were a relatively small number of respondents for both the farmers' market manager and producer surveys, therefore study results are not generalizable. Second, fresh produce pricing was collected at farmers' markets in only two states during one summer season. Hence, the pricing may have been adversely influenced by growing (weather, pest, etc.) or market conditions in the year of data collection. Further studies focusing on fresh produce supply, consumer demand, and pricing at direct markets across seasons and years would offer important insights. Additionally, studies incorporating forecasted extended season pricing in producer profitability (including both revenues and costs) analysis would enhance the discussion.

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