



Montezuma Orchard Restoration Project

Montezuma Valley Apple Market Study

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1. Introduction

Montezuma Orchard Restoration Project

Montezuma Orchard Restoration Project (MORP) formed in 2008 as an informal partnership with the Montezuma County Historical Society. Through conversations with descendants of pioneer settlers, MORP founders and horticulturalists Addie and Jude Schuenemeyer were excited to learn that fruit orchards featured prominently in the agricultural landscape of southwestern Colorado during the early 1900s. Montezuma County was known for its quality fruit and some 200 historic orchard sites still exist today—primarily apples. Thousands of heritage trees live in these orchards, and many of the rare fruit varieties are more resilient, better adapted, and tastier than commodity varieties grown commercially today. These trees hold tremendous value not only in their history and genetic diversity but in their potential in restored and new orchards that serve as the foundation of a local fruit economy. MORP envisions southwestern Colorado being renowned again for an orchard culture and economy based on the legendary quality and diversity of Montezuma Valley fruits, and believes this possible through research, education, and preservation. Our mission is *to preserve Colorado's fruit growing heritage and restore an orchard culture and economy to the southwestern region.*



Since its founding, MORP has surveyed and grafted from 120 historic orchards containing at least 195 cultivars of rare and endangered apples; researched our region's rich fruit-growing history; secured a Colorado Most Endangered Place designation for the Gold Medal Orchard; collaborated with Montezuma School to Farm in planting heritage orchards in every school in our three districts; developed orchard survey and mapping protocol; initiated DNA testing of unknown varieties and started a nursery of hand-grafted heirloom trees. What MORP is most proud of, however, is raising awareness about Montezuma Valley Fruits and inspiring historic orchard restoration. Two in particular, the Miller and T Lazy T orchards, are currently being restored and managed to supply apples to local cider start-ups. Both owners sought inspiration and advice from MORP. This Apple Market Study results from eight years of MORP investigating local apples and sharing this knowledge with others.

Apple Market Study - Background and Methods

Interest in local and heirloom foods as well as a resurgence in the U.S. hard cider industry are potential emerging markets for southwestern Colorado heritage apples. As part of MORP's goal to return an orchard economy to our region, we are interested in the economic viability of a renewed local fruit industry. In 2015 the Colorado Department of Agriculture's Enrich Colorado Agriculture Program awarded MORP a grant to conduct market research for southwestern Colorado heirloom apples. The Gates Family Foundation and Whole Foods Market provided matching funds.

Assessing the markets for heirloom apples is a first step towards understanding the economic feasibility of restoring historic and planting new orchards. Key issues this study seeks to address include:

- Current and projected demand for fresh market heritage apples grown in southwestern Colorado and apples for juice and cider
- Characteristics of target markets for these products
- Supply of heirloom fresh market and juice/cider apples in Montezuma County
- Price premiums for heritage varieties, Colorado Grown, organic?
- Production costs associated with growing apples?
- Does the information garnered in this study justify a more in-depth feasibility analysis with specific focus on the utility of a mobile cider press? Additional issues to be analyzed subsequently include labor, pest control, packaging, storage, transportation, and solutions to market barriers.

The Market Study began by assessing existing foundational apple market data. To collect new data, MORP and consultants surveyed 13 apple buyers representing local and statewide grocers, natural food stores, local and regional distribution cooperatives and school districts; 37 orchard owners representing small to commercial growers; and 21 cider makers representing hobbyist, craft, and commercial operations. Buyer surveys were conducted via phone and in person;

orchard owner and cider maker surveys were conducted on-line via Survey Monkey. Productions costs were estimated from the surveys as well as in-person interviews with five growers in Montezuma County. Cost models in the form of enterprise budgets were created for rehabilitating historic orchards and establishing new ones.

Acknowledgements

This project has been made possible by funding from Colorado Department of Agriculture, the United States Department of Agriculture, Gates Family Foundation and Whole Foods Market. Additional support from the Kenney Brothers Foundation enabled concurrent orchard survey work from which we based production estimates. Consultants Carolyn Dunmire of Dunmire Consulting and Bob Bragg of Southwest Management Services provided invaluable technical expertise in designing the study, collecting and analyzing data and developing the report and cost models, which Michael Clayton of Cap Log Group, LLC later updated. Dr. Gregory Peck, Assistant Professor of Horticulture and Sustainable Fruit Production Systems at Cornell University, and Dr. Dawn Thilmany, Professor and Agribusiness Extension Economist at Colorado State University, reviewed surveys and provided feedback to improve them. Seventy-one apple buyers, cider makers and orchard owners took the time to answer and respond to survey questions. Finally, we must acknowledge our hard-working pioneer orchardists and the people who have kept these trees alive. We are grateful to the teams of people that have supported this work for the last 126 years.



2. History and Current Status of Apple Orchards in Montezuma Valley

History of Apple Orchards and Production in Montezuma Valley

Remote, rural southwestern Colorado is home to an abundance of remnant heritage apple orchards containing heirloom trees that were planted as early as the 1870s. Fruit-growing pioneers from New England, Tennessee and the Midwest took advantage of the region's climate, deep mineral-rich soils and ample irrigation to plant orchards that supported an award-winning fruit industry. Montezuma County fruit won three gold medals at the 1904 St. Louis World Fair. Two years later, establishing a record "that has never been approached, much less equaled," Montezuma County fruits took 101 of 104 ribbons at the Colorado State Fair, 97 of them first place.



Reverend Howard R. Antes (left) winner of the 1904 Gold Medal. Antes and son in the Gold Medal Orchard (right), McElmo Canyon, Montezuma

Montezuma County's fruit economy supported schools, banks, warehouses and a strong community identity as "the most favored fruit district in Colorado." Trees grafted from larger commercial orchards were planted in home subsistence orchards throughout the county, with Mancos Valley, Lakeview, Lebanon, Lewis-Arriola and McElmo Canyon considered major orchard districts. The 1922 *Orchard Survey of the Southwestern District of Colorado* completed by state horticulturalist, E.P. Sandsten, documented 67 apple orchards with 49 known apple

varieties and 48,630 apple trees growing in Montezuma County.¹ Jonathan was the most popular variety; Rome, Winesap, Gano, Old Fashioned Delicious, White Winter Pearmain, Ben Davis and Grimes followed in decreasing abundance. Peaches, sour and sweet cherries and apricots were grown as well, but it was apples that were by far the most widely planted fruit crop. To put the historic orchards in context of today's production levels, if the 48,630 apple trees growing in Montezuma County in 1922 had borne an average of six bushels per tree, this county alone would have produced 11.6 million pounds of apples, more than the 8.9 million pounds all of Colorado produced in 2014.



The

Early Montezuma Valley fruit marketing

Sandsten survey also foretold the future of Montezuma Valley fruit, “The district has great potential possibilities for commercial fruit growing...and if transportation facilities were available it would become one of our greatest fruit sections in the State.”² Southwestern Colorado had no interstate highway and its only rail line, the Rio Grande Southern, was a regional narrow gauge train that struggled through the Great Depression and ceased operations in 1951. By that time the U.S. apple industry was focused on five commodity varieties: Red and Golden Delicious, Rome Beauty, Jonathan, and Winesap. North Central Washington, with its access to transcontinental railroads and Pacific Rim ports, had become the “Apple Capital of the World.”³

¹ Sandsten, E.P. and C.M. Tompkins. *Orchard Survey of the Southwestern District of Colorado*, The Agricultural Experiment Station of the Colorado Agricultural College. Bulletin 274. 1922

² Ibid.

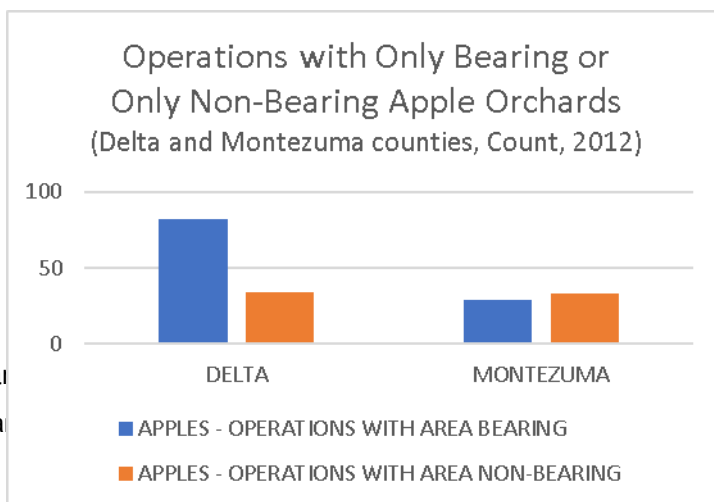
³ Overley, Fred, L. *History and Development of Apple Production in Washington*. ReConnect Magazine, Washington State University.

Nevertheless, in 1975, Bill and Denise Russell of Dolores established the Mountain Sun Juice Plant and manufactured apple and fruit juice from Montezuma Valley fruit. Mountain Sun earned and maintained a reputation for high-quality organic juices that were sold in grocery and natural food stores nationally. Bill and Denise started Mountain Sun after purchasing an old farm and homestead in central Montezuma County. The property included 700 apples trees planted in the 1940s. After a few years of hauling fresh apples to market in California, they were ready to try making juice. The Russells purchased an old meat packing plant on the banks of the Dolores River in the town of Dolores. Their vision was to create quality natural juice made entirely from fruit. The dream was to use Montezuma Valley fruit. In the early years of operation, fruit was sourced solely from Montezuma Valley orchards. Russell hired traveling fruit pickers who travelled from stone fruit to citrus fruit orchards throughout the West. They stayed on the Russells' farm and could pack 60 pounds of apples into a sack by climbing the ladder backwards, leaning back and stripping fruit into bags on their bellies. Up to 100 bushels of apples per picker per day was not unheard of. Russell also arranged to harvest and prune trees in nearby orchards in return for free apples.

The largest harvest Mountain Sun reaped from local orchards was 25,000 bushels in the early 1980s. Mountain Sun broke-even (covered costs other than the owner salary) when sales hit \$350,000 per year. On average, 25,000 bushels of fruit produced 75,000 gallons. They needed more apples than those available locally to earn a profit. The Russells purchased an 820-acre orchard in Wilcox, Arizona, in 1981 to expand the operation. At the peak in the early 2000s, Mountain Sun had \$11 million sales annually and transported 80 semi-loads of juice monthly from Dolores. Sixty people were employed at the plant. At the peak of production, Mountain Sun was asked by the US Environmental Protection Agency to stop processing apples for juice because of the organic waste being produced and subsequently flowing into the local wastewater plant.⁴ Acirca acquired Mountain Sun Juice in 2001 and closed the plant in 2002. Its label and recipes are still marketed by the current owner Hain (<http://www.mountainsun.com/>). Its website boasts: *“Drinking Mountain Sun juices is like putting your straw right into the orchard or berry patch. We choose fruits dripping with nutritional goodies, fresh press them at the peak of flavor and deliver the healthy benefits right to your glass.”* The juice plant was the last significant accessible market for Montezuma Valley apples.

Without easily accessible markets for the apples from Montezuma County, farms maintained fewer orchards for commercial purposes. In 2002, only 12 operations (or 14% of all the farms with apple orchards) had only *non-bearing* orchards; by 2012, 33 operations (or 29%

⁴ Holden, Janelle. “EPA monitoring Dolores compai
Montezuma Orchard Restoration Project Apple Ma



of all the farms with apple orchards) had only non-bearing orchards. In contrast, in regions such as Delta County with local processors of the apples, only 17% of the operations had only non-bearing orchards in 2012.

However, even with orchards not bearing apples, Montezuma County remains unique in Colorado and in the nation, as it has a predominance of old trees and “other/unknown varieties”. According to the *Colorado 2002 Fruit Tree and Vineyard Survey*, almost two-thirds of the trees in Montezuma County in 2002 were planted before 1981 and a quarter of the trees were described as “other/unknown” varieties.⁵

⁵ Ibid.

Current Status of Apple Trees and Orchards in Montezuma Valley

MORP is researching old Colorado apples and creating an [Old Colorado Apples](#) list. By searching historical books, reports and records, we have so far documented 436 varieties of apples that were once grown in Colorado. Some of the apples on this list we see still growing in our landscape on trees up to 100 years old or older. Others, nearly 50% of the list, are now considered lost/extinct. A few details from the list of **Old Colorado Apples**:

- 64 varieties (15%) are **Common**—10 or more mail order sources carry them; these varieties are NOT commonly found in nurseries, but can be found with specialty nurseries and collectors.
- 55 varieties (13%) are **Rare**—4 to 9 mail order sources carry them.
- 108 varieties (25%) are **Endangered**—1 to 3 mail order sources; MORP works to get our hands on these apples and increase their numbers before they end up on the lost list.
- 205 varieties or (47%) are **Lost**—considered Extinct; MORP seeks these varieties in Colorado's remnant orchards.

In 2017, MORP received results from 489 apple leaf samples it collected from Colorado historic orchards and submitted to the USDA-ARS National Laboratory for Genetic Resource Preservation.⁶ Results confirmed the great diversity of heritage apples still growing in our landscape with 158 individual cultivars located in Montezuma County; 195 total for the state. Of these, 58 were positively identified with 51 growing in Montezuma County. The hundred-plus remaining unknown cultivars likely represent some of our country's most rare and endangered apple genetics. To know which trees to sample was made possible by MORP's intensive, on-the-ground survey work. Surveying orchards entails taking a Global Positioning Unit (GPS) coordinate of each tree, photographs and field notes; and importantly, talking to the owners about the history of the trees. Data is entered into MORP's fruit database,

MORP DNA Results of 489 Apple Leaf Samples

VARIETY	RARITY		
American Summer Pearmain	rare		
Apple of Commerce - possible	endangered		
Autumn Strawberry	endangered		
Baldwin	common		
Beitgheimer	endangered		
Ben Davis	common		
Chenango Strawberry	common		
Cortland	common		
Crimson Beauty	rare		
Delicious - Original	common		
Duchess of Oldenburg	common		
Early Harvest - possible	common		
Early Strawberry	rare		
Esopus Spitzenburg	common		
Famuse/Snow	common		
Gano - possible	endangered		
Golden Delicious	common		
Gravenstein	common		
Grimes Golden	common		
Hibernal	endangered		
Ingram	rare		
Jefferis	common		
Jonathan	common		
King David	common		
Kinnards Choice	rare		
MacIntosh Red	common		
Maiden Blush	common		
Missouri Pippin	endangered		
Newtown Pippin/Albemarle	common		
Northern Spy	common		
Northwest Greening	common		
		Orange Pippin/Cox	endangered
		Paragon/Black Twig	endangered
		Primate	rare
		Ralls	common
		Red Astrachan	common
		Rome	common
		Saint Lawrence	rare
		Senator/Oliver	rare
		Smith Cider	rare
		Sops of Wine - possible	common
		Stayman Winesap	common
		Summer Rambo - possible	common
		Sweet Bough	common
		Tetofsky - possible	rare
		Thunderbolt/Hoover	rare
		Tolman Sweet	common
		Virginia Crab/Hewe's	common
		Wagener	common
		Wealthy	common
		White Winter Pearmain	common
		Winesap	common
		Winter Banana	common
		Wolf River	common
		Yellow Bellflower	common
		Yellow Transparent	common
		York	common

[See full DNA results at MORP's website](#)

⁶ For more information on recent discoveries related to DNA, please go to: <http://montezumaorchard.org/2017/11/09/morp-dna-results-of-historic-apple-trees/>

building knowledge of the heritage fruit resources as we design strategies to preserve them. This represents the first comprehensive orchard survey conducted since E.P. Sandsten in 1922.

When compared to 49 varieties documented in our district in 1922, DNA results show we have found 104% of that diversity! And that is just comparing to the 51 named varieties. If comparing to the total varieties found in Montezuma County to those recorded in 1922, MORP has located 322% of that diversity! (note: one difference may be that the 1922 survey focused on commercial orchards whereas MORP surveys historic commercial and homestead orchards; also a few seedlings may be in our results, but not many, as we were careful to collect from grafted trees). Yet, this diversity is hanging on a limb, so to speak; preserving it before it is gone is what MORP works to do.



A Duchess of Oldenburg Tree,
Confirmed with DNA Testing

When compared to the 436 varieties of apples that were introduced to the *state* of Colorado by 1922, Montezuma County today harbors an estimated 36% of that total diversity. From our observations we predict this is a much higher number than elsewhere in the state; yet it also demonstrates the devastating loss of diversity that occurred in Colorado and across the country over the last century. This great diversity disappeared not because these varieties did not grow well here but rather because many were simply not shiny red apples representing the standard of the time.

MORP estimates that 250 historic orchard sites remain in Montezuma County. To date, MORP has mapped over 100 historic orchards – and documented nearly 4,000 trees planted prior to the Montezuma Orchard Restoration Project Apple Market Study

1960s; over 1,000 of these highly-desired and rare heritage apple varieties were planted before 1920. We learn of more orchards all the time. We roughly estimate around 7,000 trees in these historic orchards. In addition, we estimate around 2,000 trees in modern orchards, mostly planted in the 1970s. Unlike Mesa County to the north, Montezuma County did not see the widespread eradication of apple trees in the last century. Following Mesa County's apple boom of 1895, over half a million apple trees were pulled up and destroyed due to poor irrigation management and arsenic resistant codling moth infestations⁷. Mesa County's apple industry continues to fluctuate depending on market trends, and most of the apple orchards have been planted with newer varieties.

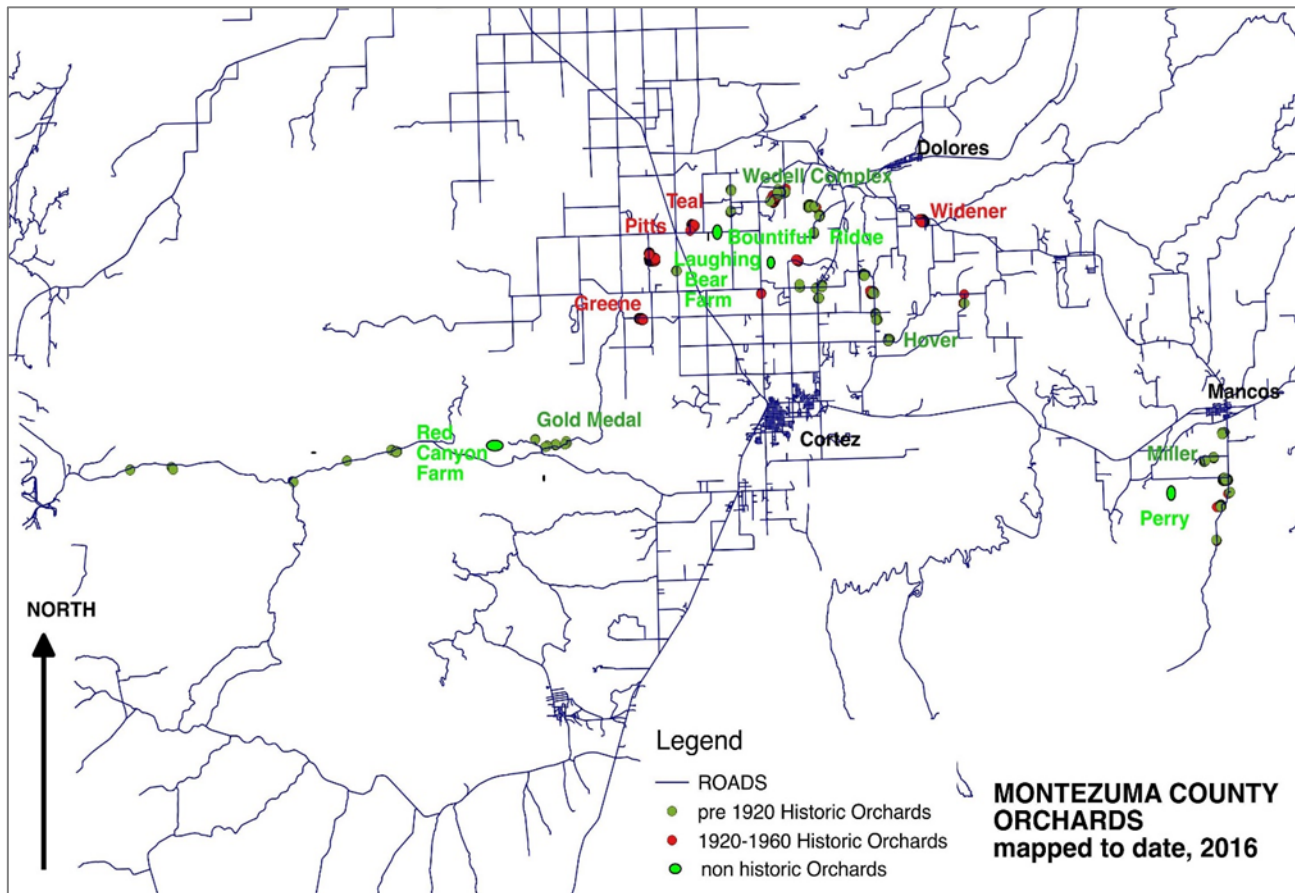
While historic fruit trees can be found in all of Colorado's historic fruit districts, the concentration and diversity of remaining historic orchards in Montezuma Valley is unique. Many old trees have co-existed with grazing and passive management, and in 2002, Montezuma County had the highest percentage of old trees and unknown varieties as compared with Colorado's top apple producing counties of Delta, Mesa, Fremont and Montrose⁸. Even so, many Montezuma County orchards were top-worked—grafting newer varieties directly onto the older trees—after 1920. The diversity found in the old trees that were not top-worked is what MORP seeks to document and preserve.

Montezuma Valley apple production is described by the age of the orchard, tree density, apple varieties planted, and estimated annual production by apple product and grade. MORP has mapped each tree in 120 of the estimated 250 historic orchard sites in Montezuma County. The resultant tree database is used to estimate production levels for the various orchard types and apple varieties, when known.

⁷ Sexton, Joyce. History of the Fruit Industry in Mesa County. Colorado State University Western Agriculture Research Center. 1986.

⁸ Colorado Agricultural Statistics Service, Colorado Fruit Tree and Vineyard Survey 2002. August 2002.

Montezuma County Orchards Mapped by MORP as of 2016



Pre-1920 Historic Orchards

These are the orchards that represent the diversity of apple varieties that MORP seeks most to document, preserve, and propagate. Typical in these orchards were 20 to 50 varieties of apples planted on standard rootstock that included a mix of summer, fall and winter apples that carried people through most of the year by storing well through winter into the following spring. They were planted prior to 1920 and are exemplified by the Miller (George Halls), Hover, Wedell, Wayt and Doerfer Orchards.

To date, MORP has identified 64 such orchards with over 1,200 highly-desired and rare heritage apple varieties that were planted before 1920.

MORP has documented numerous varieties in these orchards, including, among others: American Summer Pearmain, Baldwin, Ben Davis, Black Twig, Chenango Strawberry, Early Strawberry, Gravenstein, Grimes Golden, Northern Spy, Northwest Greening, Thunderbolt, White Winter Pearmain, Winesap, Winter Banana, Wolf River, and Yellow Transparent. Given the age and rarity of these trees, they require “vintage” tree care and are probably best suited for selective harvest and as genetic stock for future tree-planting. For example, many trees are too fragile to shake for harvest and more expensive hand-harvesting on standard-sized trees will be required. These orchards will likely have lower yields (an estimated five bushels per tree), as well as higher maintenance and harvest costs. These higher costs could be recovered by premium prices for smaller quantities of these highly desirable heritage varieties.



The Pre-1920 Historic Wayt Orchard

1920 to 1960's Historic Orchards

These are orchards planted between 1920 and 1960 with primarily several varieties of Delicious and Golden Delicious, Rome, and Jonathan as well as a handful of Winesap. The heritage orchards in this group include Burrell Orchards such as Pitts, Widener and T Lazy T orchards. The 38 orchards of this vintage (mapped so far) include over 2500 trees.

The market issues with this group are the varieties planted. Consumer education will be needed to demonstrate that these “old-fashioned” strains of Delicious, Rome and Jonathan apples taste better than modern strains because they were selected for flavor rather than color and durability and are growing on old standard rootstock. Rome and Jonathan varieties are good for cider and juice as well. As this group of trees moves into the vintage stage, potential production levels may decrease (from an estimated production volume of ten bushels to five bushels per tree) and the tree-shaking harvest method may no longer be appropriate.



A 1920-1960s Historic Orchard planted in 1944 showing mixed agricultural use

Non-Historic Orchards

These orchards are exemplified by Laughing Bear, Bountiful Ridge and Red Canyon orchards. The varieties grown on standard and semi-dwarf root stock include modern fresh market varieties such as Red Delicious, Golden Delicious, Rome, Jonathan, and MacIntosh. The issue with harvest from this group is that these varieties are mostly suitable for juice not cider, and the market is saturated with fresh-pack apples of these varieties.

NOTE: MORP has not yet mapped the non-historic orchards, most of which were planted in the 1970s. It estimates the approximately twelve such orchards include around 2000 trees.



A 1970 non-historic orchard planted on dwarfing rootstock

Modern Orchards – 2010 to Present

Most of the new orchards being planted in southwestern Colorado are at “artisan” or hobbyist scale. Many of these plantings are adjacent to existing historic orchards where the orchard owners plan to undertake cider operations using the old and new trees. Commercial-scale production from these orchards is likely to be five to 10 years in the future and small compared to other categories. It is likely that production from these new orchards will replace the historic and heritage orchard production. Therefore, these orchards are not included in the total production estimates for Montezuma Valley at this time.



**A modern 300-tree orchard of heirloom varieties
planted over the last three years**

3. Commercial Apple Production in Colorado

Apples are not today a significant component of Colorado's agricultural economy. They represent 0.2% of the market value of crops grown in Colorado. The annual value of the Colorado's apple crop has fluctuated in the past decade between a low of \$2 mil in 2013 to a high of just under \$5 million in 2012.⁹ Less than 0.2% of the apples harvested in the U.S. come from Colorado.¹⁰ Farmers in Washington (65%), New York (10%) and Michigan (10%) grow most U.S. apples.

Table 1. Estimated Yield, Production and Prices of Colorado Apples (2005-2016)¹¹

Year	Land Bearing Apples	Yield	Production			Price Received by Farmers	Value of Utilized Production
	Acres	Lbs per Acre	Total (mil lbs)	Utilized (mil lbs)	% Utilized	\$USD / lb	\$USD
2005	1,500 acres	20,700 lbs/acre	31.0 mil lbs	27.0 mil lbs	87%	\$0.179 /lb	\$ 4,824,000
2006	1,500 acres	10,000 lbs/acre	15.0 mil lbs	14.0 mil lbs	93%	\$0.270 /lb	\$ 3,780,000
2007	1,600 acres	8,130 lbs/acre	13.0 mil lbs	13.0 mil lbs	100%	\$0.215 /lb	\$ 2,790,000
2008	1,400 acres	12,900 lbs/acre	18.0 mil lbs	17.0 mil lbs	94%	\$0.234 /lb	\$ 3,970,000
2009	1,500 acres	10,700 lbs/acre	16.0 mil lbs	15.0 mil lbs	94%	\$0.258 /lb	\$ 3,870,000
2010	1,400 acres	10,000 lbs/acre	14.0 mil lbs	14.0 mil lbs	100%	\$0.216 /lb	\$ 3,020,000
2011	1,300 acres	6,920 lbs/acre	9.0 mil lbs	8.0 mil lbs	89%	\$0.293 /lb	\$ 2,340,000
2012	1,200 acres	14,200 lbs/acre	17.0 mil lbs	16.0 mil lbs	94%	\$0.304 /lb	\$ 4,860,000
2013	1,200 acres	4,670 lbs/acre	5.6 mil lbs	5.3 mil lbs	95%	\$0.363 /lb	\$ 1,923,000
2014	1,200 acres	7,420 lbs/acre	8.9 mil lbs	8.2 mil lbs	92%	\$0.255 /lb	\$ 2,091,327
2015	1,200 acres	1,855 lbs/acre	2.2 mil lbs	2.1 mil lbs	94%	\$0.333 /lb	\$ 696,516
2016	1,200 acres	8,750 lbs/acre	10.50 mil lbs	9.9 mil lbs	94%	\$0.318 /lb	\$ 3,129,005

The top ten apple varieties produced in the U.S. are Red Delicious, Gala, Granny Smith, Fuji, Golden Delicious, Honeycrisp, MacIntosh, Rome, Cripps Pink/Pink Lady®, and Empire.¹² In Colorado, the top apple varieties are Gala, Golden Delicious, Fuji, Red Delicious, Jonathan,

⁹ QuickStats by the United States Department of Agriculture's National Agricultural Statistics Services. Accessed 12/1/2017. NOTE: Reported data on pricing for 2014 falls far outside the historic averages and thus has not been included in the revenue for 2014 for these data summaries.

¹⁰ Ibid

¹¹ 2005-2014 data based on USDA/NASS Colorado Agricultural Statistics for 2015. In 2016, USDA discontinued productions estimates for apples in Colorado. The estimated total production for 2015 and 2016 is US Apple Association Production Estimates (<http://www.goodfruit.com/washington-states-2016-estimated-harvest-big-but-watch-for-caveats/>). We have assumed a similar number of acres to estimate yields for these years and taken an average percentage of utilized apples from 2005-2014 to estimate the pounds of apples utilized. **We have estimated the price and value based on the ratio of Colorado apple prices to US prices for the 2009-2013 period and then applying that price to the US average prices for 2014, 2015 and 2016.**

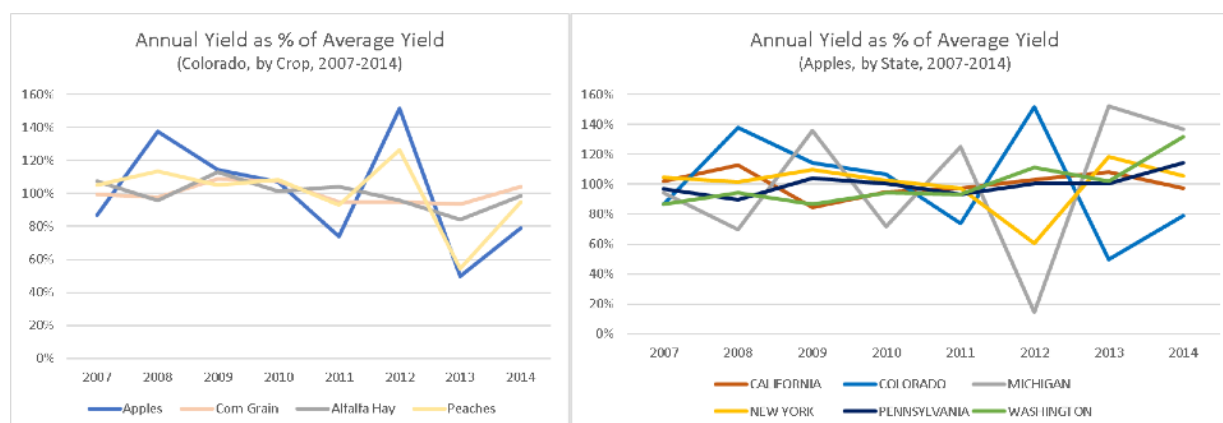
¹² Usapple.org

Jonagold, Rome, Honeycrisp, Cameo, and Granny Smith.¹³ Not surprisingly, as a very small producer primarily of apple varieties that are grown in much larger volumes in other parts of the U.S., the average price for apples received by farmers in Colorado tracks closely with average national apple prices. Over a recent ten-year period, the average price received by farmers for Colorado was 101% of the national average.

Table 2. Average Colorado Apple Prices as Percentage of Average National Apple Prices (2004-2013)¹⁴

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
113%	103%	119%	75%	101%	112%	86%	97%	82%	120%

While the price of Colorado apples generally approximates that of the national average, the yields and resulting total production of apples vary. For example, between 2007 and 2014, annual yield for Colorado apple trees varied from 44% of the average yield (or 4,670 pounds per acre in 2013) to 134% of the average yield (or 14,200 pounds per acre in 2012). In contrast, the yield on alfalfa hay fluctuated only from 88% of the average yield to 112% over the same time period (left chart in below graphic). In addition, the variance in annual yield of apple trees in Colorado is greater than that of the major apple growing states of Washington, New York, Pennsylvania and California in the same time period, although it is less than that of Michigan (right chart in below graphic).¹⁵



¹³ Colorado Agricultural Statistics Service, Colorado Fruit Tree and Vineyard Survey 2002. August 2002.

¹⁴ QuickStats by the United States Department of Agriculture's NASS. Accessed 12/1/2017

¹⁵ Ibid. NOTE: Recognizing the limits of making any statistical conclusions with such limited datasets, the coefficient of variation (a measure of variance) is higher for Colorado and Michigan than the other states for this time period.

Since most apple orchards in Colorado are located at relatively high elevation (3000 feet or higher), the apple crop is at risk for a late spring freeze each year. This reality is reflected in the swings in yields and production year-to-year.

In short, most Colorado commercial apples are varieties grown in much greater quantities elsewhere. With little differentiation and a limited impact on the national market, Colorado apple growers receive currently commodity prices approximating those of the national average; at the same time, they face significant year-to-year swings in yields.

4. Montezuma Valley's Apple Products and Attributes

Montezuma Valley's Apple Products

Montezuma Valley's orchards produce apples that can be sold fresh (for eating or cooking), for apple juice and as an ingredient for hard apple cider.¹⁶ With the right type of processing, each of these products can be sold retail or wholesale. Orchards can be managed (and apples marketed) so that they carry a range of attributes, ranging from local to natural to organic to heirloom. For example, many existing apple trees in Montezuma Valley include heritage varieties grown on old trees that result in "old-fashioned" apple varieties that were selected for taste rather than durability or red color. There are some value-added apple products available from southwestern Colorado such as apple juice and cider, but since the closure of the Mountain Sun Juice plant in 2002, there have not been any commercial-scale value-added operations in the area. In addition, farmers offer U-pick and agritourism programs that provide income to their orchard operations (on a relatively small scale).

Fresh (Whole) Apples

Fresh apples are produced to be sold whole for fresh eating or cooking. These apples can be sold retail or wholesale. Dominant buyers for fresh commodity apples have historically valued consistency in color, size, sugar content and overall appearance of the product. Fresh apples are graded to differentiate batches headed to market. Apple grading standards are based primarily on appearance.¹⁷ Current standards used by the United States Department of Agriculture (USDA) are as follows:

- Washington Extra Fancy
- U.S. Extra Fancy
- Washington Fancy
- U.S. Fancy
- U.S. No. 1
- U.S. No. 1 Hail

Unlike major commodity varieties, heirloom apples offer distinct flavors, variable seasons of ripening,

¹⁶ For the purposes of this report, juice is defined as sweet, unfermented hard (alcoholic) cider.

¹⁷ In 1923, Washington State was the first to develop apple grading standards that today are approved by the United States Department of Agriculture.



storage qualities, desirable characteristics for cider, and historical significance for marketing. Heirloom apples can be expected to have a much greater degree of variability in appearance, flavor, texture, and use, including the presence of scabs and russetting. Interestingly, recent research indicates that apple “blemishes” can increase phenolic compounds which have been linked to increased nutritional value.¹⁸ Unfortunately, the existing grading standards (listed above) do not currently incorporate some of the desirable characteristics of heirloom apples.



A Heritage Fresh #1 apple may have spots and other

Juice Apples

Apples used for juice need not meet stringent fresh eating standards as they are pulverized prior to juice extraction. Apples can exhibit more extensive hail damage, stem punctures, russetting, sunburn, bruising and some insect damage than fresh apples. However, the harvest, sorting and storage of apples for juice is critical for health and safety purposes. In fact, if “one rotten apple...is used along with 200 sound apples to make juice,” the resulting patulin level could exceed the FDA’s standard.¹⁹



A load of #2 juice/cider apples. Note bruising and other discoloration.

Quality juice apples such as Jonathan, Delicious, and Winesap, provide a balance of sweet and acid which leaves the apple juice drinker wanting for more.²⁰ As reflected in Table 3 below, Montezuma County has a preponderance of apple varieties appropriate for juice as well as many appropriate for both juice and cider.

¹⁸ ANA SLATNAR, MAJA MIKULIC PETKOVSEK, HAIDRUN HALBWIRTH, FRANCI STAMPAR, KARL STICH and ROBERT VEBERIC. Response of the phenylpropanoid pathway to *Venturia inaequalis* Infection in maturing fruit of ‘Braeburn’ apple. *Journal of Horticultural Science & Biotechnology* (2010) 85 (6) 465–472

¹⁹ “Patulin is a mycotoxin that is produced by fungi commonly found on apples. High levels of patulin can be produced in rotting or moldy apples. Fallen fruit, apples that have been damaged, e.g., by insects or birds, or bruised, e.g., during handling, are more susceptible to the growth of patulin-producing molds. Storage of apples under conditions that are not inhibitory to the growth of molds also can lead to high levels of patulin in the apples. If fallen fruit, moldy, rotten, bruised or damaged apples, or improperly stored apples, are used to make juice, high levels of patulin may occur in the juice, including pasteurized juice, because thermal processing does not destroy patulin... In fact, if one rotten apple (containing >10,000 parts per billion (ppb) patulin) is used along with 200 sound apples to make juice, the resulting patulin level in the juice could exceed FDA’s action level for patulin.” <https://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Juice/ucm072557.htm>

²⁰ Russell, Bill, personal communication. August 2016.

Cider Apples

Cider apples need not meet stringent fresh eating standards as they too are pulverized prior to juice extraction. In addition, unlike in juice production, patulin is not a concern due to the fermentation process. Cider-specific apples are grown for hard cider production, and they are generally not pleasant to eat. Tannins, which are found also in tea and red wine, are a key component of bittersweet and bittersharp cider apples and lead to bitterness and astringency which produces the dry or puckering mouthfeel in cider.²¹ Other important components of cider apples include acidity and sugar content (which affect how a cider ferments and tastes). Cider makers produce both single variety and blended ciders. Dual-purpose apples, like the Winesap, are good for both fresh eating and cider production. As noted above, Montezuma County has many dual-purpose varieties; cider-specific apples are also a focus of MORP's propagation efforts, as well as new orchards currently being planted.

Apple Production by Product in Montezuma County

MORP has surveyed 120 of the 250 (approximately half) known historic orchards sites in Montezuma County. Orchard survey includes locating and mapping each tree with Global Positioning Unit (GPS) and collecting data on age, condition, variety if known, irrigation, fencing. Additional, MORP interviews owners to known historical information. Further data from orchard owners was collected by survey and is included in Appendix A. Using these data, and production trends from Colorado Department of Agriculture (see Section 1.2), an estimate of annual apple production from southwestern Colorado is included in the table below.

Table 3: Estimated Annual Average Montezuma Valley Apple Production²²

Orchard Type	Varieties	Number of Trees (production estimate bushels/tree)	Fresh #1 (bushels)	Juice (bushels)	Prized for Cider (bushels)
Historic Pre-1920	Diversity, up to 20 in one orchard alone, including: Baldwin, Ben Davis, Grimes Golden, Northern Spy, White Winter Pearmain, Original Delicious and 100+ other varieties	3000 (5 bushels/tree)	3,000		12,000
Historic 1920-1960s	Old fashioned strains of Delicious, Rome, and Jonathan with a scattering of Winesap and unknown varieties.	4000 (10 bushels/tree)	8,000	32,000	
Modern	Red Delicious, Golden Delicious, Rome, Jonathan, Jonagold, "Improved" Macintosh	2000 (5 bushels/tree)	3,000	12,000	

²¹ www.cider.org.uk

²² A bushel represents a unit of volume or capacity which in the U.S. is the equivalent of 2,150 cubic inches, or eight gallons of dry measure. According to the U.S. Weights and Measures Act, the Standard Weight Per Bushel for Agricultural Products—Apples is 47 pounds. Practically, it is a variable weight, typically around 40 pounds. The average size of commercial apples is just under 3" in diameter; 100 of these apples would fill a bushel..

Totals			14,000	44,000	12,000
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Given the variation in production typical of Colorado orchards and the apple varieties grown, Montezuma Valley apple production would have the following attributes:

- The production pattern is assumed to be a heavy crop followed by light crop because of weather and other factors. Therefore, annual production will range 50% above or below the average reported in Table 2.
- Most of the fresh apple production will be “old-fashioned” strains of Delicious, Jonathan, Rome and Golden Delicious. Annual production will range from 7,000 to 21,000 bushels.
- Juice apples will be the largest volume of production ranging from 20,000 to 60,000 bushels annually.

Cider apples from pre-1920 historic orchards will range from 6,000 to 18,000 bushels annually. These rare varieties will command a premium price because of high cost hand-harvesting techniques and low-production.

Additional Product Attributes

Other designations are used to distinguish conventional, commodity apples from those grown locally, on old trees, using organic or natural cultivation methods. Some markets may value these designations.

Heirloom/Heritage/Old-Fashioned Apple Varieties

MORP uses heirloom and heritage interchangeably to describe old apple varieties that have been grafted and maintained by generations of gardeners and farmers. They have been cultivated for qualities such as taste, storage, season, historical significance and use, not for color and uniformity. In the case of cider apples, they are cultivated for acidity, presence of tannins and sugar content. MORP has a role to play in differentiating these special varieties, educating the public about them, and marketing them to appropriate buyers.

For example, what we commonly know today as the Red Delicious apple was first known as *Hawkeye*,²³ and MORP believes this original tree to be present in some of the oldest Montezuma County orchards. By the 1930s, numerous still tasty cultivars of Delicious, known as “double-red”, “standard” and “original” existed in local orchards. Some 300 cultivars²⁴ of Delicious have been documented by fruit-preservationists, although many of these disappeared or became endangered soon after they were named. Given the tremendous variety in Delicious cultivars, MORP refers to heritage Delicious apples that are red in color simply as “Delicious.” Delicious

²³ Schuenemeyer, Adalyn. Personal Communication. May 2016.

²⁴ Schuenemeyer, Jude. Personal Communication. May 2016.

apples grown on 100-year old trees have a complexity of taste that is not available on apples grown on smaller rootstock or Red Delicious apples grown commercially today. As Jay Kenney of Clear Fork Cidery says, “these old varieties of common apples today just taste different when grown on 100-year old trees compared to those that have been bred for extended shelf life, color and size.”²⁵

Local Designation

MORP uses the USDA definition for locally grown produce that includes agricultural products grown within a 400-mile radius of the destination market or within the same state. According to this definition, local markets for Montezuma Valley apples include:

Colorado	New Mexico	Utah	Arizona
Cortez, Durango, Telluride, Grand Junction, Denver, Boulder, Fort Collins, Colorado Springs, Southern Ute and Ute Mountain Ute Reservations	Farmington, Albuquerque, Santa Fe, Jicarilla Apache Reservation	Moab, Salt Lake City	Flagstaff, Navajo Reservation, Hopi Reservation

Colorado Proud

More than 90% of Coloradans would buy more Colorado grown and produced products if they were available and identified as being from Colorado.²⁶ The Colorado Department of Agriculture developed COLORADO PROUD in 1999. It is a free marketing program designed to help consumers, restaurants and retailers identify and purchase Colorado food and agricultural products. The bright distinctive COLORADO PROUD logo series helps residents of our state, other states and other countries easily identify Colorado food and agricultural products.

Organic Designation

Organic designation is provided to crops grown with organic certification under the USDA National Organic Program (NOP). USDA organic regulations describe organic agriculture as the application of a set of cultural, biological, and mechanical practices that support the cycling of on-farm resources, promote ecological balance, and conserve biodiversity. These include maintaining or enhancing soil and water quality; conserving wetlands, woodlands, and wildlife; and avoiding use of toxic and persistent pesticides and herbicides, antibiotics, synthetic fertilizers, sewage sludge, irradiation, synthetic growth hormones, and genetic engineering. USDA Organic regulations can be found in Title 7, Subtitle B, Chapter 1, Subchapter M, Part

²⁵ <http://www.cpr.org/news/story/how-about-them-cortez-apples>. May 2016.

²⁶ <https://www.colorado.gov/pacific/agmarkets/colorado-proud>

205 of the Federal Register. Periodic inspections are required to certify fruit as organic and are an added cost to the grower.

Certified Naturally Grown Produce

Certified Naturally Grown (CNG) produce standards are based on the USDA NOP requirements but CNG is neither accredited by nor affiliated with NOP. CNG offers peer-reviewed certification to farmers and beekeepers producing food for their local communities by working in harmony with nature, without relying on synthetic chemicals or GMOs.

Retailer Sustainability Marketing Programs

Many retailers, including Whole Foods Market, have general requirements for produce suppliers that address labeling, supply chain transparency, traceability, food safety and their own Responsibly Grown Index. The Whole Foods Market's Responsibly Grown Produce Index addresses: pest management, including prohibited and restricted pesticides, farmworker welfare, pollinator protection, water conservation and protection, soil health, ecosystems, biodiversity, waste, energy, and climate. Whole Foods Market's produce standards seek to reward farmers working to protect human health and the environment; prohibit the most harmful chemicals; and provide shoppers with information for sustainable farming practices. Suppliers must respond to all topics regarding responsibility standards prior to becoming a vendor.

5. Market Segments for Montezuma Valley Apples

There is demand for Montezuma Valley apples. As the sections below detail, significant buyers in each market segment are ready to purchase Montezuma Valley apples. However, real hurdles in getting these apples to desired markets today results in a high percentage of Montezuma Valley apples dropping to the ground to function as feed for deer and livestock.

At the simplest level, the apples grown in Montezuma Valley have commercial value in the following key market segments:

1. Fresh (Whole) Apple Market Segment
2. Apple Juice Market Segment
3. Hard Apple Cider Market Segment

Each of these market segments has both retail and wholesale channels.

As discussed in the previous section, specific apple varieties may be better suited for one or more of the above markets. In other cases, one portion of the harvest may be appropriate for a fresh fruit market and another for the juice or cider market (e.g., 10% of a modern orchard's crop to retail as #1 Fresh with the remaining crop to juice). Each market segment has particular requirements related to:

- product specifications (size, quality, appearance, variety);
- harvesting, processing and packaging;
- storage and transportation options from southwestern Colorado;
- pricing ranges and contract terms.

To understand local interest in Montezuma Valley apples, MORP conducted a buyer survey by phone and personal interviews. Most data provided was anecdotal or referenced other apple suppliers (because of the small number of wholesale transactions completed recently for Montezuma Valley apples). While the resulting demand estimates are imprecise and anecdotal, they provide insights into both the existing demand and the key product and distribution requirements for each market.

Fresh, Whole Apple Market Segment

The fresh, whole apple market segment is mature with largely flat projected total growth.²⁷ On average, Americans eat over 17 pounds of fresh apples a year. The amount consumed had been declining slightly until a few years ago when the introduction of sliced apples bumped up consumption.²⁸ Both wholesale and direct retail channels are viable options for local apples growers for a portion of their harvest.

Wholesale Channel: Nearly all the fresh, whole apples sold in the US go through wholesale channels. The major destination markets for Montezuma Valley apples would include Denver area (400 mi from Montezuma Valley), Albuquerque (300 mi), and Salt Lake City (350 mi). Wholesaler buyers like Whole Foods seek Colorado apples and have reached out to MORP with creative ideas about how to overcome the transportation hurdles. The most immediate challenge is to inspire more active orchard owners to grow quality fresh grade fruit to meet the demand.

Retail Channel: In contrast, most of the very limited revenue generated by Montezuma Valley orchards for fresh, whole apples is through local retail operations. Farmers sell fresh apples direct to customers at local farmers' markets and farmstands. In addition, several orchards host U-Pick operations. Total sales for this market segment was reported in the grower survey to be



²⁷ IBISWorld Industry Report 11135. Fruit & Nut Farming in the US. March 2016.

²⁸ Ferdman, Roberto. "A clever tweak to how apples are sold is making everyone eat more of them." Washington Post, May 19, 2016.

100 to 300 bushels (4,000 to 12,000 pounds) per year, with annual sales varying substantially.²⁹ While current sales exceed those for other market segments and the wholesale channel, the potential size of this market is much smaller than the other market segments and the wholesale channel for fresh.

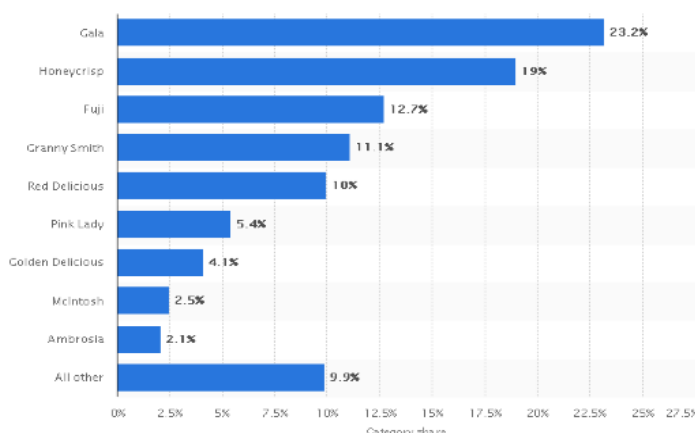
Key Product Requirements and Attributes for Fresh, Whole Apple Market Segment

First and foremost, fresh, whole apples must be attractive and marketable on the shelf. Most retailers require Heritage Fresh #1 specifications, delivered to the destination retail outlets with minimal damage and spoilage (less than 10 percent).

Wholesale Channel: For the wholesale channel, large, Colorado retailers (who buy apples in wholesale quantities) and national distributors primarily sell commodity apples from outside of Colorado. However, they actively seek unique products demanded by their customers, including quality local and heirloom apples if available in sufficient and consistent volumes.

In addition, most fresh, whole apples sold in the US (in large grocery stores such as Whole Foods Market or Kroger) are varieties with national marketing and consumers recognition: Gala, Honeycrisp, Fuji, Granny Smith, Red Delicious, Pink Lady and Golden Delicious.³⁰

Category Share of Apple Sales in the US in 2017, by apple type



Regional produce wholesalers, such as Southwest Fresh Cooperative, aggregate and sell farm produce to restaurants, schools, hospitals, and multi-farm community-supported agriculture (CSA) buyers in Cortez, Telluride, and Durango. These wholesale buyers expressed interest in apples with local or Colorado-grown attributes. Montezuma Valley's orchards meet these designations. Both retailers and regional produce wholesalers are open to non-commodity, heritage apple varieties with attributes that Montezuma Valley's orchards can offer.

Estimated total weekly demand among the small set of surveyed buyers for fresh, whole apples is approximately 50 bushels (or around 2,000 pounds at 40 pounds per bushel) per week for local, conventional apples, and 50 bushels pounds per week for local, organic, or natural apples.

²⁹ This estimate does not include sales from Mesa County at local stores and roadside stands.

³⁰ Chart from Statista, 2017: <https://www.statista.com/statistics/191352/fresh-apple-category-share-in-2011/>

Retail Channel: At the direct retail level in the region, farmers sell small volumes of their own apples through farmstands, U-Pick operations and farmers' markets. These apples must also meet quality standards similar to those described above; however, the consistency and quantity of these sales can vary more than the apples sold in the wholesale channels, since customers often place high value on "non-edible" attributes (e.g., local, heirloom, community relationships).

Harvesting Requirements of Fresh, Whole Apple Market Segment

Wholesale Channel: As noted above, fresh apples for the wholesale channel must meet Heritage Fresh #1 specifications and be delivered to the destination retail outlets with minimal damage and spoilage. As such, apples must be harvested by hand.

Retail Channel: Fresh apples for farmstands, U-Pick operations and farmers' markets must be of sufficient and consistent quality to meet customer expectations (potentially below Heritage Fresh #1 specifications). They too need to be harvested by hand.

Processing, Packaging, Storage and Transportation Requirements of Fresh, Whole Apple Market Segment

Wholesale Channel: Once harvested, apples must be sorted and placed in sturdy, padded packaging that prevents damage during transport. With the long distances to retail markets, refrigerated storage and transport are usually required to get Montezuma Valley apples to market in good shape. Some of the existing, historic orchards have sorting equipment and on-site cold storage (e.g., root cellars). However, much of this equipment is in disrepair and would require some rehabilitation before it could be used for Heritage Fresh #1 apples. In general, the commercial-scale orchards in the area noted an acute shortage of available cold storage. Some of the packing options that have been used for Montezuma Valley apples include 20-pound field boxes, 40-pound wooden crates and standard 40-pound cardboard boxes. Buyers require packaging to be well-labeled with variety and source location.

An additional hurdle is that the major destination markets (Denver, Albuquerque, Salt Lake City) for Montezuma Valley apples are all more than 300 miles away from the orchards. As there is no rail service from southwestern Colorado that serves these destinations, refrigerated trucking is the only feasible transport option.

Retail Channel: Fresh apples for local retail sales also need to be sorted in ways that minimize damage and spoilage. They require less packaging and handling than those going into the wholesale channel.

Pricing for Farmers Selling into the Fresh, Whole Apple Market Segment

For both channels, pricing for fresh whole apples is ultimately driven by the national prices of commodity apple varieties; premium prices are possible for apples with desired “edible” (e.g., taste, organic) and “non-edible” (e.g., heritage, local, Colorado-grown) attributes.

Wholesale Channel: Premiums are possible for Montezuma Valley apples sold with heritage, local and/or Colorado-grown attributes. Buyer surveys revealed the potential for a 50% premium on wholesale prices for Montezuma Valley Heritage Fresh #1 apples, in the range of \$1.00 to \$1.50 per pound (\$40-\$60 per bushel). The grower survey found local Certified Organic apples selling wholesale for \$1.65 per pound (\$66 per bushel).

Retail Channel: Suppliers reported pricing in the range of \$18 to \$20 per bushel for bulk sales and \$5 to \$10 per bushel for U-Pick operations. Natural, local apples sold at farmers markets range in price from \$1.50 to \$5.00 per pound (\$60-\$200 per bushel) depending upon apple variety, quality, and season. Early and late season apples sales can command a price premium when there are no other apples or fruit available at local markets.

Key Issues for Servicing the Fresh, Whole Apple Market

Wholesale Channel: Montezuma Valley’s orchards could produce over 10,000 bushels of Fresh #1 and Heritage Fresh #1 apples (Table 3) over a four- to six-week period. Even if current labor and infrastructure constraints reduced the consistent weekly supply by 80-90% (resulting in production of 1,400 to 2,800 bushels), the potential harvest still would easily service the current demand from interested buyers (e.g., six weeks of fresh apples at 100 bushels a week would be 600 bushels).

Overall, Montezuma Valley apples need to receive premium prices to cover the additional harvest, storage, and transport costs to larger retail markets. Some of the barriers to meeting the Fresh #1 apple demand include:

- Low production from historic orchards with highly desired heirloom apple varieties;
- Cost and availability of trained labor able to pick, sort and package fruit at needed standard;
- Sorting equipment available but in disrepair;
- Lack of refrigerated storage to provide consistent weekly supply;
- Some varieties such as heritage Delicious are in low demand and would require consumer education to support premium pricing for “old-fashioned” varieties. These older Delicious varieties have a far superior flavor to the modern Red Delicious.
- Uncertainty of cost of natural pest control methods that would meet certified natural or organic requirements to support premium pricing.

As such, even with a price premium for heritage, organic and local apples, Montezuma Valley farmers face hurdles to making a profit in the fresh apple market due to the additional harvest, storage, and transport costs. Potentially, this hurdle could be overcome by finding a consistent market for apples unable to feed into the Fresh #1 wholesale channel.

Retail Channel: Additional opportunities exist to attract customers to Montezuma Valley farms to purchase fresh, whole apples at local retail outlets. However, few farmers currently seek to transform their farms into tourist locations. Additionally, a significant increase in demand would be accompanied by increased costs for liability insurance for U-Pick operations and storage.

Apple Juice Market Segment

The US apple juice market is stable and significant. In 2011, Americans consumed “almost 700 million gallons of apple juice...enough juice to fill more than 1,000 Olympic-sized swimming pools.”³¹

Given that apple juice can be produced with mobile or stationary juicing equipment, the potential channels for servicing the apple juice market segment include: a wholesale channel for the juice apples, a wholesale channel for apple juice that is produced locally with such juice apples, and a retail channel for apple juice produced locally.

However, we have limited our assessment to the wholesale channel for juice apples for the following reasons:

- (a) Colorado’s guidance regarding the US Food and Drug Administration’s juice production regulations limits the processing of apple juice being sold either through wholesale or retail channels to juice that has been pressed and pasteurized in stationary equipment;³²
- (b) Mountain Sun’s experience in making a retail juice in the region suggests that a juice company located in Montezuma Valley would need to ship in fruit from outside the region to be profitable. Such a business is beyond the current mission of MORP and beyond the scope of this market report.

As such, the description of the market segment for apple juice focuses on the wholesale channel for juice apples grown in Montezuma Valley (rather than the retail channel or wholesale channel for apple juice pressed in the region).

Key Product Requirements and Attributes for Apple Juice Market Segment

Wholesale Juice Apple Channel: Unlike fresh, whole apples, juice apples need not be attractive and marketable on the shelf. However, they must be harvested at peak ripeness and pressed soon after harvest to avoid spoilage from bruising. Heritage juice apple varieties exist in the greatest quantity in Montezuma County and include Delicious, Rome and Jonathan, and many orchards in the area have a history of providing apples to the Mountain Sun juice plant in Dolores. Juice makers in the Grand Valley (such as Big B’s and Talbott’s) and cold-press juice-makers in the Denver area where Montezuma Valley apples could qualify for local-source status have

³¹ “Apple Juice Prices Squeezed in the U.S.” Mintec, 3/2017. <http://spendmatters.com/2017/03/06/apple-juice-prices-squeezed-u-s/>

³² See “Guidance for Industry: The Juice HACCP Regulation – Questions and Answers.” US Department of Health and Human Services, Food and Drug Administration. September 4, 2003.

expressed their interest in purchasing more juice apples from Montezuma Valley. Big B's reported using 5 million pounds of apples for juice and cider in 2014.

Harvesting Requirements for Apple Juice Market Segment

Wholesale Juice Apple Channel: Hand-stripping and tree-shaking are local harvest methods for juice apples. Large orchard bins are used to package the apples. They can be transported without packaging by truck but the apple integrity can suffer. Pressing should generally occur soon after harvest. Currently, the harvesting infrastructure needed to support juice apples in the region is rapidly deteriorating.

Processing, Packaging, Storage and Transportation Requirements for Apple Juice Market Segment

Wholesale Juice Apple Channel: Juice apples need to be harvested ripe and then transported and pressed into juice within a short time window (which differs by variety). With no local juicing capacity, the farmer must ensure a timely harvest of ripe apples and efficient transportation to the juicer buying the product. Refrigerated storage, packaging and transport are not as important for juice apples as whole, fresh apples; nevertheless, the juice apples cannot be excessively damaged or spoiled prior to delivery to the juice company. Currently, the packaging and transport infrastructure needed to support the distribution of juice apples from the region is rapidly deteriorating.

Pricing for Farmers Selling for Apple Juice Market Segment

In short, the available supply and market price of Chinese apple juice concentrate drives the price US juice makers can pay for US juice apples and for US-produced apple juice concentrate. Unlike "orange juice, which is produced in the orchards of Florida and to a lesser extent in California, the majority of apple juice [is] imported. Around 85% of apple juice consumed in the U.S. is shipped from abroad."³³

Wholesale Juice Apple Channel: Reconstituted apple concentrate produced in China is available for \$0.70 per gallon (the equivalent of \$0.04 per pound of apples). Our surveys did find juice makers in the Grand Valley and the Denver area are interested in purchasing and paying a premium for "heritage and local" juice apples from Montezuma Valley. Juice apple farmers in the region reported receiving prices of up to \$0.50 per pound for Certified Organic #1 apples or desirable heirloom varieties in crates and as low as \$0.01 to \$0.02 per pound for Grade B juice apples on the tree. Surveyed juice and cider makers in the region reported paying \$0.18 per pound for juice apples.

³³ "Apple Juice Prices Squeezed in the U.S." Mintec, 3/2017. <http://spendmatters.com/2017/03/06/apple-juice-prices-squeezed-u-s/>

Key Issues for Servicing the Wholesale Juice Apple Market

Wholesale Juice Apple Channel: The estimated Montezuma Valley juice apple supply (Table 3) could be nearly about 40,000 to 80,000 pounds per week assuming a 20-week season. However, the same constraints on harvest labor and storage infrastructure apply to juice apples as fresh apples so it is expected that less than a quarter of this supply would be available at this time.

Some of the barriers to Montezuma Valley farmers servicing the juice apple market include:

- Cost of transportation of juice apples to juicing companies outside of the region.³⁴
- Cost and availability of trained labor able to pick and put fruit in bins at needed times;
- Lack of refrigerated storage to provide consistent weekly supply;
- Uncertainty of cost of natural pest control methods that would meet certified natural or organic requirements to support premium pricing.

Even with the price premium for heritage, organic and local apples, Montezuma Valley farmers face steep hurdles to making a profit due to the additional costs for handling and transporting juice apples to juicing companies that rely on low-cost juice concentrate from other sources.

Hard Cider Juice Market Segment

The US hard cider market is growing rapidly. As noted in a 2015 article,

“In 2009, cider was a \$35 million market in the U.S. that wasn't spreading past core markets in the Northeast, Northwest and Great Lakes. Last year (2014), it exploded into a \$366 million industry, according to market research firm IRI. That's up from \$172 million a year before and, at 75.4% growth, is way ahead of the 18% growth of the craft beer segment through June of last year and the 1.9% downturn in overall beer sales just a year earlier.”³⁵

Consistent with national trends, the demand for cider apples in Colorado and New Mexico is growing rapidly. In June 2015, USA Cider Market Survey reported that Colorado had 15

³⁴ Given the long distances to destination markets, shipping cider juice would be primarily economically profitable than shipping juice apples. However, with current regulatory requirements for state juice pressed by mobile juicing equipment, it is only possible to press and pasteurize juice in a facility with stationary equipment. The business rationale for such a facility does not exist.

³⁵ “5 Hard Ciders That Are Changing the Way You Think About Beer”. The Street, 2/2015. <https://www.thestreet.com/story/13025044/1/5-hard-ciders-that-are-changing-the-way-you-think-about-beer.html>

Heritage Cider Apples and American History

(Johnny Appleseed) collected seeds by the bushel from Pennsylvania cider mills and ferried them west, where he established apple nurseries in Ohio, Indiana, and Illinois, and distributed wildly random seedlings to settlers far and wide. The mouth-puckering results of these efforts would be primarily economically profitable for applejack. These weren't great eating apples. What Johnny Appleseed was disseminating was booze. Eventually this backfired, as temperance activists fingered the apple as a source of alcoholic sin and demanded that the morally upright burn their apple trees.

cider producers, two apple wineries, and one meadry.³⁶ New Mexico reported two cider producers and a commercial cidery is currently being built in Durango. As the market becomes more competitive, local and national hard cider vintners need heritage, cider-specific apples for their brews. Such vintners desire juice from rare apple varieties with a marketable story. Cider juice could be produced with mobile or stationary juicing equipment in the Montezuma Valley area. The potential channels for servicing the cider juice market segment include: a wholesale channel for the cider apples, a wholesale channel for cider juice that is produced locally with the cider apples, and a retail channel for apple cider produced locally.

Hard apple cider is fermented after the cider juice has been initially pressed and processed. As such, cider juice can be produced in either mobile or stationary juicers and then legally sold through wholesale channels to cider breweries as the starting material for the hard cider.³⁷

As such, we consider cider juice (pressed with mobile juicing equipment) as the core product for wholesale channels within this market segment. We have not considered the retail hard cider market below because it currently falls beyond the scope of MORP's capacity or interest.

Key Product Requirements and Attributes for Apple Cider Market Segment

Wholesale Cider Channel: Like juice apples, cider apples do not need to meet the stringent appearance standards for the fresh, whole apple market segment. Ultimately, cider makers are seeking apples that match their "taste profile" requirements. Tannins, which are found also in tea and red wine, are a key component of bittersweet and bittersharp cider apples, creating bitterness and astringency which produces the dry or



Dual purpose apple variety en route to Denver for cider production

³⁶ https://cydermarket.com/Cider_Maker_Survey.html

³⁷ According to Guidance for Industry: The Juice HACCP Regulation – Questions and Answers.” US Department of Health and Human Services, Food and Drug Administration. September 4, 2003: “The regulation applies to any unfermented juice that is added to an alcoholic beverage (e.g., wine or cider) as an ingredient to adjust flavor or sweetness and retains and expresses its organoleptic (e.g., color, taste) and nutritional characteristics in the finished beverage (§120.1(a)). The regulation does not apply to juice used solely as a starting material for a fermented alcoholic product that is fermented such that the organoleptic and nutritional characteristics associated with the juice are modified to the extent that the original juice becomes an alcoholic beverage and is no longer recognizable as juice at the time processing is complete (comment #5, 58 FR 2897 at 2899; §101.3(k)).

puckering mouthfeel in cider.³⁸ Other important components of cider apples include acidity and sugar content (which affect how a cider ferments and tastes). Cider makers produce both single variety and blended ciders. Montezuma County has both cider-specific apples and dual-purpose varieties; many of the heritage apple trees which MORP has a focus on restoring are appropriate for cider.

Harvesting Requirements for Apple Cider Market Segment

Wholesale Cider Channel: A key cost hurdle to meeting cider apple demand with Montezuma Valley apples is that the desired apple varieties are currently often on the oldest trees; these trees are not suited to tree-shaking as a harvesting method. This can potentially make the cost of harvesting Montezuma Valley cider apples quite high.

In addition, while the Montezuma Valley seems to be a cider maker's ideal source for heirloom apple varieties, there are some constraints that make the potential supply less than perfect. Unlike more common commercial varieties, older cider varieties may not be suited to closely spaced production on dwarfing rootstock due to the pressure of fire blight. Furthermore, annual production can be limited as many cider apple varieties are biannual bearers. Fortunately, Delta County growers are experimenting with cider varieties planted on dwarfing rootstock to help address some of these production hurdles.

Processing, Packaging, Storage and Transportation Requirements for Apple Cider Market Segment

Wholesale Cider Channel: Unlike most juice apples which need to be harvested ripe and then transported and pressed into juice within a short time period, only summer varieties of cider apples need to be pressed into cider juice within such a time window. In contrast, the acidity of most fall and winter cider apple varieties tends to improve during a four- to twelve-week storage period. In fact, one cider apple variety is best harvested after the first freeze. As such, cider apples can be utilized over a much longer period of time than either fresh apples or juice apples, if the proper harvest, storage, processing and distribution capacity exists.

However, crates and bins for harvest and storage are a significant cost (with long payback periods) for individual farmers. These costs can be distributed across multiple farms if a single entity owns and recycles the required equipment to store many bins of fruit for several weeks (as cider apples mature). Likewise, disposal of waste from the juicing process is a significant cost and liability to a location with stationary equipment. However, if the juicing equipment can move such that it can process smaller batches nearby to the contributing orchards, the "local" pulp can be spread onto those fields, turning the waste into a needed component of fertilization.

³⁸ www.cider.org.uk

In short, the processing and distribution of wholesale apple cider require juicing equipment that can move from county to county; crates, bins and locations in different counties able to store cider apples for eight to twelve weeks; dispersed agricultural fields for spreading pulp as fertilizer; and a centralized location for storing and loading the cider juice onto trucks (e.g., forklift-accessible cold room for the pressed juice). Although no such mobile juicing equipment exists currently in the region, MORP tested out mobile juicing equipment in 2016 and is in touch with the producer of such equipment. It also tested out locations that could be used for cider juice storage and distribution.

Pricing for Farmers Selling for Apple Cider Market Segment

Wholesale Cider Channel: Unlike juice apples, the variety and characteristics of the cider apple drive the demand and associated price cider makers are willing to pay for cider apples and cider juice. In addition, many of the craft cider breweries are located in metropolitan areas, increasing their interest in purchasing cider juice rather than cider apples (due to the cost of disposing of the pulp generated in the pressing process).

MORP's 2016 survey discovered a range of prices paid by for cider makers from \$2-3 per gallon for juice made from commodity apples from out-of-state, to \$4 per gallon for similar apples from Colorado, to \$6.50 per gallon for heirloom varieties with cider-specific characteristics. Consistently, cider makers noted a willingness to pay a premium (ranging from 10-100%) for cider juice made from heirloom, local cider apples. Many cider makers stated their strong desire for such ingredients but the lack of such a supply. One stated a clear interest in making a higher margin, specialty cider that could be sold on several of the characteristics of apple trees promoted by MORP.

Key Issues for Servicing the Apple Cider Market Segment

The current estimated supply of cider apples is 12,000 bushels (Table 3). Given the current apple source is historic orchards, many with very old trees, the supply could be much lower because of inconsistent fruit year-to-year and difficult harvest conditions.

Some of the barriers to Montezuma Valley farmers servicing the cider apple market include:

- Cost of production and harvesting from heirloom varieties in historic orchards;
- Cost of planting new orchards with heirloom varieties;
- Variability of yield of historic and new orchards due to varieties and weather;
- Cost and availability of trained labor able to pick and put fruit in bins at needed times;
- Cost of storage to prepare cider apples for pressing;

- Cost of mobile juicing equipment and centralized location for storing and distributing apple juice cider to buyers;
- Uncertainty of cost of natural pest control methods that would meet certified natural or organic requirements to support premium pricing.

One additional interesting challenge is that the desired bitter taste that adds complexity to cider flavor makes some cider varieties otherwise inedible and unavailable for multiple uses as fresh and juice apples.

6. Economics of Apple Orchard Restoration and Establishment in Montezuma Valley

As described previously, despite a long and storied history of apple production in Montezuma Valley, apple orchards have not recently made economic sense for most farmers. As a result, trees have been removed and potentially valuable orchards have fallen into disrepair. Reversing this trend requires farmers and the surrounding community to see an economic reason for investing time and money in rehabilitating and planting apple orchards.

To understand the economic potential, MORP interviewed five apple orchardists in Montezuma County and the staff of the Colorado State University (CSU) Southwest Colorado Research Center about costs and returns associated with their production practices. Two of the growers were in the second to fifth year of establishing new orchards. Three of them were producing apples on established trees ranging from 50 to over 100 years old, as well as planting young trees to fill in space in their orchards where old trees had been removed. More detailed and descriptive information about each of these growers and their current cost structure is included in Appendix 1. MORP used this information to develop cost models that reflect the production costs of the desired orchards for Montezuma Valley.

These models assume orchards with “traditional” widely-spaced heirloom varieties grown on standard or near-standard rootstock with perennial groundcover (often pasture grasses). Such orchards preserve the historic nature of our older orchards and use fewer costly inputs than large-scale commercial orchards using trellised, shorter-lived smaller trees. These enterprise budgets assume the orchard will be able to service multiple markets -- with apple varieties appropriate for the fresh (whole) apple market, the juice market, and cider market.

The orchards promoted and modeled by MORP could augment small diverse family farms and homestead gardens. Interestingly, research in the United Kingdom shows that traditional orchards are hotspots for biodiversity, finding over 1,800 species across the plant, fungi, and animal kingdoms in less than six acres of orchard. Another use for this model of orchard is in conjunction with hay and livestock operations if the trees are spaced widely enough to allow for haymaking and irrigation equipment.

The models consider two types of orchards:

- (1) Rehabilitating an Established Heritage Orchard. Given the likely three-year period to rehabilitate an historic orchard, this model reflects cost and revenue projections for Year One, Year Two and “At Maturity” (once the orchard needs only routine maintenance and the backlog of rehabilitation pruning is complete).

- (2) Establishing a New Orchard. This model reflects the planting and establishment costs of Year One and then cost and revenue projections “at full production” (five to ten years after planting).

Both models assume orchards with 150 trees/acre with 50% production of apples for cider, 40% for juice and 10% for the fresh, whole Heirloom #1 market. The high, medium and low prices in the scenarios below reflect ranges documented during interviews with growers and buyers.³⁹ Additional assumptions are included in the summaries below:

User Inputs / Key Assumptions	ORCHARD ESTABLISHMENT			ORCHARD REHABILITATION		
	Scenario #1	Scenario #2	Scenario #3	Scenario #1	Scenario #2	Scenario #3
Trees / Acre	150 trees/acre	150 trees/acre	150 trees/acre	150 trees/acre	150 trees/acre	150 trees/acre
Average Yield / Tree at Year 5	5 bu/tree	5 bu/tree	5 bu/tree	5 bu/tree	5 bu/tree	5 bu/tree
Year 4 Yield as % of Year 5 Yield	60%	60%	60%	100%	100%	100%
Year 3 Yield as % of Year 5 Yield	15%	15%	15%	90%	90%	90%
Year 2 Yield as % of Year 5 Yield	0%	0%	0%	60%	60%	60%
% of Total Production - Not Sold	TED	TED	TED	TED	TED	TED
% of Marketable Production - Retail Sales	10%	10%	10%	10%	10%	10%
% of Marketable Production - Wholesale Juice	40%	40%	40%	40%	40%	40%
% of Marketable Production - Wholesale Cider	50%	50%	50%	50%	50%	50%
Price per Bushel - Retail Sales	\$25.00 /bushel	\$30.00 /bushel	\$40.00 /bushel	\$25.00 /bushel	\$30.00 /bushel	\$40.00 /bushel
Price per Bushel - Wholesale Juice	\$2.00 /bushel	\$5.00 /bushel	\$7.50 /bushel	\$2.00 /bushel	\$5.00 /bushel	\$7.50 /bushel
Price per Bushel - Wholesale Cider	\$3.00 /bushel	\$6.50 /bushel	\$11.25 /bushel	\$3.00 /bushel	\$7.50 /bushel	\$11.25 /bushel
Average Labor Costs (\$/hr) - Over 5-Year Period	\$12.00 /hr	\$12.00 /hr	\$12.00 /hr	\$12.00 /hr	\$12.00 /hr	\$12.00 /hr
Outputs	Scenario #1	Scenario #2	Scenario #3	Scenario #1	Scenario #2	Scenario #3
Initial Investment	\$7,719 /acre	\$7,249 /acre	\$6,757 /acre	\$6,059 /acre	\$4,845 /acre	\$4,845 /acre
Annual (Full Production) Revenue at Year 5	\$3,600 /acre	\$6,188 /acre	\$9,469 /acre	\$3,600 /acre	\$6,563 /acre	\$9,469 /acre
Net Operating Profit at Full Production (Year 5)	\$1,123 /acre	\$3,710 /acre	\$6,991 /acre	\$882 /acre	\$3,844 /acre	\$6,750 /acre
Accumulated Net Cash Receipts at End of Year 5	-\$6,597 /acre	-\$2,068 /acre	\$3,674 /acre	-\$3,701 /acre	\$6,668 /acre	\$16,840 /acre
Breakeven Year (Assuming Continuing Year 5 Production)	Year 11	Year 6	Year 5	Year 10	Year 4	Year 3

Both the establishment of a new orchard and the rehabilitation of a historic orchard require upfront financing, in the range of \$5,000-\$8,000 per acre (not including land or irrigation water costs). This amount includes the annual operating costs for the orchard until production generates positive net annual income. To cover annual operating costs at the lower prices (e.g., juice sold at \$2.00 per bushel or \$0.05 per pound), the orchard would need to produce about 1,240 bushels per acre of juice apples, equal to an average yield of about 8 bushels of juice apples per tree. At the higher price point of \$7.50/bushel (or \$0.18 per pound), orchards would need only to produce 330 bushels/acre or 2.2 bushels per tree. The higher quality apples that could be sold as fresh apples generate significantly higher margins and, as such, greatly impact the overall profitability of the orchards. Desirable cider apple varieties can generate premium prices well above the low end of the range of prices for juice, \$2.00/bushel.

These models do not currently incorporate the uneven production of Montezuma Valley orchards year to year. In planning, financing and operating, orchard owners would have to garner higher

³⁹ To convert prices per pound documented during the interviews to prices per bushel, we have assumed 40 pounds of apples per bushel.

than average profits in good years to cover fixed costs in years with lower yields. These fixed annual costs average about \$2,000-\$2,500 per acre and do not vary substantially with yield.

7. Findings and Recommendations

The long history of fresh apple and juice production in the Montezuma Valley is experiencing a renaissance with the increased demand and premium pricing offered for local heirloom apples. The agricultural heritage in southwestern Colorado has preserved many of the orchards and much of the infrastructure, but the lack of market in the past 30 years has resulted in neglect and disrepair. Furthermore, the cost of transportation to destination markets creates an economic need for Montezuma Valley apples to receive premium pricing. The risks and barriers to Montezuma Valley apple production as well as some recommendations for near-term solutions are listed below.

Many of Montezuma Valley’s existing apple orchards have historical, genetic and market value. Vintage trees in Montezuma Valley produce very desirable apple varieties for both the fresh apple and the cider apple markets. These 80 to 100+ year-old trees are the foundation of what makes Montezuma Valley apples unique and desirable in the local marketplace. However, these trees have variable annual production and may only produce for a few more years. Most trees are on standard root stock and in fragile condition requiring expensive hand-harvesting in tall trees. These orchards are best suited as a genetic source with minimal production to keep the “taste” for these apples alive in the marketplace while new trees grown from these vintage trees mature.

Many orchards planted to produce apples for juice now must find new buyers to be economically valuable. The Mountain Sun juice plant in Dolores, Colorado closed 15 years ago, but the source trees for the organic apple juice are still producing. Montezuma Valley has many heirloom Delicious apples as well as Jonathan and Rome apples, well suited to juice production. The economics of selling juice apples for processing outside of the region is not promising. However, these orchards may be appropriate for cider juice – and MORP is evaluating feasibility of a mobile juice unit that could press and process apple cider juice to be sold to cideries. In addition to adding value to the cider juice apples, the mobile juice unit could reduce the cost of shipping product to destination markets.

Bringing standing orchards back to production requires investments in labor and infrastructure. The infrastructure required to get fresh Montezuma Valley apples to market is in disrepair after decades of neglect. The sorting equipment, packing boxes and storage locations require significant investment to get them back into commercial-scale condition. Similarly, the labor needed to harvest Montezuma Valley apples and to prune trees has long dispersed and a new workforce would need to be trained and supported to have a steady apple supply available

for market. MORP is applying for grant money to refurbish existing equipment and packaging as well as exploring options for training and supporting local labor.

Heirloom varieties have valuable attributes as fresh apples that are different that accepted market standards for Fresh, Whole Apples. Varieties of certain heirloom apples such as Stayman are not able to meet USDA #1 apple standards because they have a greater degree of variability in appearance, flavor, texture and use than conventional apple varieties grown to meet Fresh #1 standards. MORP must continue to educate buyers about the differences between heirloom and commodity apples especially with respect to appearance. MORP is also advocating to adapt USDA grade U.S. Extra Fancy to allow for russetting and other variabilities commonly present on heirloom apple varieties to meet a “Heritage Fresh #1” standard with the following specifications: *apples that are mature, but not overripe, clean, fairly well formed, and free from decay, internal browning, internal breakdown, freezing injury, visible water cores, and broken skins. The apples are also free from damage caused by bruises, hail, disease, insects, bitter pit, Jonathan spot, or damage by other means, and russetting and scabbing will not disqualify an heirloom apple from being a Heritage Fresh #1 apple*

In addition, it is difficult to meet organic and natural certification pest control requirements with old apple trees. MORP is proposing alternative pest control methods specifically designed for older trees that would qualify for organic or natural certification and education and marketing around the variability in appearance of heirloom apples.

Servicing the fresh, whole apple market at the scale possible requires collaboration with committed buyers. As stated previously, with no rail service from southwestern Colorado and the major destination markets between 300-400 miles away, trucking is the only feasible transport option. To make transportation economically feasible (even with local, heirloom price premiums), special arrangements, such as the options below, may be necessary:

1. Fill truckloads of other regional products such as Bow and Arrow® corn and Adobe Milling® beans already being transported to retailers. This option is only feasible for retailers that source these other products locally; it would probably not have refrigeration needed to keep apples in top condition.

2. Backhaul/deliver apples to local/regional store loading dock for internal distribution. Some retailers return empty trucks to Denver after deliveries to local markets. For example, Kroger Stores deliver to City Market in Cortez and can return to Denver area with an empty truck. Whole Foods Market has a store in Basalt that could be a loading point for Montezuma Valley apples. This option would require that apples are delivered to the regional store in proper packages or pallet lots with clear labelling. It would require that suppliers be willing to accommodate “special” deliveries and that apple producers work cooperatively to create required lot sizes and packaging on specified dates. This level of storage and packaging is currently not possible with existing infrastructure in southwestern Colorado.
3. Fill trucks shipping fruit from Grand Junction area with Montezuma Valley apples. Local apples would first need to be shipped to Grand Junction. Because of the shorter distance, refrigerated transport to Grand Junction would not be required.

Rehabilitating and establishing orchards to service the growing demand of the cider market is promising but it will take significant investment, coordination and time. While the Montezuma Valley seems to be a cider maker's ideal source for heirloom apple varieties, there are some constraints that make the potential supply less than perfect. Unlike more common commercial varieties, older cider varieties may not be suited to closely spaced production on dwarfing rootstock due to the pressure of fire blight. Furthermore, annual production can be limited as many cider apple varieties are biannual bearers. To alleviate the supply/demand mismatch for cider apples, MORP is building sources of cider apple scion wood for and encouraging new and expanded orchards to be planted in the Montezuma Valley featuring cider varieties. These new orchards feature heirloom varieties grown on standard rootstock to meet the cider and juice taste requirements while maximizing tree durability.

8. Conclusion

In summary, Montezuma County is Old Orchard Country. Today's interest in local and heirloom food, together with the resurgent hard cider industry foretells a new future for old apples. The work of our early fruit-growing pioneers remains in our landscape to use as building blocks to restart a local fruit economy. With this foundation, we believe:

- (1) The climate and soils of Montezuma County have shown they can support a diversified landscape of heritage apple tree varieties that celebrate our history and community. Hundreds of different varieties of heritage apple trees are currently standing, ready to be restored and integrated into an overall local economic ecosystem. If the economics make sense, landowners are interested in establishing new, diversified orchards.
- (2) Large retail customers in Colorado and in other major metropolitan areas considered "local" to Montezuma County (e.g., Denver, Salt Lake City, Albuquerque) would pay a premium price for fresh, whole apples, including heritage apples. The difficulty and cost of getting apples from trees to these destination markets in a consistent and high-quality manner is significant; nevertheless, it is a valuable market that should continue to be pursued for a portion of the Montezuma County harvest.
- (3) Current regulations make it difficult for apple growers in Montezuma County to press and process juice for sale to the retail or wholesale channels of the apple juice markets. As such, while heritage apples from the region are valued by juice manufacturers, it is difficult to generate profit from sales of juice apple. Priority should be given to the whole, fresh apple market segment and the hard cider market segment.
- (4) The national hard cider market is projected to continue to experience strong growth. Hard cider vintners within and beyond southwestern Colorado value heritage apples, with their specific taste profiles and with stories and attributes that can differentiate their products. Many varieties of heritage apples grown in Montezuma County would meet their needs,
- (5) Current regulations allow for farmers and organizations providing juice pressing to sell juice to hard cider brewers. In addition, many craft cideries located in metropolitan areas (unable to fertilize fields with waste from the apple pressing) would prefer cider apple juice for fermenting to cider apples. As such, a promising opportunity exists to develop a mobile pressing capacity to process valued cider apples in the field and sell Montezuma Valley apple cider juice at a premium to the growing number of cideries.

In conclusion, we at the Montezuma Orchard Restoration Project are not satisfied to read about tasty heirloom apples when there is a chance to taste them as fruit and as cider. Join us in our

mission to preserve our fruit-growing heritage and restore and orchard culture and economy to southwestern Colorado: www.montezumaorchard.org.

9. Appendices

Appendix 1: Summaries of Interviews with Apple Orchardists in Montezuma Valley

A summary of the anecdotal production cost information reported during the interviews is included below:

1. Bill Russell, Mountain Sun Juice owner/operator (1975-2002)

Russell invested a lot of time marketing the story of Montezuma Valley apples and Mountain Sun juice. He developed a “training and sales” program that he personally presented to all store employees to ensure that everyone knew the story, and lobbied to get the Mountain Sun juice shelved in the produce department. Tree-shaking as a harvest technique only works when fruit is ripe and the fruit must be used immediately because it does not keep very long. This harvesting technique would be most appropriate with the mobile juice unit on-site. Russell is enthusiastic about the concept of a mobile juice press coming to the Montezuma Valley. He believes that juice would be a viable product again if the enterprise is led by someone with business sense, vision, and tenacity. While he doesn’t think there is currently enough fruit in Montezuma Valley alone to support a profitable juice enterprise, a regional operation can be profitable. However, with southwestern Colorado’s ample land, water and growing climate, the potential to increase production to meet enterprise needs is here. Russell recommends building the brand by marketing in one location initially and expanding from there. He says to create a business model by learning lessons in one location and to size every part of the operation to fit each other: apples, freight, pressing, packaging, delivery, and capacity. He believes that more volume is better in the food business, generally. For Mountain Sun, the cool building was a big advantage for them as they didn’t have to refrigerate their processing area as they do in California.

2. Miller Orchard, Mancos Colorado. Sara Miller, Owner-Operator

Sara Miller has been rehabilitating an orchard in the Mancos area for the past five years that was first established in the 1890s by early fruit-growing pioneer, George Halls. The orchard consists of almost 300 trees. Most of them are the original trees, along with one-to-three year-old trees that were planted when she started managing the orchard for fruit production. She counts 24 varieties of apples in the orchard. Miller’s initial work involved cutting out dead wood and poorly shaped branches on the old trees. She harvested some of the slash for fire wood and chipped smaller branches, some of which she has sold for smoking meat in area restaurants. Sara has hired workers to help with spring pruning, with labor costs running from \$7.00 to \$8.00 per hour. She pays similar wages for picking, and the workers pick from four to six bushels of apples per hour. Other costs for orchard operations include pest control, rent of a chipper to

handle slash, planting new trees and maintenance of equipment. However, she has not kept close track of costs each of the operations performed. Her goal is to develop a local hard cider operation that will have a retail outlet in Durango. She has installed a cider press in a building at her orchard, which is pressing apples from her orchard as well as other orchards in the area. A problem she has encountered is that there is no place to store the juice in the area, and has had to ship the juice to a storage facility near Grand Junction. She currently pays \$600/month to store 10,000 gallons of frozen juice.

3. T Lazy T Orchard, Arriola Colorado, Dusty and Martha Teal, Owner-operators

The Teals bought a farm a few years ago, located northeast of Arriola that had 55 standard apple trees that are about 75 years old. The trees had not been managed as a productive orchard for many years and have required considerable work to get back into production. They have also planted 35 new trees and plan to eventually have 50 heritage-variety trees on semi-dwarf root stock when the planting is complete. The Teals do all the work associated with the orchard themselves. Since they have been rehabbing the old trees, pruning has been quite time consuming, often taking several hours per tree per year. Pruning all of the newly established trees took about a day to complete this spring. The Teals will market all of their apple crop through production of hard cider. They will mill and press the apples and store the juice on site, until they ferment it make the cider. One difficulty they have encountered is the licensing requirements for cider-makers. Colorado has not established a license for small-scale producers to sell hard cider. This will require legislation to be approved through the Colorado State legislature and could take a few years given that each state legislator has a limited number of bills that they can introduce each session. While deer do not bother their large, standard trees, they have erected a deer-proof fence to protect the newly planted trees. They also must provide protection for these trees from damage caused by rabbits and other rodents.

4. Sam Perry

Sam Perry tends an orchard near Mancos that contains both five-to-ten year-old trees and some recently planted trees. He is also establishing a new orchard adjacent to the older orchard, and is caring for another orchard near Ignacio. Perry's cost associated with rehabilitating old, neglected, standard trees is about \$25 per tree, plus rental costs for lift equipment. He also has costs associated with slash disposal from pruning of the older tree, pest management treatments for codling moth, and irrigation water. Cost estimates to introduce parasitic wasps for codling moth control depend on release rates, and include labor for monitoring, releasing, and evaluating treatment effect. For moderate release rates (60-70% control) on standard trees, supplies (wasps, shipping, traps, thermometers) can cost \$270 per acre annually. Labor (temperature monitoring, trap setting and monitoring, wasp releases) is estimated at \$125 per acre assuming a labor cost of \$20 per hour though this is generally done by orchard owner. Perry is installing deer-proof fencing for his new orchard using native cedar posts and recycled fence material. He

is bearing all of the costs himself, rather than applying for assistance from Colorado Parks and Wildlife Department. The fence that will surround the new orchard is similar to the one that encloses the older orchard. However, he had considerable damage to small trees from rabbits gnawing on the trunks during this last winter with particularly deep snowfall.

5. Bountiful Ridge Farm, Dolores, Colorado Rick and Gerrie Goodall, Owner-operators

Mr. Goodall planted 250 Golden Delicious trees in 1992 on semi-dwarfing rootstock. Since 2009 he has planted another 250 trees. The Goodalls sell apples retail at the Cortez Farmer's Market and wholesale to area restaurants and natural growers through Southwest Farm Fresh Cooperative. He believes that finding orchard labor is one of his top concerns. His pruning costs amount to about \$5.00 per tree; and reports picking costs are about \$2.00 per bushel, sorting \$2.00 per bushel and he spends \$2.50 for each cardboard box he uses to market fresh apples. Since he is planting trees on soil that has not been used as an orchard before, he first surveys the land and draws up a design for the trees. Then he works the ground much like preparing the soil for any other crop. He plows, discs and harrows the soil before digging holes to plant the trees. His costs for planting trees include land preparation at \$55 per acre, \$10 for each tree and \$10.00 to prepare a hole and plant the tree. He also cultivates the ground between trees to control vegetation two to three times per year at a cost between \$25 and \$30 per acre. During the fifth year, he establishes grass and further cultivation is not required.

6. Colorado State University Yellow Jacket Fruit Tree and Vineyard Research & Demonstration Project

Gus Westerman, Colorado State University Cooperative Extension Agent, Dolores County, coordinates the fruit tree and research project. The project was started in 1991 to answer questions posed by people who wanted to know if fruit production would be profitable on lands irrigated by Dolores Project water. It is the highest-elevation research orchard in the world. A full description of the project is available at: <http://www.coopext.colostate.edu/WR/Dolores/fruitmgmtguide.pdf>.

The orchard is maintained by Cooperative Extension staff from Montezuma and Dolores counties, and knowledgeable volunteers. The orchard has benefited from the research conducted at the CSU Orchard Mesa Research Center located near Grand Junction, Colorado, and the University staff. Apples are produced on 300 trees, consisting of four different rootstocks, ranging from trellised dwarf trees to trees that are 70% of standard. Since some of the trees that were first planted are now at the end of their productive life, they are being replaced by new trees of various varieties. Because of the diversity of trees within the orchard, visitors can see the management methods used with various tree layouts,

irrigation methods and production practices. The Research Center staff shares their knowledge during tours and workshops at various times during the year. Apples are marketed through “U- Pick” harvests during the fall. These events attract a large number of people who both visit the orchard and obtain a supply of apples at \$1.00 per pound.

Estimated time spent on the 300-tree (dwarf and semi-dwarf) orchard annually include:

- | | |
|---------------------|-----------|
| · Pruning | 200 hours |
| · Cleaning prunings | 45 hours |
| · Fertilizing | 3 hours |
| · Mowing | 60 hours |
| · Spraying | 60 hours |
| · Irrigation | 30 hours |

Equipment used in the orchard includes:

- | | |
|---|--|
| 1 | 50-gallon sprayer |
| 3 | Heavy duty pole loopers/pruners with 6 foot to 12 ft. extensions |
| 1 | Tree-pruning portable system |
| 1 | Portable tree pruning compressor |
| 3 | Hand pruners |
| 1 | Poulan gas powered pole pruner |
| 1 | Kawasaki Mule 610 UTV |
| 3 | Tallman orchard ladders, 6, 10 and 12 foot |
| 1 | John Deere Lawn Mower |

For comparison, the cost information reported in orchard owner surveys includes the following:

- Experienced fruit pickers are paid \$10.00 per hour. Pickers with no experience are paid minimum wage. One grower reported that they had difficulty finding labor even when offering \$10 per hour. A grower and juice maker in the Grand Valley reported most fruit costs about \$40 to \$50 per bin to harvest.
- U-Pick and local retail operations are breaking-even at prices of \$20 to \$40 per bushel (\$0.50 to \$1.00 per pound for fresh apples).
- Wholesale prices of \$1.00 for natural apples and \$1.65 for certified organic apples reported to support break-even operations at several orchards.

Appendix 2: Surveys used for the Market Report

QUESTIONS FOR FRESH APPLE PRODUCT BUYERS

Ask to speak to produce manager or person that orders fruit/apples - if talking to individual store. For chains/corporate, try for purchasing for produce or apples.

1. How do you purchase apples? Directly from orchard? Produce vendor? Other supplier?
2. What volume do you order of fresh apples in each order? For example, if you order weekly, do you order enough to get volume discount? Look at last year's sales? Other?
3. What types and volumes do you order of fresh apples? We are particularly interested in fresh apples only available in the fall - harvested in Aug, Sept, Oct, Nov.

If you can break it out by Apple variety, organic, local/Colorado grown that would be most useful.

Apple Variety _____ Volume _____
Organic? _____ Local/Colorado? _____ Heirloom? _____

Apple Variety _____ Volume _____
Organic? _____ Local/Colorado? _____ Heirloom? _____

4. What are average prices you paid for these apples - in most recent orders?

Apple Variety _____
Organic? _yes/no _____ Local/Colorado? _____ Heirloom? _____

Other/Natural/Conventional? Y/N

Apple Variety _____
Organic? _____ Local/Colorado? _____ Heirloom? _____

Other/Natural/Conventional? Y/N

Apple Variety _____
Organic? _____ Local/Colorado? _____ Heirloom? _____

Other/Natural/Conventional? Y/N

5. What other types or kinds of fresh apples or apple products would you like to buy?

6. What aren't you going to buy in the future?

7. Do you also sell any fresh apple products such as fresh apple cider or caramel apples?

If yes, what? _____

Where/ how do you purchase these? _____

Are they Colorado made? _____

8. What do you recommend that Colorado apple growers do to make it easier for you to purchase their produce?
9. Who else do you recommend that I talk to about apple purchasing either at your company or another company or organization?

Thank you for your time and information. It will really help U.S. shape the future of fresh apple production and sales from SW Colorado in the future.

ORCHARD OWNER SURVEY QUESTIONS

1. Your name and contact info
2. Describe your orchard (s)
 - How many acres are planted in apple trees? Of those, how many are currently productive?
 - Approx. how many apple trees total; or trees per acre?
 - Do you grow other types of fruit besides apple that are turned into juice or cider? If so, what types and volumes (bushels/gallons)? note: 42 pounds in a bushel and 2000 pounds in a ton

- General condition of orchard (Actively managed, yielding well; Generally managed; yielding moderately; Passively maintained and harvested; Little or no management currently)
- Age range of apple trees planted; and type of rootstock(s)
- Apple varieties planted, if known
- Orchard history (date established, historic orchard name and ownership if applicable)
- Tell U.S. more

3. Describe how apples from your orchard(s) are currently being used/marketed. (Check all that apply)

- U-pick sales/operation
- Direct farm sales, picked
- Wholesale direct to retailers
- Wholesale to cooperative/other suppliers
- Offsite retail outlet, owned by you
- Sell at farmers market
- Contract out crop (X agrees to buy your crop X price for X years)
- Use crop for home use ONLY
- Allow gleanings; others pick for free
- Give away to family, friends, charity
- Fresh market apples, grade A
- Juice grade, not grade A
- Juice
- Hard cider
- Value added products
- Tell U.S. what of the above (or other) best describes your orchard/operation. If you do not currently use or sell your apples tell U.S. why not; and last known use/market, if any.

4. How many bushels of apples and/or gallons of juice did you produce and sell in the last two seasons? Did any get turned into hard cider? note: 42 pounds in a bushel or 2000 pounds in a ton

- Apples produced 2015/ Bushels/Gallons
- Apples produced 2014/ Bushels/Gallons
- Apples sold 2015/ Bushels/Gallons
- Apples sold 2014/ Bushels/Gallons
- What volumes of apples/juice did you produce/sell in the past 2 years to be made into hard cider?
- Tell U.S. more

5. What average price do you charge per bushel of apples? If you sell apple juice, use the last blank to list your price per gallon. If there are price differences per categories of apples (say, juice grade vs grade A; or conventionally grown vs Certified Organic, please let U.S. know all average prices.) Note volume discounts, if any. Put N/A as needed.

- U-pick operation
- Wholesale, picked
- Retail, picked (note if direct farm sales or off site retail)
- Contract Price (note if picked or not; and what type of customer you contract with - cider or juice maker, grocery, other)
- List specific varieties of apples you plan to grow more of
- Price per gallon of apple juice

6. Do you make a profit selling apples or juice?

2015 Apples made profit
2015 Apples no profit
2015 Apples broke even
2015 Apples unsure
2015 Apples N/A

2014 Apples made profit
2014 Apples no profit
2014 Apples broke even
2014 Apples unsure
2014 Apples N/A

2015 Juice made profit
2015 Juice no profit
2015 Juice broke even
2015 Juice unsure
2015 Juice N/A

2014 Juice made profit
2014 Juice no profit
2014 Juice broke even
2014 Juice unsure
2014 Juice N/A
Tell U.S. more

7. What types of apples would you be interested in growing more of; and what price per bushel would you like to get?

Existing fresh market varieties

Existing fresh market varieties yes
Existing fresh market varieties no
Existing fresh market varieties maybe

Heirloom apples, multipurpose for cider, juice, fresh, and processing

Heirloom apples, multipurpose for cider, juice, fresh, and processing yes
Heirloom apples, multipurpose for cider, juice, fresh, and processing no
Heirloom apples, multipurpose for cider, juice, fresh, and processing maybe

Specialized cider specific varieties

Specialized cider specific varieties yes
Specialized cider specific varieties no
Specialized cider specific varieties maybe

Price per bushel you would like to get; and how many more acres/and or trees you may be interested in planting?

8. Operation details: if applicable to your operation

- price you pay your pickers per bushel to pick
- how do you transport crops to market; what does this cost, and how do you pass that cost along
- what types of infrastructure do you have (i.e.) cold storage, trucks/tractor, processing equipment, other

- Tell U.S. more

9. What growing and marketing methods do you practice? (mark all that apply) note: our definition of naturally grown is no synthetic pesticides/fertilizers/treatments pre or post harvest

- Certified Organic
- Naturally Grown, un-certified
- Locally Grown
- Heirloom/Heritage
- Certified Naturally Grown
- Conventionally Grown
- other (describe)
- Please give your definition of local, organic, heirloom, natural, and heritage/heirloom if you use the terms in your marketing.

10. What cultural/mgmt. practices DO YOU USE in your orchard/operation? Please, first mark yes or no, IF YOU DO any of the following; then mark one more box to let U.S. know how much support you could use from Montezuma Orchard Restoration Project (or others) to grow your orchard/operation. (so, please mark TWO boxes per row!)

feral orchard (no management)

feral orchard (no management) yes

feral orchard (no management) no

feral orchard (no management) no support needed

feral orchard (no management) some support needed

feral orchard (no management) a lot of support needed

pruning

pruning yes

pruning no

pruning no support needed

pruning some support needed

pruning a lot of support needed

grafting

grafting yes

grafting no

grafting no support needed

grafting some support needed

grafting a lot of support needed

fencing (deer, etc)

fencing (deer, etc) yes

fencing (deer, etc) no

fencing (deer, etc) no support needed

fencing (deer, etc) some support needed

fencing (deer, etc) a lot of support needed

water/irrigation

water/irrigation yes

water/irrigation no

water/irrigation no support needed

water/irrigation some support needed

water/irrigation a lot of support needed

pest control (coddling moth, etc)

pest control (coddling moth, etc) yes
pest control (coddling moth, etc) no
pest control (coddling moth, etc) no support needed
pest control (coddling moth, etc) some support needed
pest control (coddling moth, etc) a lot of support needed

disease control (fire blight, etc)

disease control (fire blight, etc) yes
disease control (fire blight, etc) no
disease control (fire blight, etc) no support needed
disease control (fire blight, etc) some support needed
disease control (fire blight, etc) a lot of support needed

planting new trees

planting new trees yes
planting new trees no
planting new trees no support needed
planting new trees some support needed
planting new trees a lot of support needed

harvesting/labor

harvesting/labor yes
harvesting/labor no
harvesting/labor no support needed
harvesting/labor some support needed
harvesting/labor a lot of support needed

processing

processing yes
processing no
processing no support needed
processing some support needed
processing a lot of support needed

direct marketing

direct marketing yes
direct marketing no
direct marketing no support needed
direct marketing some support needed
direct marketing a lot of support needed

wholesale marketing

wholesale marketing yes
wholesale marketing no
wholesale marketing no support needed
wholesale marketing some support needed
wholesale marketing a lot of support needed

distribution to commercial buyers

distribution to commercial buyers yes
distribution to commercial buyers no
distribution to commercial buyers no support needed
distribution to commercial buyers some support needed

distribution to commercial buyers a lot of support needed

liability coverage for U-pick

liability coverage for U-pick yes

liability coverage for U-pick no

liability coverage for U-pick no support needed

liability coverage for U-pick some support needed

liability coverage for U-pick a lot of support needed

beneficial/natural/organic orchard mgmt.

beneficial/natural/organic orchard mgmt. yes

beneficial/natural/organic orchard mgmt. no

beneficial/natural/organic orchard mgmt. no support needed

beneficial/natural/organic orchard mgmt. some support needed

beneficial/natural/organic orchard mgmt. a lot of support needed

frost protection (heat, fans, sprinkler, other)

frost protection (heat, fans, sprinkler, other) yes

frost protection (heat, fans, sprinkler, other) no

frost protection (heat, fans, sprinkler, other) no support needed

frost protection (heat, fans, sprinkler, other) some support needed

frost protection (heat, fans, sprinkler, other) a lot of support needed

Tell U.S. more about how Montezuma Orchard Restoration Project can help you grow our local fruit economy.

CIDER MAKER SURVEY QUESTIONS

1. Tell U.S. about your cider making operation:

- Are you a commercial or hobbyist cider maker?
- Your first and last name; Job title
- Name of your business/operation
- Mailing address; Phone number; Email
- What year did you start selling cider (commercial); How many years have you been in production (hobbyist); Or are you a start up?
- What is the size of your operation? For commercial cider makers define in terms of # of employees, total square feet of operation (note amount in retail space if any), acres in orchard, and revenue generated; for hobbyist cider makers define in terms of square feet of operation and acres in orchard.
- How do you see your future growth?
- How do you go about sourcing apples/juice? From your own orchard; Directly from producer; Delivered by supplier; You/your crew pick in area orchards; Put contracts on crops; Gleaning; Other. Discuss all that apply.
- Tell U.S. more

2. How many gallons of cider have you: (for hobbyist cider makers: fill in first two blanks of this question only)

- produced 2015
- produced 2014
- sold retail 2015
- sold retail 2014
- sold wholesale 2015
- sold wholesale 2014
- Tell U.S. more

3. How many bushels of apples did you PURCHASE to press as part of your operation? If you use any types of fruit besides apple fill third blank under this question. Also see last blank under this question if you used any apples you did not directly pay for. note: 42 pounds in a bushel and 2000 pounds in a ton

- 2015 Season
 - 2014 Season
 - Do you use any other types of fruit besides apple? If so, what types and how many bushels in the past 2 years?
 - In the past two seasons, how many bushels of apples were from a Colorado grower? Why or why not?
- How many bushels of apples did you "glean", trade for, or grow yourself in the last two seasons?

4. How many gallons of pressed apple juice (or gallon equivalent of concentrate) did you purchase? See third blank under this question if you purchase any other type of juice besides apple.

- 2015 Season
- 2014 Season
- Do you purchase other types of juice besides apple? If so, what kinds of juice; and how many gallons in the past two years?
- In the past two seasons, how many gallons of apple juice were from a Colorado source?
- Why or why not from Colorado source?

5. What average price do you pay per bushel of apples? If there are price differences per categories of apples (say, juice grade vs grade A, or conventional vs Certified Organic) please let U.S. know. Note volume discounts, if applicable.

- existing fresh market varieties "on the tree"; your CREW picks
- existing fresh market varieties "off the tree"; already picked/wholesale
- classic cider/heirloom varieties "on the tree"; your CREW picks
- classic cider/heirloom varieties "off the tree"; already picked/wholesale
- delivery cost, if applicable (specify average order size and method(s) of delivery)
- labor cost per bushel to pick, if applicable
- Do you put contracts on crops (agree to buy crop at X price for X years); why or why not?
- Do you manage (prune, harvest, etc) any orchards not owned by you in exchange for crop, or agreed price on crop?
- Do you own your own orchard(s); acres planted in apple trees? Approx. # of apple trees?
- Do you have a preference of rootstocks whether you are growing, picking, or producing?
- Tell U.S. more

6. What average price do you pay per gallon of pressed apple juice? If there are price differences per categories of apples (say, juice grade vs grade A, or conventional vs Certified Organic) please let U.S. know. Note volume discounts, if applicable.

- made from existing fresh market varieties
- made from classic cider/heirloom varieties
- delivery cost (specify average order size and method(s) of delivery)
- Tell U.S. more

7. What growing & marketing method is most important to you? rank in order of importance with #1 being the highest. (Our definition of naturally grown is no synthetic pesticides/fertilizers/treatments pre or post harvest)

- Certified Organic
- Local
- Conventional
- Certified Naturally Grown
- Naturally Grown, uncertified
- Heritage/Heirloom

8. What most influences your decision on where to buy apples and/or juice? rank in order of biggest influence with #1 being the biggest.

- apple variety
- availability to meet needs
- price
- standing relationships with growers/producers
- growing/marketing methods (includes local, etc)

9. Are you able to source enough apples locally; and are you able to get enough of the varieties you want?

- How do you define local?
- Are you generally able to source enough apples locally? Why or why not?
- If you use organic, natural, or heirloom/heritage in your marketing- please define what the words mean to you.
- Are there categories of apples you need more of? (Certified organic, natural, heirloom, other)
- DO YOU have a strong preference for specialized cider specific varieties (such as Harry Masters Jersey and Dabinett) vs heirloom/heritage varieties that are good for cider among other uses (such as Winter Banana and Stayman Winesap)?

- IF YES a STRONG PREFERENCE, what percentage more, if any, would you be willing to pay for a cider specific vs "good for cider" multipurpose, heritage variety?
- Please tell U.S. what specific varieties of apples you would like more of.

10. Tell U.S. more about how Colorado growers, producers, and the Montezuma Orchard Restoration Project can help meet your needs.