A project of the
Rural-Urban Connections Strategy
(RUCS)

SACRAMENTO REGIONAL AGRICULTURAL INFRASTRUCTURE PROJECT

Yuba County Case Study

Technical Report

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INTRODUCTION

Agriculture is a way of life in Yuba County and continues to be the cornerstone of the local economy. As stated in the County's 2030 General Plan, "agriculture represents the single most important economic activity and most prevalent land use in Yuba County."[1] Next Economy, the regional economic development strategy, also highlights the importance of agriculture to economic resiliency, vitality and opportunity, with agriculture and food as one of the strategy's core business clusters. Even when compared to other farming regions agriculture's contribution to the local economy stands out: over 11.5 percent of gross regional product in the Yuba Metropolitan Statistical Area[2] comes from the direct value of farm output alone (not including agriculture's substantial multiplier effect), a rate significantly higher than the rest of the Sacramento Valley. Indeed, the relative contribution of agriculture to gross regional product in the Yuba area is 50 percent higher than in the Fresno or Bakersfield MSAs, the state's largest agricultural regions by output.[3]

Despite agriculture's centrality to both the local economy and way of life, working landscapes in Yuba County are undergoing major changes as market forces, policy and environmental conditions shift. As a result, agricultural lands often face pressure from competing uses, in particular urban land development. Like other growing areas, Yuba County aims to balance agriculture and other land uses to accommodate long-term population growth, preserve quality of life and foster economic development.

This case study on current and possible future agriculture production in Yuba County provides information, data and economic modeling results that may help the County in assessing land use planning and economic development strategies. The study applies the tools developed as part of SACOG's Agricultural Infrastructure project to Yuba County. In addition to an updated crop modeling platform these tools include refined local consumption and production estimates, fiscal results of various land use scenarios, and financial feasibility tools to respond to market opportunity. While the County is the primary audience for the study, we anticipate these tools will have relevance to local growers and investors as well and transferability to other counties or regions.

The first section of the case study identifies existing conditions in Yuba County's agriculture cluster and how possible changes in market and natural resource conditions may affect cropping patterns and agricultural viability. The study also highlights specialty crop production for the local market and associated agriculture infrastructure as a burgeoning economic opportunity while also discussing critical infrastructure for the county's mainstay commodity crop production. The second section of the case study assesses the emergence of a local market scenario compared to other possible future cropping patterns reflecting changes in market demand and management objectives. This second section also showcases the economic and fiscal value of recent agricultural conservation as a result of Yuba County direction and policy. The modeling results provide the County data and comparison across numerous fiscal and economic metrics for land use and economic development strategies. Finally, the case study concludes with a section showcasing opportunities to leverage agriculture as a form of economic development in Yuba County.

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[1] Yuba County 2030 General Plan, Chapter 7 Natural Resources Element-16.

[2] The Yuba MSA includes both Yuba and Sutter counties.

[3] Bureau of Economic Analysis, Gross Domestic Product by Metropolitan Area. For year 2011 in current dollars. http://www.bea.gov/regional/index.htm

KEY FINDINGS

Market Scan

- The last two years have provided record levels of agricultural production in Yuba County, helping fuel economic recovery from the recent recession.
- Yuba County's water supply and soil quality can support a broad array of crops, granting growers flexibility to respond to new market signals. The county appears to be well positioned to capitalize on a range of market opportunities. Currently major export commodity production dominates the county's agriculture sector. Between 2008 and 2012 growers added more acres of walnuts than any other crop in Yuba County.
- Specialty crop production geared to local consumption represents a growing and largely untapped market opportunity in Yuba County and the greater Sacramento region, yet barriers inhibit growth in this market segment.
- Local agriculture infrastructure such as a food hub can help overcome these barriers and capitalize on the burgeoning local food system. The case study shows a conceptual food hub (aggregation, processing, storage, and distribution) in Yuba County is a financially feasible business endeavor, generating a positive annual cash flow of nearly $2 million and over 11 percent return on investment by the tenth year of operation. Likewise, the case study provides the specifications of an alternative hub model geared to process walnuts, Yuba County's top crop by value; the study shows this infrastructure serving existing production also appears to be economically viable in the county.

Scenario Analysis: Possible Agriculture Futures

- A regional-serving food hub would require around 530 acres of dedicated specialty crop production, depending on the facility's crop mix and number of processing lines; the county's existing crop acreage could easily support this total, even within currently fallow agricultural land. Growers supplying specialty crops to the single facility in aggregate would also earn estimated profits of $2.4 million. The hub could meet the full fruit and vegetable consumption of 13,165 people, or a smaller proportion of that consumption to a larger number of people (e.g., a quarter of annual fruit and vegetable consumption of 52,600 people).
- A variety of future cropping patterns illuminate the full economic potential of the county's agriculture sector as market, natural resource and social factors fluctuate. A shift to high value crops within the existing cropping pattern (e.g., orchard lands stay in orchards, but switch to highest value orchard crop) could increase the sector's gross farm gate value by two-thirds, from about $350 million based on the study's estimates to reach $591 million a year.
- Further economic objectives include maximizing return on investment (ROI) to farmers. A study scenario that tested crops that have the highest return shows a cropping pattern that produces a 43% ROI on average for farmers. This cropping pattern, however, has a more limited market and may not have the same economic impact on the entire agriculture industry since it supports less diversity in processing and other related businesses.

- In comparison, the scenario that tested extensive specialty crop production generated the highest value by far, as well as a high return on investment. Compared to the base, the specialty crop scenario quadruples overall value, increases average ROI and actually decreases agricultural water consumption by 78,000 acre-feet. A greater diversity of economic activity could occur in this scenario since processing and other related activities could generate a greater multiplier effect throughout the county. To reach these economic levels, however, the scenario results in significant additional labor demand.

- Environmental considerations are equally as important as economic ones when analyzing crop production. A scenario that tested crops with low water demand cuts water consumption by half, but also reduces agricultural value $73 million from today's base conditions. Likewise, agriculture labor hours in the county fall by nearly 50 percent in the low water scenario compared to the base. This analysis highlights the positive correlation between agricultural value, water consumption and labor demand (i.e., they tend to move in the same direction). Generally, higher agricultural values and returns require more water and labor supply.

- Finally, the project's analysis illuminates economic and fiscal results of agricultural land conservation in Yuba County. Recent Yuba County policy—per its 2030 General Plan—establishes long-term agriculture use in the valley floor. The case study estimates this agriculture conservation effort preserves approximately 10,000 agriculture acres from converting to urban use over the course of the plan, protecting $31 million in agricultural value—using today's cropping pattern—while saving an estimated $40 million in future Operations and Maintenance (O&M) annual expenditures.

Opportunities to Leverage Agriculture to Expand Economic Development in Yuba County

- **Growers**

    - Yuba County is well positioned to grow a diversity of crops for a range of markets. Expanding national and international demand for commodity agricultural products presents continued opportunity for growers in the county, given that commensurate water and labor supply is available.

    - The local market represents an emerging opportunity, yet the success of this system is predicated on a sufficient supply of local specialty crop production. Growers in Yuba County have noted that they need to see a strong market signal to decide to produce specialty crops for the local market.

    - The regional Agricultural Infrastructure project being conducted by SACOG provides detailed evidence of the burgeoning local market opportunity, including untapped local demand and price points for local specialty crops. The financial pro forma shows farmers in aggregate will be profitable growing at estimated prices offered by a prototypical food hub facility. This work helps document the competitiveness of specialty crop production.

- **Yuba County**

    - Yuba County's 2030 General Plan articulates the need to preserve the county's agricultural heritage and economic base. The plan re-designates almost 5,000 acres of farmland (including grazing) from future urban development to agriculture. Likewise, the plan calls for future

development to be focused within the Valley Growth Boundary, in turn conserving long-term agriculture use in the valley. If this policy holds, using the development trends of the past 20 years, the county could ultimately realize 10,000 acres of agricultural land conservation over the life of the general plan. Together, this direction helps confirm the importance of agriculture in the county and provides a clear signal to growers of the long-term stability of the sector.

- Farmers don't have to shoulder the entire risk of building up the local food system. Yuba County can continue to support initiatives such as the grower-institution matchmaking of the Yuba-Sutter Economic Development Corporation, as well as work to update policy to support local food production such as allowing more uses on agriculturally zoned parcels. The impediments report, which is part of the larger agriculture infrastructure study, highlights other incentives the County could employ to support specialty crop production and a food hub.

- **Investors**

  - The Agricultural Infrastructure project provides a suite of business tools that help inform investment decisions. In addition to that project's detailed pro forma and business plan, this case study reports the financial feasibility of an alternative conceptual food aggregation facility customized to Yuba County.

  - The RUCS modeling platform estimates grower revenue and costs by various future conditions such as drought, establishment, or changing market price. These data can also be of use to help steer investment to specialty crop production.

  - A prototypical food hub serving the Sacramento Valley requires a cash investment of $3.5 million and becomes cash positive by the end of the fourth year, rising to a nearly $2 million positive annual net cash flow by the tenth year of operation. Over the course of the pro forma, the facility gives a nearly 25 percent Internal Rate of Return.

YUBA COUNTY'S AGRICULTURE SECTOR

MARKET SCAN

> The region's $2 billion agriculture sector has emerged from the recession well positioned to capitalize on favorable market trends.

During the recent recession agriculture was one of the few bright spots in the regional economy and has helped to fuel economic recovery—in Yuba County the last two years have provided record levels of agricultural production, showcasing the strength of the local agricultural sector.[4] Yuba's neighboring counties in the Sacramento Valley also evince a similar trend of record agricultural value, illustrating the vitality of the agricultural cluster identified in Next Economy's regional prosperity plan. For example, Yolo County's gross value of agriculture production in 2012 was at an all-time high and an increase of 17.5 percent from the previous year.[5] In 2011 Sacramento County witnessed its highest ever level of crop production value, a level that was surpassed the following year.[6] Indeed, agriculture in the six county region produced nearly $2 billion of value from farmgate production alone in 2012, the highest level recorded.[7] This total does not include the additional contribution of processing, transport or other value-added activities tied to the agricultural sector, nor the increasing value of ecosystem services provided by working landscapes. In short, the region's agricultural sector has emerged from the recession well positioned to capitalize on growing demand and higher international market prices for commodities.

CURRENT CONDITIONS- COMMODITY PRODUCTION IN YUBA COUNTY

As with other parts of the region, export commodity production currently dominates Yuba County's agriculture industry. SACOG's Agriculture Infrastructure project estimates that 98 percent of the county's estimated $350 million agriculture output[8] is exported, including commodities destined for national and overseas markets.[9] To analyze this current cropping pattern SACOG created a field-level crop map for Yuba County with the most recent 2012 data from the Pesticide Use Report from the California Department of Pesticide Regulation supplemented by satellite imagery. This map is the "base case" scenario against which future scenarios are compared as described below. Of the 281,093 agriculture acres in the county, timber encompasses 72,519 and rangeland/pasture another 114,232, with 94,342 acres of crop production. The map on the following page shows the location of major crop production in the county: half of crop coverage in the county comes from rice, but specialty crops round out the next most prevalent, with walnuts, prunes, peaches, almonds and pears the next largest crops by acreage.

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[4] Yuba County Department of Agriculture, "2012 Crop Report."

[5] Yolo County Department of Agriculture and Weights & Measures, "Yolo County 2012 Agricultural Crop Report."

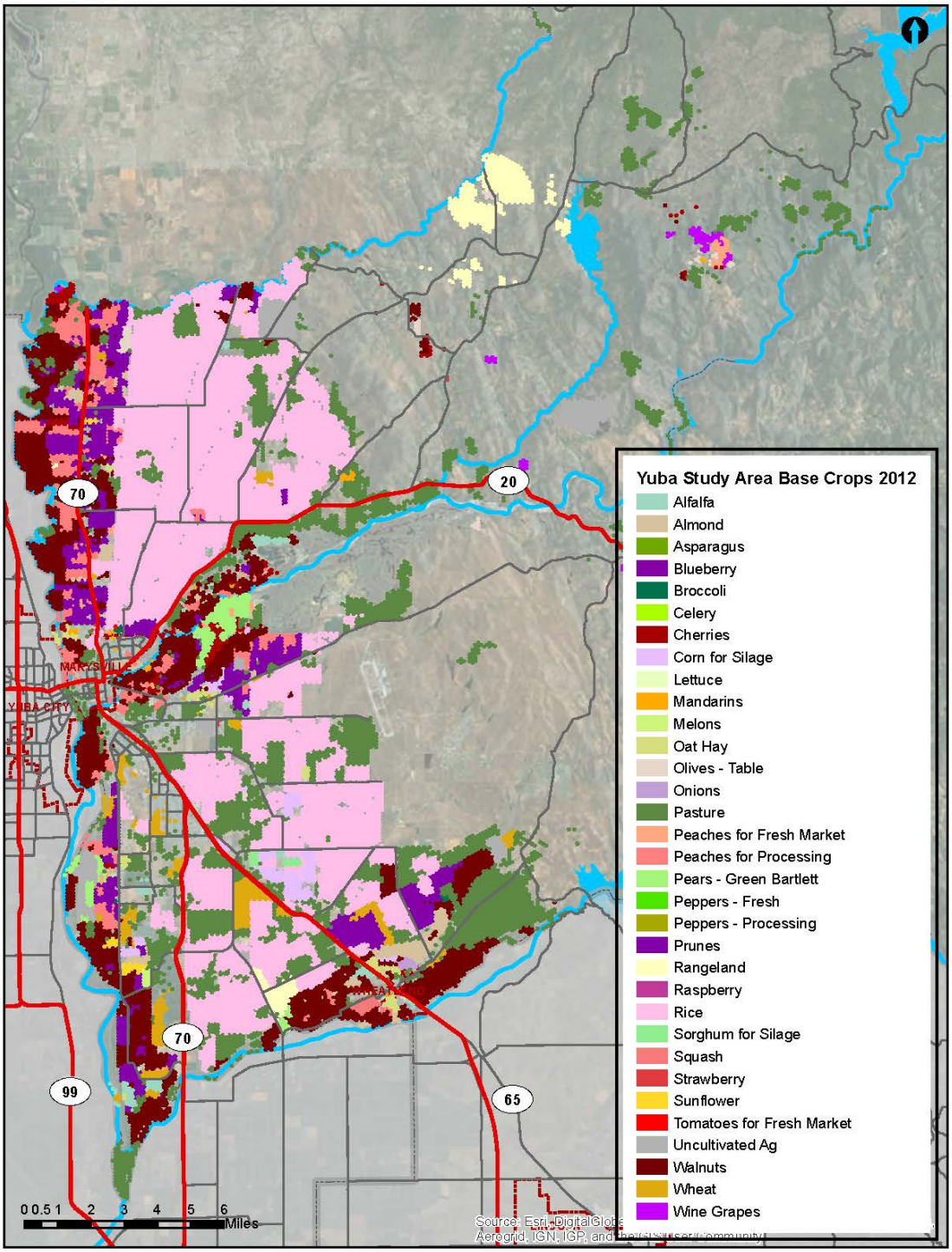
[6] Sacramento County Department of Agriculture, "Sacramento County 2012 Crop & Livestock Report."

[7] SACOG analysis of 2012 County Crop Reports.

[8] This level is based on SACOG's 2012 Crop Map and may differ from other published sources.

[9] SACOG Regional Agricultural Infrastructure Project, "Policy Brief: Food Hub Trends and Characteristics." 2014.

2012 Field-Level Yuba Crop Map



The tables below compare the 2012 top crops in the county by value to their inflation-adjusted 2008 levels, and note the harvested acreage change for these crops in the same period. The review found that largest change between periods came from walnut planting, as this crop has exhibited marked increases in market value recently.

2012 Top Yuba County Crops by Value compared to 2008 Inflation-Adjusted Levels

Crop	2008 Value (in $2012)*	2012 Value	Percent Change 2008 to 2012
Walnuts	$18.6 million	$59.5 million	220%
Rice	$87 million	$57 million	-34%
Prunes	$22.1 million	$25.7 million	16%
Peaches	$12.5 million	$16.5 million	32%
Kiwifruit	$3.5 million	$4.5 million	28%
Pasture	$4.32 million	$4.3 million	-0.5%
Almonds	$1.4 million	$2.8 million	100%
**2008 values adjusted into 2012 dollars to account for inflation. Adjustment based on Bureau of Labor Statistics Inflation Calculator*			
Totals exclude milk, cattle and timber. Source: Yuba County 2008 and 2012 Crop Report			

2012 Top Yuba County Crops by Acreage compared to 2008 Levels

Crop	2008 Harvested Acres	2012 Harvested Acres	Percent Change 2008 to 2012
Pasture	199,600	198,300	-1%
Rice	35,294	37,600	7%
Walnuts	9,006	11,560	28%
Prunes	8,650	7,367	-15%
Peaches	2,854	3,632	27%
Almonds	973	860	-12%
Kiwifruit	285	319	12%
Source: 2008 and 2012 Yuba County Crop Report			

NATURAL ASSESTS SUPPORTING COUNTY AGRICULTURE

Yuba County's abundant agricultural output benefits from physical attributes such as good soils, mild climate, water availability and transportation connectivity. A look at Yuba County's soil quality and water supply in particular—two of the most important physical factors determining agriculture production in California— provides a measure of what forms of production are feasible in the county. This review shows an environment capable of supporting varied crop production, giving local growers a wide range of production modes and crop mix, and flexibility to respond to changing market signals.

WATER

Relative to other portions of California, Yuba County is water-rich.[10] Data provided by the Yuba County Water Agency (YCWA) show the vast majority of crops in the county are irrigated, either through surface water, ground water, or a mixture of the two.[11] Reclamation District 10, one of the county's most productive agricultural areas, is one of the few major agricultural areas in the county still dependent primarily on groundwater. [12] Yet overall, Yuba County agriculture relies primarily on surface water, and YCWA delivers 310,000 acre-feet of water a year to eight local irrigation districts in the county covering 79,590 acres.[13] According to YCWA's most recent budget, the base rate for wholesale water transfer to member units is $1.93 per acre-foot, plus an additional $2 for supplemental transfer.[14] Each individual irrigation district charges its own rate to the end agricultural user, and while costs can vary significantly even between districts within the Sacramento Valley[15], these low wholesale rates can translate to low water costs for agriculture in Yuba County. For example, the current 2014 cost of delivered water in the Browns Valley Irrigation District—one of those wholesaled by YCWA—stands at $16.20 per acre-foot of water for the approximately 1,300 agricultural users in the district.[16] In comparison, a snapshot of recent data from the University of California show much higher water costs for specialty crop production in other major agriculture areas of the state: $170 per acre-foot for production in Ventura County, $260 in the central coast, and $129 in the

[10] Yuba Local Agency Formation Commission, "Municipal Service Review Findings." July 24, 2008.

[11] State of California Department of Water Resources, "Metadata for the Yuba County Land Use Survey Data." Division of Planning and Local Assistance, May 20, 2013.

[12] SACOG analysis of DWR data and the 2012 crop map.

[13] Yuba County Water Agency website; Yuba Local Agency Formation Commission, "Municipal Service Review Findings." July 24, 2008 and Yuba County Water Agency, "Agricultural Water Management Plan." December 2012.

[14] Yuba County Water Agency, "Agricultural Water Management Plan." December 2012.

[15] Christopher A. Greet et al., "2012 Sample Costs to Produce Rice: Sacramento Valley." University of California Cooperative Extension, 2012, p4.

[16] Browns Valley Irrigation District 2014 Budget. Approved February 27, 2014; GEI Consulting, "Yuba County Integrated Regional Water Management Plan." Submitted to Yuba County IRWMP Water Management Group.

southern San Joaquin Valley.[17] In interviews conducted for the project, growers noted that the water prices in the state have spiked relative to the above 2011 costs, especially given the recent drought.

An abundant water supply relative to other agriculture areas also provides stability, which is especially beneficial for high-value yet water-intensive crops. The recently constructed Yuba-Wheatland Canal expands surface water irrigation to a segment of the county previously reliant on groundwater, mitigating groundwater overdraft in the southern portion of the county and helping preserve groundwater aquifers for dry years. The canal improves the reliability of water supply, carrying up to 205 cubic feet per second of surface water to service local growers.[18] On a county-wide level, the recently established Lower Yuba River Accord provides consensus and stability for water diversions moving forward. This accord balances uses on the river, increasing higher minimum instream flows on the lower Yuba River for fish and wildlife purposes while providing steady water supply for irrigation and power generation. Importantly, the accord overcame several decades of litigation to reach consensus on flows on the lower Yuba River. [19]

SOIL

In addition to a relatively enviable water supply, agriculture in Yuba County also benefits from good soil quality that supports major crop production. The project team obtained detailed county soil quality data and information from USDA's Natural Resources Conservation Service. This source covers over 95 percent of the United States and represents the single authoritative source of soil survey information. According to this data source, almost all of the valley floor consists of loam soil with no or slight slopes. The best soils for widespread crop production –based on USDA's Official Soil Definition Series soil quality definitions—come from the multiple river loams in the county. In addition, the project's soil review found that soil on the valley floor farther away from the rivers can also support a wide variety of crop production.[20] For example, with over 57,500 acres in agriculture production (and another 19,000 developed by urban use), San Joaquin loam soil is the most widespread soil in the county. Currently about half of this soil type in the county is in rice production, followed by pastureland, prunes, wheat, walnuts, peaches, almonds and corn, with smaller acreage in olive, citrus, pears, mixed vegetables, strawberries, pecans, persimmons, pumpkins, alfalfa and clover production.[21] This diversity of crop type illustrates growers' ability to produce a wide variety of crops—including specialty crops—on the county's most widespread soil.

[17] Etaferahu Takele et al., "Costs and Profitability Analysis for Bell Pepper Production in the Oxnard Plain, Ventura County, 2012-12." University of California Agriculture and Natural Resources. Mark P. Bolda et al., "Sample Costs to Produce Second Year Strawberries: Central Coast Region." University of California Cooperative Extension, 2011. Neil V. O'Connell et al., "2011 Sample Costs to Establish a Citrus Orchard and Produce Mandarins: San Joaquin Valley- South." University of California Cooperative Extension.

[18] Yuba County Water Agency, "Yuba-Wheatland Canal Project Summary."

[19] Water Education Foundation, "The Lower Yuba River Accord: From Controversy to Consensus." 2009.

[20] The three most widespread soils in the valley floor are San Joaquin, Conejo and Kimball loans. Other prominent soils include Columbia, Hollenbeck, Holillipah, Kilaga and Shanghai loams. See USDA's Official Soil Definition Series for a full classification of these and every soil in the county. https://soilseries.sc.egov.usda.gov/

[21] 2012 SACOG crop map.

Overall, SACOG's recently completed crop map combined with grower interviews show there are over 60 different crops grown at various scales in Yuba County.[22]

Local grower and agriculture stakeholder sentiment captured as part of the case study substantiate how soil capacity is not viewed as the major constraint in Yuba County's valley floor. In interviews, local growers related their capacity to grow almost any crop they wished due to favorable climate, soil and water supply. [23] And while it is harder and more expensive to grow specialty crops on heavier soils, growers could make production work if they saw the end reward of a high market price.[24] In short, growers' production choices on the valley floor have not been dictated primarily by physical constraints but instead by market signals.

In the foothills, soil type and slopes become more of a limiting factor for commodity production, but can still support smaller-scale niche agriculture. The map below shows the ten largest soil types by acreage in the county. Generally, the soils in the foothills starting with the Auburn complex do not support full-fledged agriculture. The work of the North Yuba Grown group however illustrates how smaller-scale agriculture can be successfully conducted throughout the county. The cluster of specialty crop producers near Oregon House, for example, evidence the ability to grow in a variety of conditions: USDA's soil data show this production to occur on gravelly soil with slopes between eight and 15 percent.[25] Farmers who are part of the North Yuba Grown group listed crops in production, including heirloom tomatoes, lettuce, kale, arugula, lavender, mixed vegetables and olives.[26]

In short, the study's review of natural assets supporting agriculture in Yuba County found a physical environment capable of supporting a wide range of crop production. These inherent assets provide growers flexibility to respond to changing demand, a key advantage in today's global marketplace. Documenting Yuba County's physical attributes also stresses the importance of maintaining and perhaps expanding the critical infrastructure that helps tap into these fundamental assets. The next section on the report delves into the market case for one such form of agriculture infrastructure, a food hub that captures more of the food system value chain within Yuba County.

[22] SACOG Crop Map and local grower interviews. While many crops are grown on a smaller scale, overall the county is dominated by a few large crops. The three largest by coverage—rice, walnuts, and prunes—account for 80 percent of all crop acres in the county (excluding pasture and timber acres).

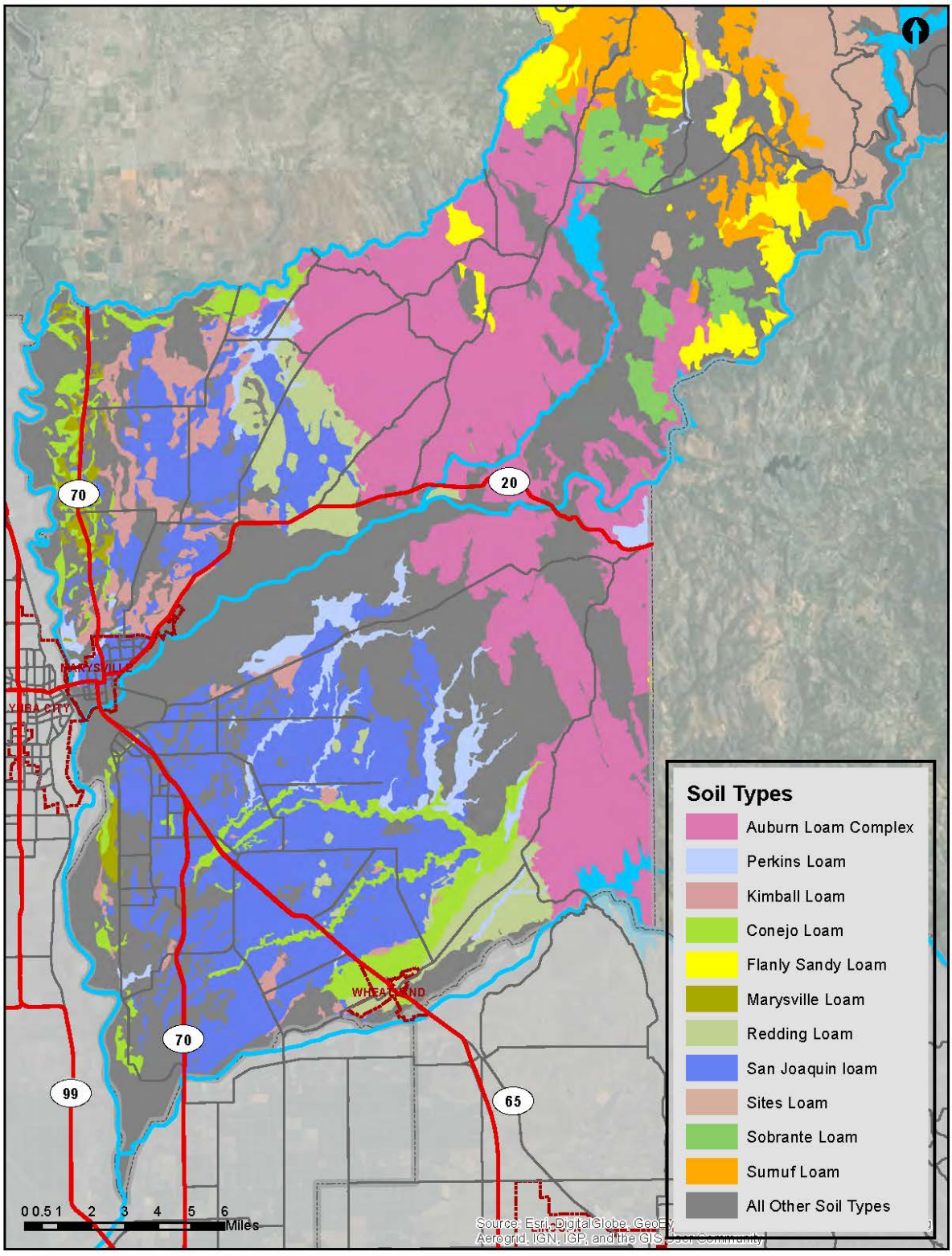
[23] SACOG Regional Agricultural Infrastructure Project, "Interview List." Prepared by Applied Development Economics, Inc. in partnership with Foodpro International, Inc., The Hatamiya Group and DH Consulting, 2014.

[24] SACOG interview with Mark Lundy, Area Agronomy Advisor, University of California Cooperative Extension: Colusa-Sutter-Yuba Counties, July 15, 2014.

[25] USDA Natural Resources Conservation Service and 2012 SACOG crop map.

[26] SACOG interview with North Yuba Grown, March 5, 2014.

Largest Soil Categories in Yuba County



Source: USDA Natural Resources Conservation Service

AGRICULTURAL INFRASTRUCTURE: FOOD HUB FOR THE LOCAL MARKET

Large-scale commodity production is the dominant form of agriculture in Yuba County. While commodity production for external markets will likely continue to serve as a mainstay of the county's agricultural cluster, growers increasingly can also look to capitalize on the burgeoning local market as a new economic market outlet and means to diversify, and do so on a relatively small amount of land. This section first provides a market analysis around local demand, as it is not as well understood as national and international commodity markets, and then documents a potential food hub facility that can help address a critical infrastructure gap.

EVIDENCING LOCAL DEMAND

Currently the greater Sacramento region consumes over 1.8 million tons of food each year, with nearly 60,000 tons of this in Yuba County. Yet despite being one of the nation's leading agricultural areas, SACOG estimates that only about two percent of food consumed in the region is grown in the region, with the remaining 98 percent imported from elsewhere. As farm-to-fork and similar trends continue to spread, local agriculture stakeholders have stressed the substantial market potential of meeting more local food demand through local production and distribution. The vast majority of this demand is for fresh fruit and vegetable specialty crops.

Several recent studies document the market demand for local product. The National Restaurant Association's 2014 Culinary Forecast identified local sourcing as the top trend in the restaurant industry this year.[27] Yet this development is not limited just to restaurants. A 2012 National Grocers Association survey for example found that over 85 percent of U.S. consumers partly base their grocery store selection on whether it carries local products while a 2014 report found that 70 percent of survey respondents will pay a premium for locally grown produce and prefer retailers that carry more locally produced items.[28] Moreover, according to a Produce Marketing Association survey by the Hartman Group in 2011, U.S. consumers increased their tendency to buy locally grown fresh fruits and vegetables by 30 percent over the previous year.[29] SACOG's interviews as part of the Agricultural Infrastructure project with over 100 growers, distributors and stakeholders in the region echo these findings: local sourcing is a major market trend in the region.

[27] Farm Futures, "Local Food Projected to be Hot Trend in 2014," Dec 9, 2013, http://farmfutures.com/story-local-food-projected-hot-trend-2014-0-105820

[28] A.T. Kearney, "2014 Ripe for Grocers: The Local Food Movement Survey." Riemendschneider, Pamela, "Survey: Consumers want local, willing to pay premium," *The Packers*, May 6, 2014.

[29] PMA, "Consumer Survey Reveal Growing Importance of Fresh, Local and Safe Produce," January 2011, http://www.pma.com/resources/research-center/consumer-trends/consumer-survey-article

Yuba and Sacramento Region Annual Food Consumption

Food Group	Yuba County Food Consumption (tons per year)	SACOG Regional Food Consumption (tons per year)
Fruits	11,888	384,828
Vegetables	20,642	668,204
Meat	6,972	225,678
Nuts	184	5,959
Eggs	1,488	48,178
Grains	3,549	114,877
Fats/Oils	1,030	33,357
Dairy	9,633	311,833
Sugars	3,150	101,978
Total Consumption	**58,536**	**1,894,892**

For primary food weight. Source: SACOG Food Consumption Calculator, 2014

While definitions vary, market channels for Yuba's 'local' specialty crop production extend at least to the contiguous six counties of the region and can even reach the population centers of the Bay Area.

As the above table illustrates, fruits and vegetable specialty crops account for the majority of total food consumption by primary weight each year in the region. For these specialty crops in particular the region experiences a marked supply/demand imbalance between local production and consumption. The table below estimates the number of acres in Yuba County devoted to several specific specialty crops compared to how many acres would be needed to meet current demand in both Yuba County and the entire six-county region. This analysis shows opportunities to expand local specialty crops to meet demand in the county, but tellingly, also areas to tap into greater regional demand. Local growers and stakeholders interviewed as part of this case study often equated the local market to Yuba and Sutter Counties, but not the other counties of the Sacramento region. This local market conception excludes the nearby consumption centers and thus major market opportunities. SACOG's Agricultural Infrastructure project found that because of its great diversity of crops, favorable climate and other assets, the market shed for a producer to be deemed 'local' in Yuba County is at least 100 miles, and can even extend to neighboring regions such as the Bay Area. As such, the final column in the below table illustrates the significant market opportunity in growing specialty crop for the greater Sacramento region, and the need to increase market channels to tap into this existing demand.

Examples of Local Market Supply/Demand Specialty Crop Imbalance

Crop	Acres in production in Yuba County	Acres needed to match Yuba County consumption	Acres needed to match regional consumption
Apples	19	251	8,129
Asparagus	0	53	1,721
Bell Peppers	1	10	323
Blueberries	2	18	570
Broccoli	3	46	1,497
Carrots	0	29	940
Kale	1	9	307
Lettuce	7	85	2,755
Lima Bean	0	29	940
Onions	4	32	1,028
Spinach	0	16	522
Squash	3	22	729
Sweet potatoes/Yams	1	24	770

Source: 2012 Agriculture Census, USDA NASS 8-year average yields, SACOG food calculator and County Agriculture Commissioner

BARRIERS GROWING FOR THE LOCAL MARKET

Despite the potential referenced above, farmers growing specialty crops for the local market face serious challenges compared to conventional commodity production. A related report included in SACOG's Agriculture Infrastructure study, "Impediments to Supplying Locally Grown Specialty Crops," discusses these barriers at length. The below section summarizes four of those challenges—**policy**, **market access, operating infrastructure** and **farmer reluctance**—most pertinent to Yuba County.

Policy

The rapid expansion in local market demand—epitomized by the region's branding as the nation's Farm-to-Fork capital—represents a relatively recent change that raises new grower needs and support. Stakeholders in Yuba County have made significant strides responding to this new market development. The Yuba-Sutter Economic Development Corporation for example is assisting the North Yuba Grown group with a local Agriculture Tourism project while the Yuba-Sutter Farm Bureau convenes young farmers with an eye towards niche markets.[30]

Even with these steps, current and potential growers in Yuba County expressed that more could be done from a policy standpoint to foster a vibrant local market. In particular, interviewees pointed to current zoning as a possible barrier that could inhibit small local operations from expansion. Examples include growers wishing to convert a barn on the property into a farm store, but finding sales on rural agriculture parcels prohibited, or the desire to approve farm stays so agri-tourists coming to the county would have places to stay. As the County updates its agricultural zoning, changes supporting flexible mixed use on rural agriculture parcels to allow light processing and agri-tourism uses can help fully capitalize on the growing market opportunity. An estimated 200,000 people a year come to Yuba County for recreation activities; supportive zoning can help channel this recurring demand to the county's nascent local food system. Butte County's agricultural overlay land use and zoning designation allows visitor-serving commercial uses, farm stays, education and specialty produce retail in agricultural areas and serves as one possible model of how a nearby county has supported its local food system.[31]

Zoning changes supporting flexible mixed use on rural agriculture parcels that allow light processing and agri-tourism uses can help fully capitalize on Yuba County's growing market opportunity.

Market Access

Unlike in contract agriculture, specialty crop growers focused on local markets are seldom provided the security of a guaranteed outlet for their product. While growers expressed concern that some common market outlets—chiefly farmers' markets and Community Supported Agriculture (CSAs)—may already be saturated at the regional level, these same channels may be underdeveloped specifically in Yuba County. Furthermore, growers have found it difficult to navigate procurement policies at local institutions.

Operating Infrastructure and Costs

Large-scale commodity production still dominates Yuba County's agriculture sector and the region's current agriculture infrastructure reflects this export orientation. Through interviews, growers identified the shortage of

[30] SACOG interview with Brenda Stranix, Yuba-Sutter Economic Development Corporation, and SACOG interview with Megan Foster, Yuba-Sutter Farm Bureau and Yuba County Supervisor Roger Abe, February 21, 2014.

[31] Butte County General Plan, Element 7- Agriculture.

agriculture and food infrastructure tailored to regional aggregation, handling, processing and distribution as a primary constraint in meeting demand for more locally grown specialty crop. In particular, growers expressed the lack of mid-scale produce handling and processing capacity as a major constraint— growers will not produce for the local market if they do not see a viable supply chain infrastructure that enables their product to efficiently reach consumers. The subsequent section of the study focuses on the financial feasibility and structure of a food hub to provide needed local agriculture infrastructure.

In addition to off-farm infrastructure challenges, growers shifting production to new crops incur substantial costs on the farm. Costs of crop conversion include capital establishment expenses as well as the time needed to get the new crop to mature yield levels. These costs do not apply solely to new farmers; even established growers need to make capital investments when switching crops.

The recent increase in walnut production provides valuable insight into the challenges expanding specialty crops in the county. SACOG conducted an in-depth exploration of the economics of walnut production, which is included in this case study as a technical appendix, *Exploring Long-Term Viability of Walnut Growers*. In summary, the review highlighted the implications of converting to crops with high establishment costs and long establishment periods, such as walnuts but also other orchard or vine crops like peaches, kiwis and grapes.

For example, a typical grower must spend around $7,000 an acre the first year converting to a new walnut crop, to prepare the land and purchase and plant tree starts. Yearly costs decrease after the first year but the orchard still must be tended with irrigation, fertilizer and pesticide. The new walnut starts do not produce any harvest until the fourth year, and don't reach full maturity until eight years after planting. In consequence, the grower incurs significant upfront costs with a delayed return. Indeed, the analysis suggests that the average grower does not make back his initial investment in walnut production until the 11th year of operation. And if walnut prices decrease by a third, the analysis indicates the grower would still not have repaid establishment costs by year 25, when he would likely need to re-establish the crop. Overall, the analysis shows that a shift to these types of specialty crops can be financially rewarding in the long-run, but also pose risk to the grower due to high capital investment, long period to maturity and the potential for a decrease in market price. Importantly, given the uptake in walnut planting in the county, the review also shows how growers are willing to take such a risk when they see a long-term market reward. It is worth noting that even specialty crops that produce immediately—such as leafy greens, brassicas, etc.—still have significant establishment costs in terms of the capital investment needed to start or change a farm operation.

Grower Reluctance

Because of the challenges of growing local and the strength of the existing commodity system, many farmers expressed reluctance about increasing the supply of product geared to the local market. Commodity production provides stability through guaranteed contracts and over time farmers have developed strategies and knowhow to deal with this regulatory system. Given this, they have capitalized their operations to grow commodities and would have to make expensive purchases to retool for other crops. With international commodity prices high, growers need to see a strong market case for increasing local production. The various components of the regional Agricultural Infrastructure Project provide metrics and data to help growers gauge local market opportunities. Furthermore, a food hub will rely on a guaranteed steady supply of the products and volumes needed to successfully operate the facility, thus providing one of farmers' biggest incentives, a contract for product.

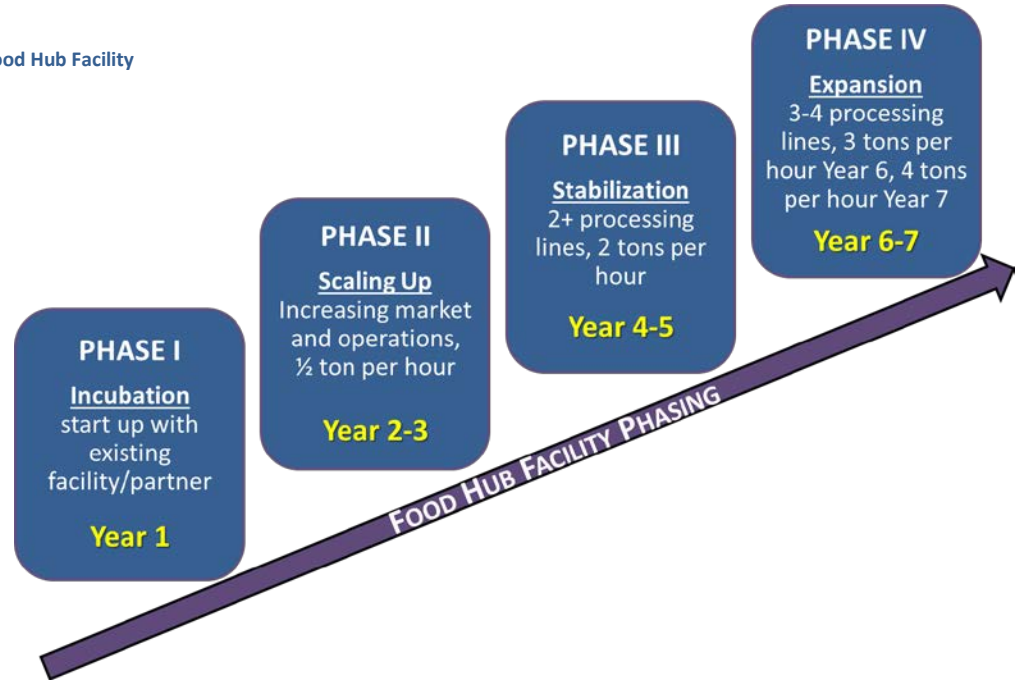
FOOD HUB: CAPITALIZING ON LOCAL MARKET OPPORTUNITY

Over the past several years, SACOG's RUCS program has engaged local growers and agricultural stakeholders to better understand the extent of the local market opportunity. This process identified the need for expanded agricultural infrastructure for the regional food system as a key way to overcome the above barriers to producing for the local market. In particular, a food hub to aggregate, pack, process, market and distribute local specialty crops would provide a vital piece of infrastructure to help actualize the local market opportunity, especially by offering contracts for locally-grown specialty crops.

SACOG's Agricultural Infrastructure project delves into the market case for developing a food hub in the Sacramento Valley. The project provides an overview of market drivers and trends pointing towards more local consumption, as well as how a food hub facility can help complement existing agricultural infrastructure by filling a key distribution gap. Furthermore, the project describes a detailed conceptual design, cost estimate, and operational and financial plan for the facility with value-adding processing capacity.

Financial analysis conducted by the project team shows this food hub facility and model to be a feasible business operation in the region. The project's pro forma analysis provides costs and revenue of the operation through time. Initially, the facility requires a cash investment of $3.5 million and runs at a financial loss in the first years of operation as the facility establishes market share (graphic below), highlighting the risk involved in the startup. The project's phasing not only helps to spread risk, but also to build market relationships and supplier networks slowly through time. Once the food hub expands from an incubation stage to reach adequate scale, it becomes cash positive by the end of the fourth year, rising to a nearly $2 million positive annual net cash flow by the tenth year of operation. Over the course of the pro forma, the facility gives a nearly 25 percent Internal Rate of Return (IRR).[32]

Phasing of Food Hub Facility



[32] Applied Development Economics, Foodpro Inc., The Hatamiya Group and DH Consulting, "Comprehensive Food Hub Pro Forma," July 25, 2014 edition.

The case study's review of Yuba County's agriculture sector highlights numerous assets that would support and enhance the competiveness of a potential local food hub. First, agriculture in the county benefits from an enviable water supply and productive soils needed for the high value but water intensive specialty crops that supply the facility. As drought conditions continue to extend throughout the state, the county's relative edge in water cost and stability in particular will likely serve as a further competitive advantage for the type of agricultural production serving a local food hub facility. Recent direction by the County and other stakeholders—such as convening young farmers interested in niche markets, updating agricultural zoning codes, and advancing policy preserving long-term agriculture—can also help showcase to potential agriculture infrastructure investors a stable and supportive environment for long-term capital appreciation.

Finally, farmers in Yuba County can likely respond more smoothly to the food hub's proposed business model. Based on an extensive review of existing capacity in the region, the overall Agricultural Infrastructure project recommends the food hub's initial focus to create a supply channel for large-scale buyers primarily, including existing fresh produce distributors and wholesalers, and institutions such as schools and hospitals. This model both fills a major gap in the existing distribution system and performs well on financial feasibility testing, but also operates on wholesale prices. As the Agricultural Infrastructure project team notes, this price point thus relies on the participation of large growers to provide the product volumes necessary to achieve economies of scale. Overall this business model fits well in Yuba County's agriculture sector, where large-scale growers can dedicate a portion of their existing production to a food hub at cost-competitive pricing and where smaller growers already targeting local markets can have another market channel. Growers that can efficiently capitalize to new crops can also use the hub as a diversified market outlet. And as the food hub reaches scale it also includes service to help smaller growers increase their capacity to grow for the regional market. As such, the food hub business model offers opportunities for large scale exporters to diversify production and tap into a new market, while also serving as a possible outlet for efforts such as the North Yuba Grown group.

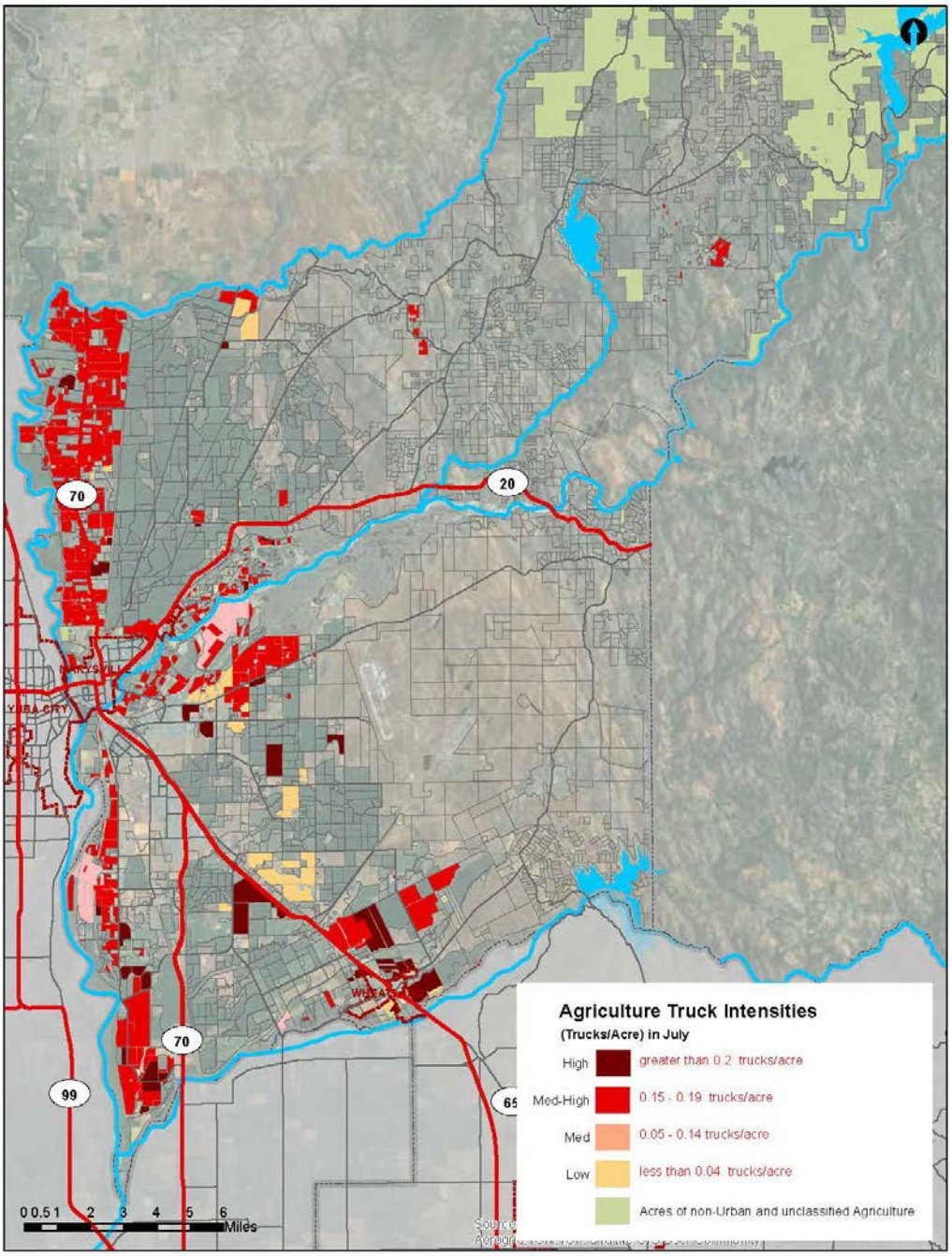
INFRASTRUCTURE SUPPORITNG COMMODITY AGRICULTURE

In addition to the above food hub model targeting the local market, the project team also delved into agricultural infrastructure serving the county's mainstay commodity production. First, the team customized a possible food hub model in the county that both supplies fresh specialty crops to the local market but also employs a glazing processing line that adds value to walnuts, the county's top commodity crop by value. This processing function could capture more of the total food system value chain within Yuba County, resulting in additional local economic output and jobs. Overall, this alternative food hub model in Yuba County appears to be financially feasible, as described in this case study's technical appendix *Yuba County Alternative Food Hub Model*.

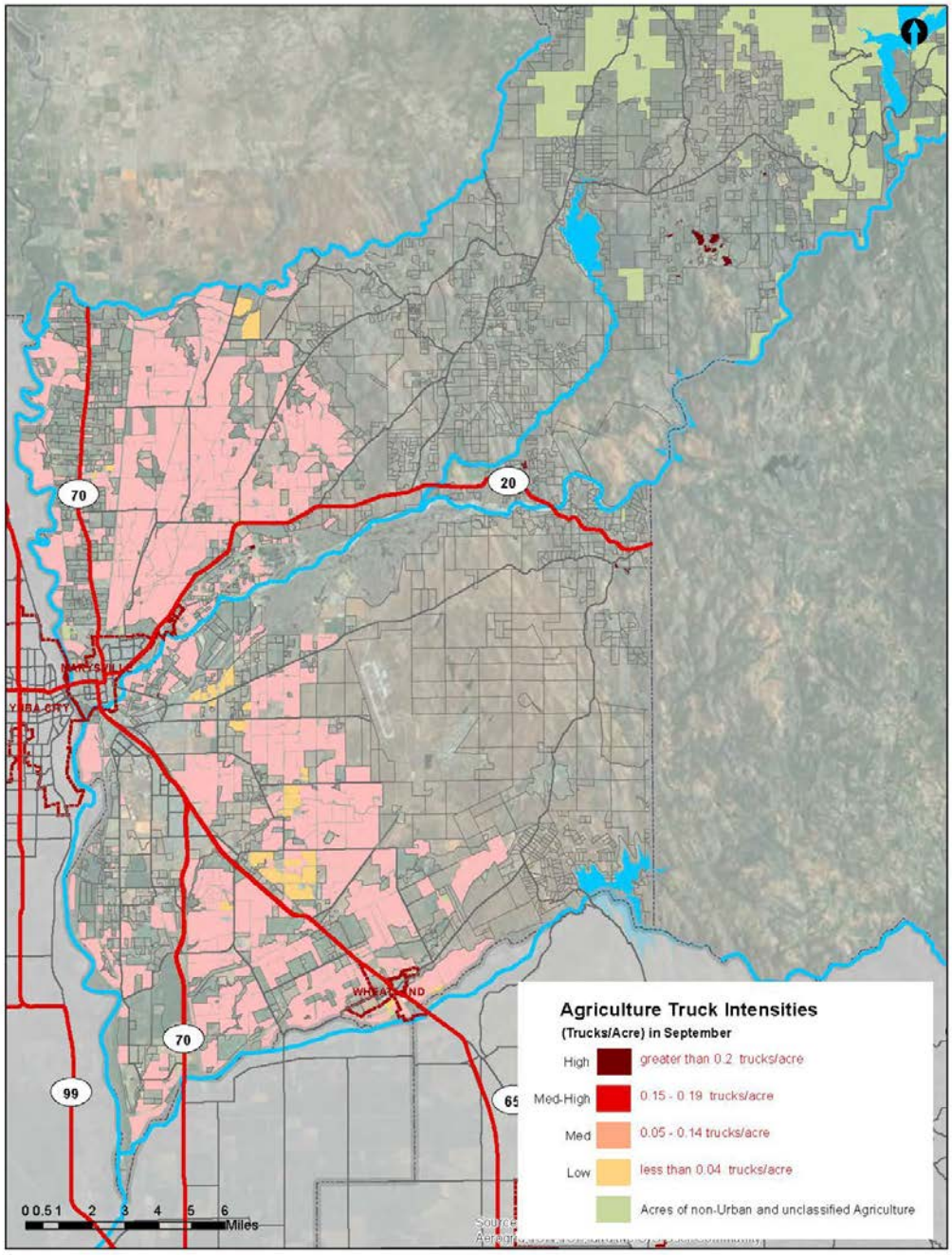
The project's infrastructure review also drew on recent RUCS work highlighting the importance of rural transportation infrastructure maintenance and operating efficiencies. The nearly $2 billion worth of direct farmgate value produced in the region travels over rural roads to packing, shipping or consumption points. Yet without an adequate rural transportation system this phenomenal agriculture output can't reach consumption markets. One relevant and important example is rice harvested in Yuba County must be trucked to the Port of West Sacramento to be shipped to markets abroad.

Maintaining the transportation system can be a major burden in rural areas which account for 48 percent of the road miles in the region, but only 13 percent of the population. In many instances, rural roads near or between residential neighborhoods and employment centers become ad hoc commuter routes creating a need for more intense maintenance in areas where resources are already limited. Heavy truck traffic can also take a serious toll on the surface conditions of rural roads that serve as connectors between fields, processing centers and markets.

Typical Agriculture Truck Intensities in July



Typical Agriculture Truck Intensities in September



The above maps show the average number of truck trips generated by acres of agriculture production at two different times in the year as different crops are harvested and sent to market. Maintaining the capacity of rural farm to market infrastructure is critical to the success of the agriculture sector, yet rural areas can face challenges balancing commuter, goods movement and heavy truck traffic on nearly half of the region's total lane miles.

AGRICULTURE SCENARIOS

The first section of this report described the current state of agriculture in Yuba County, including the role of commodity production and the emerging local market potential. Yet as market forces, policy direction and environmental conditions continue to shift, so too will agriculture in the county to remain a strong element of the county's economy. Using a recently updated RUCS crop modeling platform and fiscal impacts model, this section provides economic and fiscal metrics of various future cropping patterns that reflect changes in market demand, cost of production and management objectives for working lands.

The range of agricultural scenarios include cropping patterns that serve a potential food hub, as well as patterns that reflect other market dynamics that may impact cropping patterns. The scenarios are compared on metrics such as revenue, return on investment, water consumption and labor use. The scenarios evaluate potential changes in comparison to existing cropping patterns.

Each of these agriculture scenarios is also evaluated in the context of urbanization. Changing land use in the county will influence not only the acres available to agricultural production—and thus the economic output of the county's agriculture sector—but also the County's fiscal costs of servicing various forms of development. The fiscal component of the scenario analysis compares additional infrastructure cost and operations and maintenance to current County finances, also set to a base year of 2012. The section first looks at the various agriculture scenarios and then turns to effects of urbanization and land use decisions.

METHODOLOGY

Agricultural scenarios were built for comparison with today's cropping pattern—the base case—in order to illustrate the range of economic and natural resource impacts. The scenarios can also be compared to each other to determine favorable (or not so favorable) futures for the county's agriculture industry. Constructing these scenarios relied on two primary data components: SACOG's field-level crop map and costs and return data for each crop.

The base case was constructed with SACOG's GIS-based crop map updated with 2012 Pesticide Use Report data from the California Department of Pesticide Regulation. California's pesticide reporting program is internationally recognized as one of the most comprehensive, thereby creating an incredibly detailed database of cropping patterns. These parcel-level crop data are underpinned with cost and return data collected and published by the University of California Cooperative Extension (UCCE), which provide costs assumed by growers to establish and produce a given crop as well as the returns gained from their sales. These cost and return data, updated to the most recent figures for this case study, are broken down to line item quantities and prices, allowing detailed analysis of factors such as water consumption and labor demand. When aggregated to the county level, the combination of these crop and economic data provides a powerful and comprehensive snapshot of the agricultural industry's contribution to Yuba County's economy and resource use.

The scenario analysis tool uses per-acre quantity and cost data for production inputs including: water, labor, chemical, fuel, irrigation, etc., as well as operating costs, overhead costs, and establishment costs. These data are multiplied by acreage of a given crop in a scenario and then summed to create county-level scenario indicators of demand for production inputs. Yield and price data are used to determine revenue from production and when compared to cost, provide net revenue and return on investment. For example, if the 4,268 of current peach

production increases to 7,000 acres, the model provides a comparison of inputs, outputs and values of today's peach production to that of the future expanded production

Several "dials" were installed in the analysis tool. These dials adjust factors such as establishment costs (modeled in phases including: newly established, producing but still repaying establishment loans, and fully established with loans repaid), land costs, water costs, labor costs, and production yield. These dials allow for analyses to show the variance in costs and returns when, for example, there is outright land ownership versus ongoing land costs, orchards or vineyards are maturity versus first established, there is readily available water versus supply shortages, etc.

SCENARIOS

Scenarios allow comparison between specialty crop production and a range of potential competing uses. Scenario comparison is a powerful tool to test thresholds or "boundary conditions"—economically, environmentally, socially, et cetera. Each scenario estimates the county-wide effects of different crop mixes. Of course, there are many factors affecting cropping patterns that were not considered in this exercise (e.g., market saturation or lack thereof affecting demand and prices). The study only tests high and low extremes for various factors, but offers a starting point from which more refined scenarios can be crafted to test conditions based on assumptions or forecasts of future market conditions. Furthermore, the work reveals general cause and effect conditions that may be helpful in building strategies that capitalize on potential agricultural economic development. The information produced by these scenarios is intended to help decision makers—growers, land owners, policy makers—understand opportunities and challenges from changes in market conditions, cropping patterns and land use decisions. The scenarios described below are not prescriptive—they do not tell what should be grown—and are just a small subset of possible scenarios that could be analyzed. Rather, these scenarios use data to define a spectrum of effects that could be expected from a variety of crop mixes.

Base Case: The base case represents the current cropping patterns as described above and is the baseline against which the specialty crop and various scenarios are compared using indicators noted earlier. Crops currently being grown are represented in the table below, grouped by crop category.

Crops by Crop Category

Forage	Fruits	Fruit Trees	Grains	Orchards	Vegetables	Other
Alfalfa	Blueberries	Cherries	Rice	Almonds	Asparagus	Dried Beans
Silage Corn	Melons	Mandarins	Wheat	Olives	Broccoli	Safflower
Silage Grain	Raspberries	Fresh Peaches		Walnuts	Celery	Sunflower
Oat Hay	Strawberries	Processing Peaches			Eggplant	
Pasture	Wine Grapes	Pears			Iceberg Lettuce	
Silage Sorghum		Prunes			Romaine Lettuce	
					Onions	
					Fresh Peppers	
					Processing Peppers	
					Squash	
					Fresh Tomatoes	

High Revenue: This scenario represents a crop mix that returns the highest revenue to growers while maintaining a diversity of crops across general crop types (vegetables, fruits, orchards, fruit trees, grains, forage and other). Rather than assigning every field with the single highest revenue crop, the highest-return crops within each crop category were assigned to the existing acreage for that category. For example, raspberries return the highest revenue per acre of all fruit crops grown in Yuba County—including strawberries, melons, grapes and blueberries—in total covering approximately 500 acres. Those 500 acres were converted to raspberries in this scenario to test the upper limit of revenue for that crop category. While this scenario does not maximize revenue to its fullest, it provides more realistic and useful information by showing the effects of converting crops to the highest returner within a crop category.

Crop Category	Crop	Gross Revenue per Acre
Forage	Corn for Silage	$1,440
Fruits	Raspberries	$75,000
Fruit Trees	Mandarins	$28,467
Grains	Rice	$1,547
Orchards	Walnuts	$7,200
Vegetables	Tomatoes for Fresh Market	$64,200
Other	Sunflower	$1,360

Low Revenue: Similar to the High Revenue scenario, this scenario estimates an extreme condition but at the lowest end of revenue to growers. It assigns the lowest valued crop to each crop category, again maintaining the same agricultural diversity as current conditions at the broad category level.

Crop Category	Crop	Gross Revenue per Acre
Forage	Oat Hay	$375
Fruits	Wine Grapes	$4,800
Fruit Trees	Pears	$4,567
Grains	Wheat	$950
Orchards	Olives	$3,600
Vegetables	Onions	$3,024
Other	Safflower	$363

High Return on Investment (ROI): Slightly different from the High Revenue scenario, the Return on Investment scenario takes into account the costs of production for the crops grown as well as the revenue (revenue is exclusively the returns from selling products). Using the ratio of net returns to costs, ROI is a standard way to measure profits compared to costs. This scenario represents a crop mix with the highest ROI across the six general crop categories. In tandem with the High Revenue scenario, we can see which crops not only perform well in terms of absolute revenue, but also which will be best at keeping farmers viable, or "in the black".

Crop Category	Crop	Return on Investment
Forage	Grain for Silage	62%
Fruits	Melons	165%
Fruit Trees	Mandarins	17%
Grains	Wheat	13%
Orchards	Walnuts	74%
Vegetables	Peppers – Fresh	54%
Other	Sunflower	85%

High Water Use: Current drought conditions in California make water use an important metric with which to examine cropping patterns. To evaluate water use, per acre water demand was gleaned from UC Cooperative Extension's Cost & Return studies for each crop. Some of these data were collected in regions outside of the Sacramento Valley (e.g. lettuce grown on the Central Coast of California) and will vary for crops grown in Yuba County; however, they provide a vetted basis of comparison from which to start conversations about water use. Furthermore, to be conservative with water use assumptions for crops typically grown on the cooler and damp Central Coast, water demand was increased by 10% from the base data provided in UCCE's cost and return studies. This scenario assigns all acres within a crop category to the crop with the highest per acre water demand—for example, grain acreage assigned as rice; forage acreage assigned as silage corn.

Crop Category	Crop	Water Demand (Ac-Ft/Ac)
Forage	Corn for Silage	4.0
Fruits	Blueberries	3.0
Fruit Trees	Peaches for Fresh Market	3.7
Grains	Rice	4.1
Orchards	Walnuts	3.5
Vegetables	Eggplant	3.3
Other	Beans – Common Dried	2.5

Low Water Use: The Low Water Use scenario frames the lower limit of water use while still maintaining the crop mix across general categories. It is not the bare minimum of water that could be used to produce crops in the county—in which case the entire county would be in dryland oat hay or rangeland—but a scenario that assigns low water crops to each crop category.

Crop Category	Crop	Water Demand (Ac-Ft/Ac)
Forage	Oat Hay	0
Fruits	Wine Grapes	1.5
Fruit Trees	Cherries	2.5
Grains	Wheat	1.7
Orchards	Olives	3.0
Vegetables	Lettuce – Iceberg	1.4
Other	Safflower	0.5

High Labor: The agriculture industry relies heavily on labor to work machinery, manage fields, and harvest crops; however, a survey of agriculture labor has shown shortages in the labor supply in the recent years (SACOG Agricultural Labor Study, 2014). With growers facing challenges to recruit and retain agricultural labor, labor demand is an important metric to take into consideration when comparing scenarios. This scenario represents a crop mix that maximizes labor demand, as specified in the UCCE cost and return studies, across Yuba County, again maintaining the general crop category and distribution.

Crop Category	Crop	Labor (Hours per Acre)
Forage	Alfalfa	6.19
Fruits	Blueberry	2,138.02
Fruit Trees	Mandarins	786.06
Grains	Rice	4.99

Orchards	Olives	27.6
Vegetables	Tomatoes for Fresh Market	4619.16
Other	Beans – Common Dried	5.76

Low Labor: In contract to the High Labor scenario, this scenario minimizes the labor hours across general crop types to find a cropping pattern that represents lower demand of labor demand.

Crop Category	Crop	Labor (Hours per Acre)
Forage	Oat Hay	0.92
Fruits	Wine Grapes	68.05
Fruit Trees	Pears	35.13
Grains	Wheat	1.57
Orchards	Walnuts	7.28
Vegetables	Broccoli	9.56
Other	Safflower	2.68

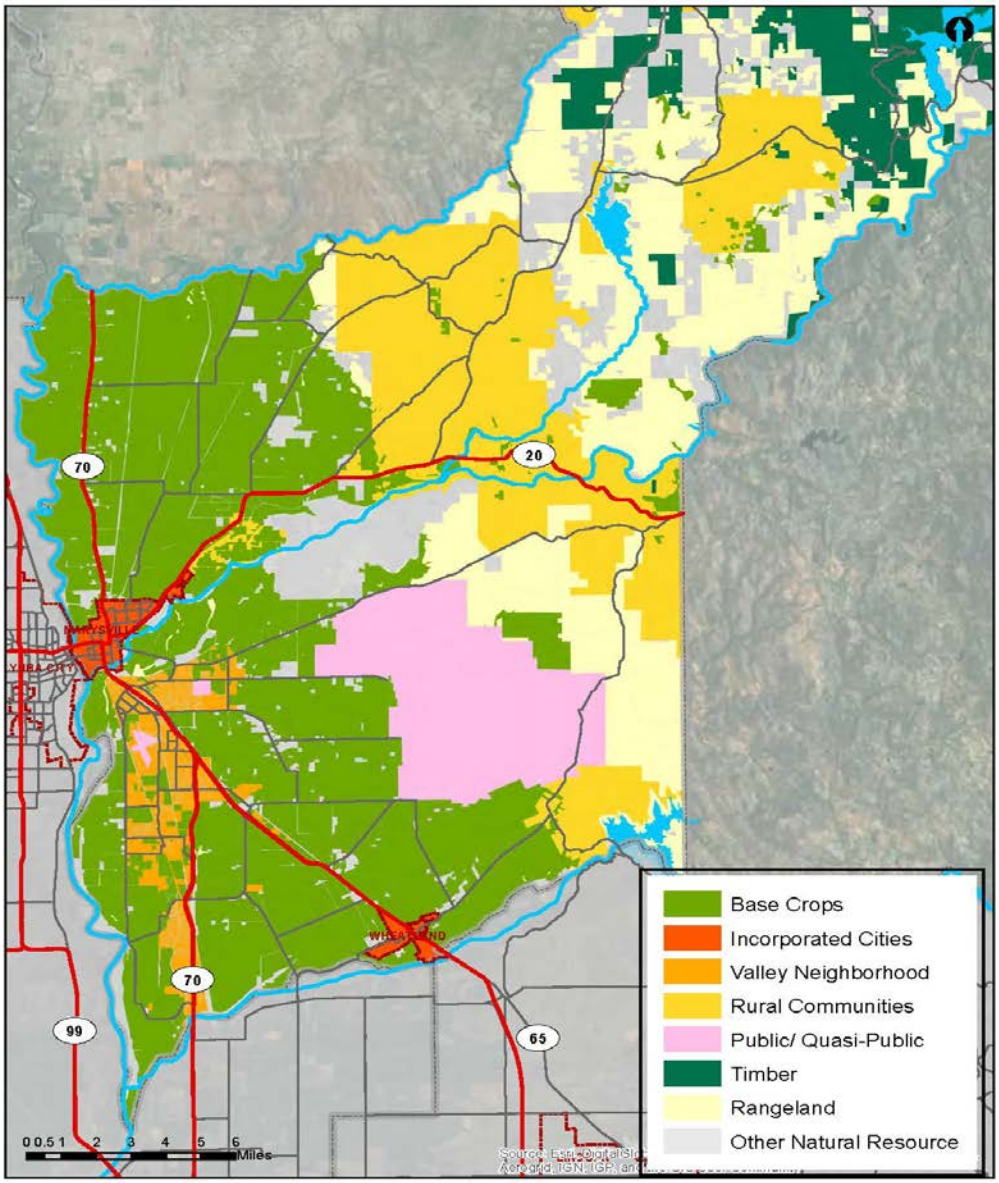
Local Consumption/Food Hub: This scenario is very similar to the Base Case but replaced 530 of its approximately 2,000 fallow acres with specialty crops that would be processed by the proposed food hub. The converted acres have access to irrigation from either surface water or ground water—easily accessed with Yuba County's high water table—and have soil of suitable quality for growing vegetable crops. Fallow fields were assigned crop acres respective to the amount of crop that would be processed by the food hub. Crop acres were calculated using food hub demand and acres required to grow that amount of product. Fallow acres were used instead of replacing other crops to demonstrate that there is capacity within the county's existing cropping patterns and agricultural infrastructure to grow for the food hub without compromising current operations.

Specialty Crops: This is the scenario that explored the impact of shifting entirely to specialty crops in Yuba County, rather than just enough specialty crop production to meet the demands of the food hub. Crop categories were not maintained when analyzing the potential of specialty crops in order to measure an unrestricted conversion away from commodity production, and further because two of the major crop types—grains and forage— are not specialty crops, along with animal products (e.g. meat, dairy, eggs), soybeans, crops used for oils (e.g. safflower, canola, sunflower), among others. Yuba County's current crop acres were summed and divided among 26 specialty crops that are prominent in today's market. Many of these specialty crops—walnuts and prunes, for example—are already grown in the county. Some of these specialty crops are grown elsewhere in the Sacramento Valley and would be viable given Yuba County's similar climate, soil and water characteristics. Some of these specialty crops are currently grown in the Sacramento Valley but at smaller scales than large commercial operations in other regions—strawberries and lettuce on the Central Coast, for example. Acreage assigned to individual specialty crops took into account if they are or are not currently grown in Yuba County or the Sacramento Valley.

Specialty Crop Mix

Almonds	Broccoli	Iceberg Lettuce	Olives	Pears	Raspberries	Walnuts
Asparagus	Celery	Romaine Lettuce	Onions	Fresh Peppers	Squash	Wine Grapes
Dried Beans	Cherries	Mandarins	Fresh Peaches	Processing Peppers	Strawberries	
Blueberries	Eggplant	Melons	Processing Peaches	Prunes	Fresh Tomatoes	

Base Agriculture Acres



The agricultural scenarios model various cropping patterns on the same set of acres, set as the base crops in the above map.

SUPPLYING THE LOCAL FOOD HUB

Modeling a local food hub scenario shows that a cropping pattern shift of 530 acres in Yuba County dedicated to specialty crop production would provide sufficient supply to serve a prototypical food hub. This scenario shows that not only would this food hub provide a positive return on investment for the hub operator, but also for growers providing the supply of specialty crop to the hub. To measure grower profitability from supplying the hub, the project team compared the estimated contract prices[33] provided by the food hub to the costs to produce the crop.[34] The analysis shows that overall, growers supplying a single local food hub would share in annual profits of $2.4 million.[35] However, current cost of production data suggest that, at wholesale prices, local farmers would not turn a profit growing certain individual crops for a food hub, such as lettuce or squash.[36]

In aggregate, supplying specialty crops for a single food hub would increase the direct farmgate value of Yuba County's agriculture sector by 2.5 percent compared to the base case. While a 2.5 percent gain may seem small, it derives from a change in only 0.48 percent of the base crop acres. This gain demonstrates the powerful economic potential of specialty crops.

Finally, the regional food hub facility would provide an increase of fresh and locally produced specialty crop fruits and vegetables in the local food system. The hub could feed the full fruit and vegetable consumption levels of 13,165 people; more likely however the hub would meet only a portion of consumers' total specialty crop demand. For example, the hub could provide a quarter of annual fruit and vegetable consumption to 52,600 people or ten percent of demand to 131,000 individuals.

Scenario Comparison: Local Food Hub to the Base Case

	Base Case	Local Food Hub
Annual Ag Value	$360,174,281	$368,495,155
% Change in Ag Value	--	2.5%
Average Ag ROI	26%	25%

[33] The estimated food hub contract prices per pound come from the SACOG's detailed pro forma analysis. The pro forma assumes the hub sells product at wholesale prices so buys for less than wholesale, thus representing a conservative take on prices. See Applied Development Economics, Foodpro Inc., The Hatamiya Group and DH Consulting, "Comprehensive Food Hub Pro Forma."

[34] Growers' costs to produce come from UC Cooperative Extension Cost and Return studies.

[35] Based on a crop throughput of blueberries, broccoli, celery, iceberg and romaine lettuce, onions, peaches, pears, peppers, raspberries, squash and strawberries. The analysis excluded tomatoes due to the discrepancy between processing and fresh market methods of production.

[36] The crops where production costs exceed estimated hub price are eggplant, lettuce (both iceberg and romaine) and squash. The analysis used data from the UC Cooperative Extension where some crops' cost of production were studied in different regions with different growing conditions, such as broccoli, lettuce and celery on the Central Coast. To make these data more applicable to the Sacramento Valley, yield was reduced by 10% and water use was increased by 10%. Updated cost of production data for leafy greens in the Central Valley would provide a clearer picture of the financial feasibility of these crops.

MAXIMIZING REVENUE OR RETURN

To compare specialty crop production in Yuba County to competing uses, the case study analyzed other various cropping patterns testing economic metrics such as gross revenue or return on investment. This comparison helps emphasize the economic potential of specialty crop production in the county.

The high and low-revenue scenarios help frame the economic potential of the county's existing agriculture land within its current major cropping categories. As described in the methodology section, the high-revenue scenario models a shift in production patterns to provide the largest gross revenue to the county's overall farm sector respecting the current distribution by crop type of forage, grain, vegetables, fruit, nuts, fruit orchards and other. This possible agriculture future increases the county's annual farmgate value by two-thirds over the base case value of $350 million to an annual output of $591 million. Conversely, the low-revenue scenario produces an annual agriculture sector value of $213 million, a loss of forty percent of the base case crop value.

For comparison, the specialty crop scenario models a cropping pattern in Yuba County consisting entirely of specialty crops. The specialty crop scenario returns a remarkable $1.8 billion in total agriculture output. The scenario could meet the fruit and vegetable demand of 3.5 million people and supply 200 food hub facilities, underscoring the substantial market opportunities in specialty crop production. The scenario also shows the capacity for continued growth in the overall output of the county's agricultural-based economy through a shift to specialty crop production.

Gross Agriculture Value and Return on Investment by Selected Scenarios

	Base Case	High Revenue	Low Revenue	High ROI	Specialty Crop	Low Labor
Annual Ag Value	$360,174,281	$591,842,338	$213,018,538	$516,796,080	$1,824,343,487	$317,222,288
% Change in Ag Value	--	64%	-41%	43%	407%	-12%
Average Ag ROI	26%	29%	8%	43%	36%	41%

In addition to measuring annual agricultural value, which gauges the gross output of the sector by cropping pattern, the return on investment (ROI) indicator provides a metric of on-farm profitability or efficiency of investment. A comparison of scenarios using this metric illuminates alternative strategies growers can take to increase on-farm profitability.

One strategy to realize the high returns is for growers to shift to high value crops such as walnuts, mandarins, and melons. As discussed in the barriers section above, these crops require significant outlays during establishment and harvest, showing how high returns can sometimes depend on sizable upfront capital investments and reliance on personal equity or the means to secure credit.

Compared to the high revenue or high return scenarios, the low-labor scenario provides an alternative method to secure a favorable grower return on investment. Unlike the above, the low-labor scenario generates favorable return by shifting to crops that minimize workforce costs. At 41 percent return, the low-labor scenario provides the second highest grower return of any modeled scenario. The tradeoff, however, is in the overall agriculture value,

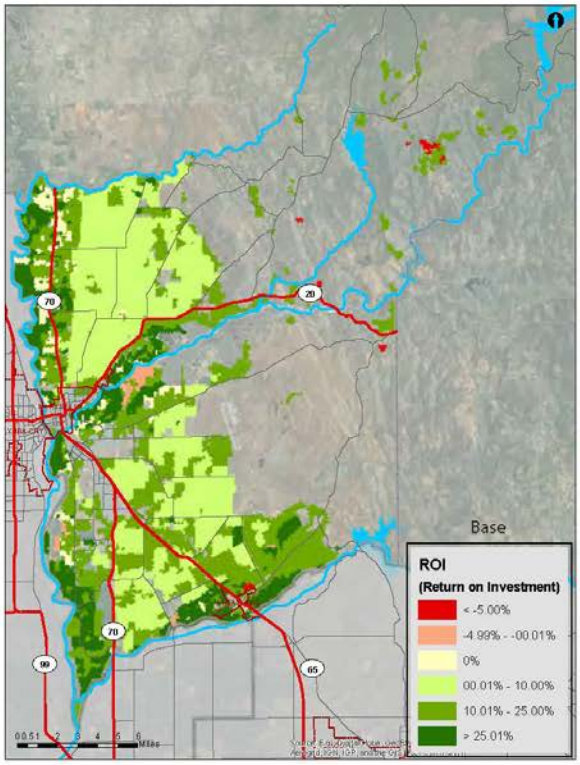
as the low-labor scenario's total output in dollars, at $317 million, falls well short of the high return scenarios. Furthermore, this cropping pattern supports relatively little value-added processing and jobs related to agricultural production and does little to meet the increasing demand for locally grown food. This comparison demonstrates some important trade-offs to consider in determining which strategies the county and its farmers may want to pursue in the future, as well as which metrics to use in evaluating the agriculture sector: ROI and revenue must be considered in tandem to gauge both the cash flow and economic efficiency of the food system.

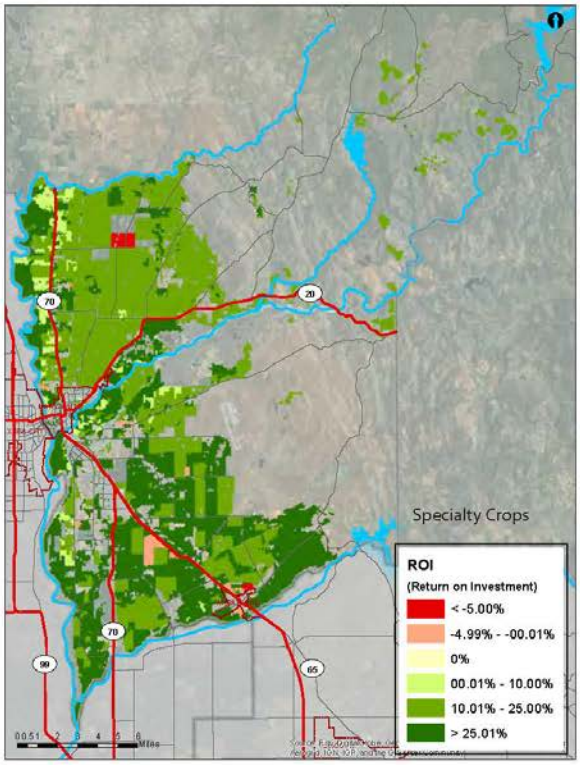
The maps on the following page further illustrate the link between cropping patterns and ROI. In the top left, the base case shows existing conditions in the county and serves as a point of reference for change. The specialty crop map shows a much wider dispersion of profitable crops. Indeed, the scenario overall provides a 36 percent return on average to local growers after capital investments are paid off and marketable yields achieved.

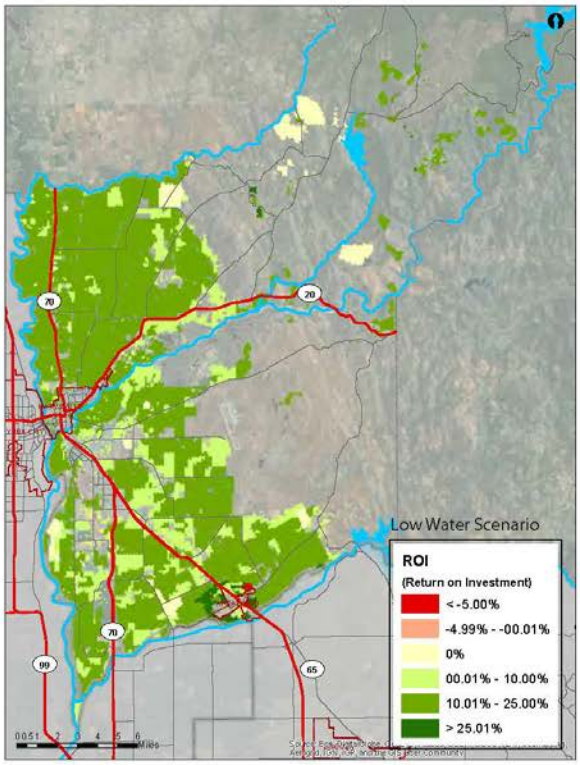
The third map—low water (see table below)—provides a more even distribution of returns compared to the base case but with a much lower overall ROI. The scenario also results in a total agriculture value less than the base case, emphasizing the link between water availability and economic vitality.

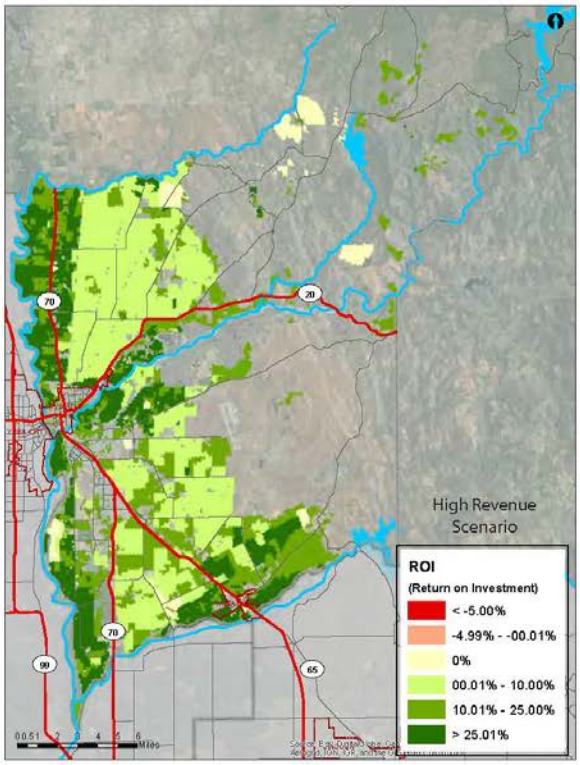
Finally, the high revenue map shows an overall return very similar to the base, with only small differences in the distribution of those returns. This suggests that strategies to enhance grower return or overall agriculture output may require much different cropping patterns than today, not just more valuable crops. The specialty crop scenario modeled above is an example of this cropping pattern shift.

Return on Investment by Cropping Pattern









ECONOMIC AND ENVIRONMENTAL TRADEOFFS: AG VALUE AND WATER CONSUMPTION

The specialty crop scenario referenced in the above section provides very significant gains in the value of agriculture in Yuba County and profitability of local growers. A look solely at economic indicators, however, masks important natural resource considerations in agriculture production. To showcase the environmental effects of different cropping patterns, the project team calculated water consumption by scenario. This variable helps illuminate an important finding of the scenario analysis, generally that higher-valued crops tend to also require greater water consumption, an important caveat particularly given the state's current drought. For example, while the high revenue scenario increases agriculture revenue over the base, it also raises water consumption by 35,128 acre-feet, an eight percent increase. To further make the point, a cropping pattern shift to low water crops cuts agriculture water use in half, but also reduces agriculture value by nearly $73 million a year—a 20 percent drop.

A look at the high-water scenario helps illustrate the water intensity of the county's current cropping pattern. The high-water scenario only increases by about 10 percent the amount of water consumed compared to the base year. [37] While Yuba County is relatively water-rich compared to other agricultural areas of the state, this tradeoff can help inform future production decisions, especially if drought conditions persist.

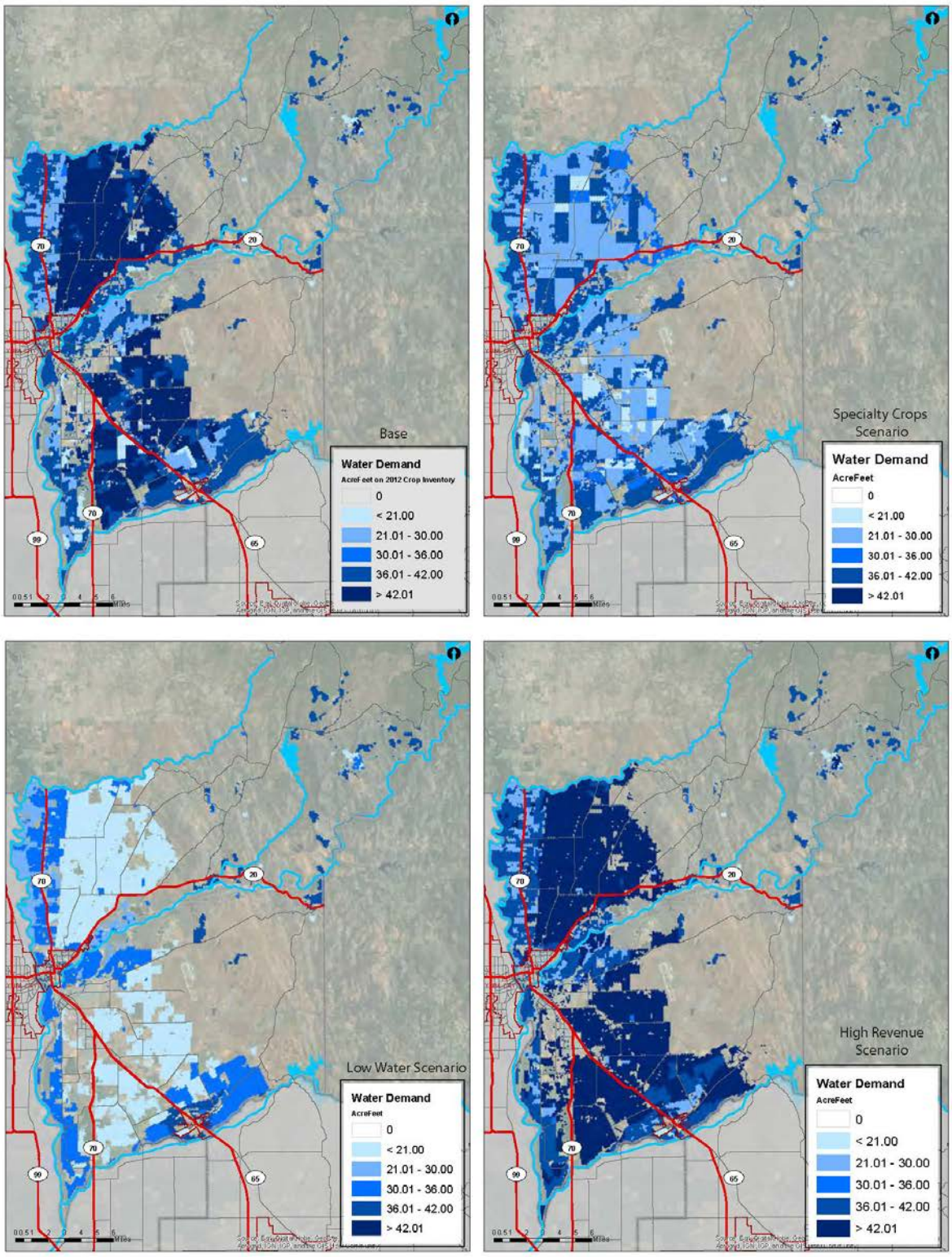
High and Low-Water Scenarios Compared to Base Case

	Base Case	Low H2O	High H2O	Specialty Crop
Annual Ag Value	$360,174,281	$283,246,111	$434,938,759	$1,824,343,487
% Change Ag Value	--	-21%	21%	407%
Average Ag ROI	26%	13%	24%	36%
Ag H2O (acre-ft)	417,671	190,866	461,272	339,940
% Change H2O	--	-54%	10%	-23%

Finally, the maps on the following page help illustrate an important advantage of specialty crop production in the county. The base scenario map shows the current high water use of the sector. Likewise, the high revenue scenario mimics a cropping pattern also demanding a high degree of water availability. In contrast, at about 340,000 acre feet, the specialty crop scenario actually uses less water than these scenarios while providing the positive economic indicators as discussed above.

[37] With nearly 50,000 acres, rice is the county's largest crop by acreage and is also one of the most water-intensive.

Water Demand by Cropping Pattern



LABOR DEMAND

In addition to economic indicators and agricultural water consumption, the project team estimated the annual labor demand of different cropping patterns as the Sacramento region has faced challenges recruiting and retaining agriculture labor in the last decade. The region's agriculture industry relies on workers to tend fields and harvest crops, so labor demand is an important metric on which to measure potential scenarios. Furthermore, there are significant infrastructure demands to take into consideration as the agricultural workforce grows, such as housing, transportation, education, health facilities, et cetera.

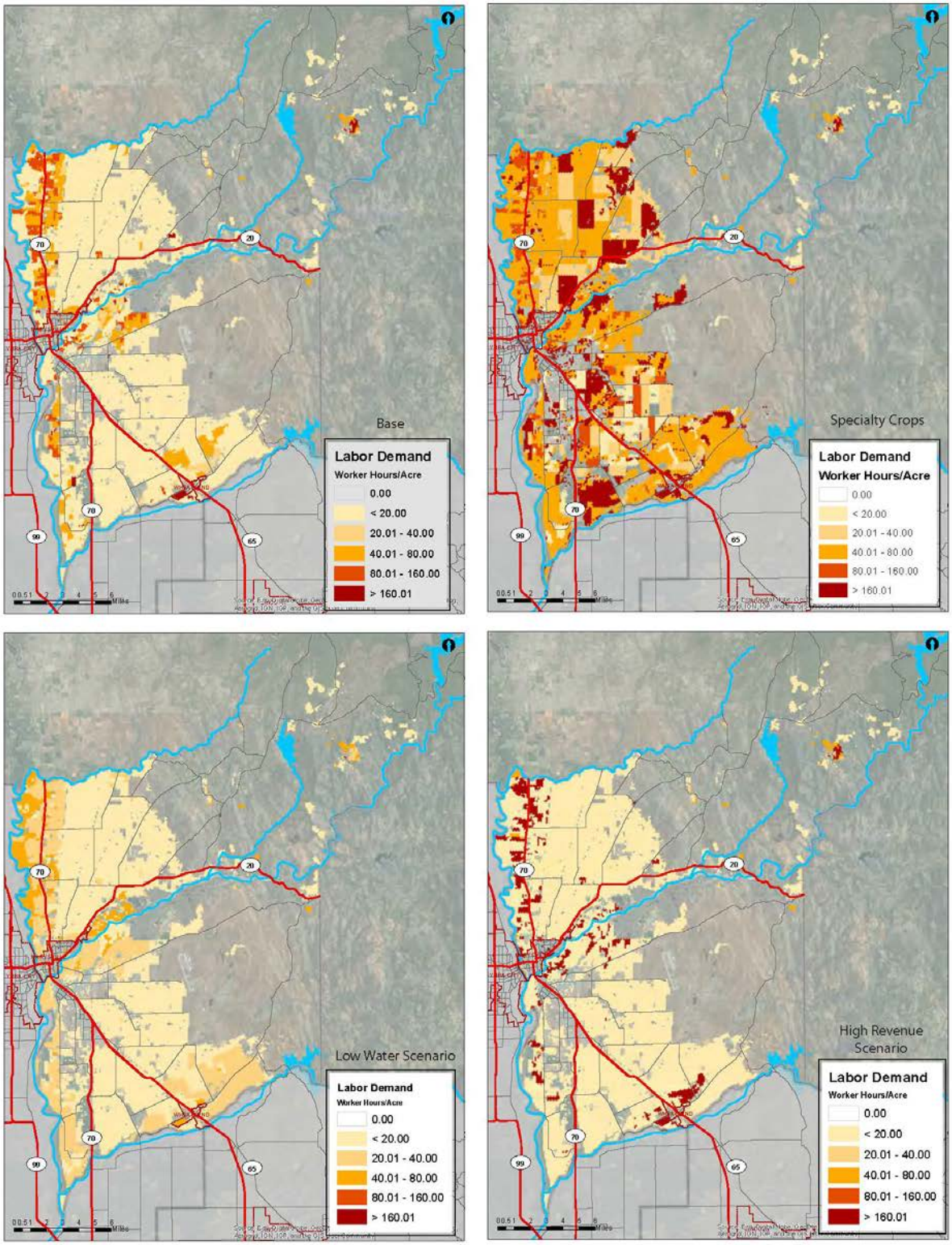
Labor Demand of Selected Scenarios

	Base Case	High Labor	Low Labor	Specialty Crop	High Revenue
Annual Ag Value	$360,174,281	$458,447,698	$317,222,288	$1,824,343,487	$591,842,338
% Change in Ag Value	--	27%	-12%	407%	64%
Average Ag ROI	26%	11%	41%	36%	29%
Ag Labor (hrs)	2,606,789	9,845,138	595,999	32,022,547	8,253,271
% Change in Labor	--	278%	-77%	1128%	217%
Ag H2O (acre-ft)	417,671	371,247	205,757	339,940	452,799
% Change in H2O	--	-11%	-54%	-19%	8%

The high and low-labor demand scenarios show a distinct correlation between high labor demand and high revenue; in other words, crops that require more labor hours tend to be higher value crops. (As noted earlier, these higher value crops also tend to require high amounts of water.) The high labor scenario almost quadruples labor demand (378%) compared to the base case, whereas it only increases labor demand by one-fifth (20%) relative to the high revenue scenario. The high labor scenario also generates revenue almost 30% higher than the base case. However, as referenced above, cropping patterns with low labor demand may be an alternative strategy for increasing return on investment, but not revenue. Labor is often one of the most costly line items on growers' budgets and many crops with low labor demand have mechanized production practices to increase efficiency, resulting in a higher ROI.

As the maps on the following page show, specialty crops are particularly labor intensive: the ten most labor intensive crops are specialty crops and the ten least labor intensive crops are commodity crops. So while the specialty crop scenario would provide higher economic returns with lower water consumption in Yuba County, it would also have to be linked with farm labor housing and services to support and attract an adequate supply of agriculture workers.

Labor Demand by Cropping Pattern



In short, comparing possible future specialty crop production side-by-side with the base case and other possible competing use shows opportunities and trade-offs across economic, water and labor metrics. The specialty crop scenario generates the highest gross revenue by far of any scenario as well as a high return on investment. And compared to the water-intensive base, the scenario would in fact decrease agriculture water consumption in Yuba County. However, the specialty crop scenario would require a significant influx of agriculture labor. While this demand would support numerous food chain jobs, it also raises challenges in a system already facing a constricted labor supply. The matrix below captures these tradeoffs for the case study's specialty crop scenario compared to the base case and other uses.

Summary of Agriculture Scenarios

Indicators	Scenarios									
	Base Case	Local Food Hub	High ROI	High Revenue	Low Revenue	High Water	Low Water	High Labor	Low Labor	Specialty Crop
Overall Agriculture Output (In $ millions)	360	368	516	591	213	434	283	458	317	1,824
Labor (millions of hours)	2.6	2.9	6.1	8.2	1.2	4.3	1.4	10	0.6	32
Water (thousands of acre-feet)	417	418	246	452	191	461	190	371	205	339
Return on Investment (%)	26	25	43	29	8	24	13	11	41	36

URBANIZATION SCENARIOS

In addition to changes in market demand and costs of production tested in the agricultural scenarios, local land use decisions will affect the future of agriculture in Yuba County. In the past decade, the population of Yuba County grew by over 15 percent and growth is expected to continue in the future, adding perhaps between 75,000 and 100,000 people in the unincorporated portions of the county by 2030.[38] The County's General Plan notes how most of the recent growth has occurred in unincorporated areas of the valley floor; indeed, today three-quarters of the county's population reside in these unincorporated areas.[39] Yet while the county's valley floor has been the center of most of the current and planned development in the county, the above base agricultural acreage map shows how it is also the site of existing agriculture production.

Yuba County's 2030 General Plan includes policies and actions to balance the need for development with the need to preserve the county's agricultural economic base and rural heritage. Overall, the Plan establishes long-term agricultural areas within valley portions of the unincorporated County that preserve valuable farmland, while also establishing areas for new jobs and new residents. This section first shows the gross revenue benefits to the county's agriculture sector from this policy direction and then turns to the fiscal savings of agriculture preservation.

AGRICULTURE PRESERVATION

Yuba County's 2030 General Plan re-designates nearly 5,000 acres from future development to agriculture use (including grazing) compared to the 1996 General Plan.[40] In addition to this direct conservation, the project team estimates land use policies of the County's 2030 General Plan can preserve an additional 5,000 acres by the implementation of a Valley Growth Boundary that focuses future development within its limits and minimizes growth outside it.[41] This new framework changes significantly the land use trajectory of the last twenty years, in which the California Department of Conservation estimated a loss of agricultural land in Yuba County at a rate of 750 acres per year.[42] In effect, this policy direction balances urban development with agriculture preservation, providing areas for new jobs and housing while also employing a tool to establish long-term agricultural areas in the valley floor.

[38] U.S. Census Bureau, for period 2002-2012. Yuba County General Plan for estimated growth rates.

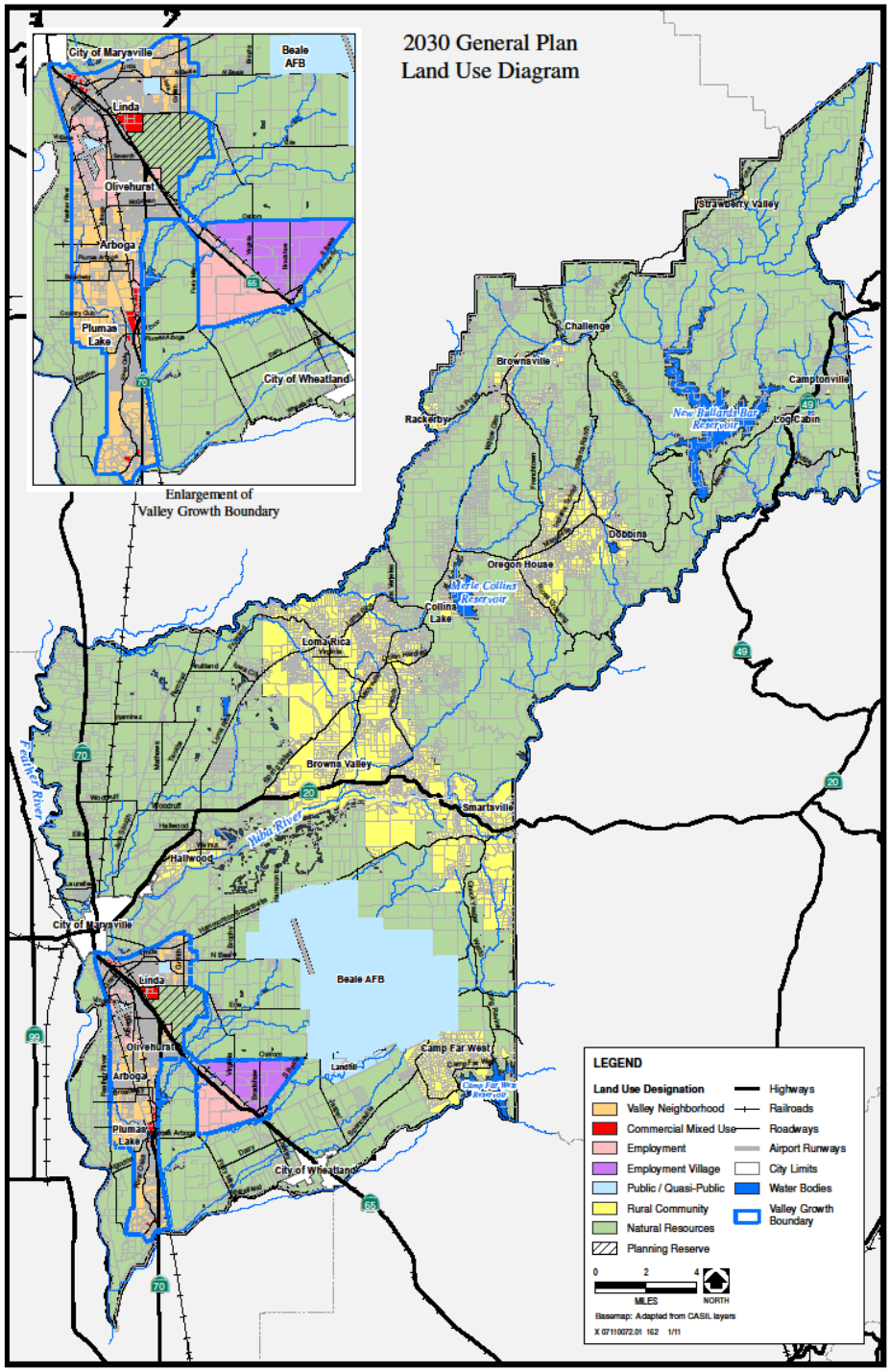
[39] Yuba County General Plan, Vision-2

[40] Yuba County General Plan Updated, "2030 General Plan Environmental Impact Report: Section 5- Alternative."

[41] The analysis compares the converted agriculture acreage in the 2030 General Plan to an alternative scenario that maintains the agricultural conversion rate of the prior twenty years.

[42] 2030 General Plan Environmental Impact Report Table 4.2-1.

Yuba County 2030 General Plan Land Use Designations



Source: Yuba County 2030 General Plan

This agriculture preservation saves significant value in the local agricultural sector and provides the opportunity for future cropping patterns and management strategies to further increase gross agricultural output. The study's crop modeling platform has estimated the following economic returns per acre of agriculture in Yuba County.

Yearly Per Acre Costs & Returns per Acre of Agriculture

	Annual Agricultural Revenue	Annual Agricultural Costs	Annual Farmer Net Revenue	On-Farm Jobs	Off-Farm Jobs*
Existing Crop Mix	$3,176	$2,526	$651	0.01	0.01
Possible Future Agricultural Uses:					
Grains	$1,097	$938	$159	0.002	0.002
Orchards	$5,459	$4,182	$1,277	0.013	0.015
Fruits & Vegetables	$34,528	$26,773	$7,755	0.494	0.563

*Off-Farm jobs calculated by an employment multiplier of 2.2. Source: University of California Agriculture and Natural Resources, 2012.

When viewed on a 10,000-acres scale as preserved by the Valley Growth Boundary, these economic gains of agriculture preservation are significant.

Estimated Annual Agricultural Value Preserved by Yuba County 2030 General Plan

	Annual Agricultural Revenue	Annual Agricultural Costs	Annual Farmer Net Revenue	On-Farm Jobs	Off-Farm Jobs*
Existing Crop Mix	$31,750,000	$25,250,000	$6,500,000	115	135
Possible Future Agricultural Uses:					
Grains	$11,000,000	$9,400,000	$1,600,000	15	20
Orchards	$54,600,000	$41,900,000	$12,700,000	135	160
Fruits & Vegetables	$345,300,000	$267,800,000	$77,500,000	4,900	5,900

*Off-Farm jobs calculated by an employment multiplier of 2.2. Source: University of California Agriculture and Natural Resources, 2012.

In addition to the economic benefit of its growth policy, the county earns fiscal benefits from agriculture preservation. A national review of the fiscal costs of land use (call out box below) found that converting agricultural land into urban development tends to lead to a net fiscal loss to local government finances. Scenario analysis by the project team found this national trend to hold in Yuba County as well. Using SACOG's fiscal impacts model, the project team estimated the capital infrastructure and ongoing operations and maintenance (O&M) costs of urbanizing agricultural land in Yuba County's valley floor. The following table shows the estimated annual costs and public sector revenue of converting valley agriculture to urban use at various scales of development. This analysis shows the costs the County may have likely encumbered to service new development on agricultural lands given the historical land use trajectory, and thus the avoided fiscal obligations as a result of concentrating new development within the growth boundary.

Yearly County Costs & Revenue from Urbanizing Valley Agriculture in Yuba County

	Public Capital Costs[43]	Annual O&M Costs	Total Costs	Revenue	Net Revenue
On 100 acres	$1,101,267	$423,469	$1,524,736	$346,844	-$1,177,891
On 1,000 acres	$5,860,526	$4,138,052	$9,998,578	$3,468,440	-$6,530,138
On 5,000 acres	$27,125,021	$20,529,314	$47,654,335	$17,342,201	-$30,312,134
On 10,000 acres	$53,736,606	$41,115,481	$94,852,087	$34,684,401	-$60,167,685

In short, Yuba County policy preserves a valuable asset by keeping prime farmland in agriculture and ensures future economic revenues from its agriculture industry, while minimizing costs and still providing for economic development opportunities and strong communities.

The technical appendix *Costs of Urbanizing Agriculture Land* explains the use of SACOG's fiscal model and explores in further depth the fiscal effects of varying land use decisions.

Fiscal Impacts of Land Use Decisions

To help better understand the fiscal impact of land use decisions, SACOG conducted a review of national case studies identifying infrastructure and services costs and revenues from agricultural land currently in production compared to costs and revenues related to urban residential development, documenting what local governments earn in revenue, owe in debt, and spend on services. This review of over 200 examples across the nation details the fiscal contribution of agricultural and other working lands. Key findings from this work include:

- Agriculture and working lands are fiscally positive land uses, generating more in local government revenue than they consume in services. Of the studied cases, agriculture cost only $0.45 on average in services for every dollar generated in revenue.
- Urbanizing agricultural land requires not only significant upfront infrastructure investments, but also ongoing operations and maintenance expenditures, resulting in increased debt service levels and annual operating budgets.
- Converting rural working lands into urban land uses tends to transform a fiscal surplus into a drain on city or county finances. Land converted to residential use requires $1.21 on average in local government expenditure per dollar of public revenue.

Sources: Matthew J Kotchen and Stacey L Schulte, "A Mete-Analysis of Cost of Community Service Studies." *International Regional Science Review*, Volume 32, Number 3. July 2009: 376-399; Farmland Information Center, "Fact Sheet: Cost of Community Service Studies." American Farmland Trust, August 2010; Smart Growth America, "Building Better Budgets: A National Examination of the Fiscal Benefits of Smart Growth." 2013; Roger Coupal, Donald McLeod and David Taylor, "The Fiscal Impacts of Rural Residential Development: An Econometric Analysis of the Costs of Community Services." *Planning and Markets*, Volume 5, Number 1, 2002.

[43] Capital costs amortized over 20 years. In the analysis public capital costs include major streets and street upgrades, water distribution and mains, water supply, treatment and storage, stormwater collection and detention, sewer trunk, collection and treatment, parks, and services such as police, fire, health and education. Developer costs include local streets, water laterals, stormwater laterals, and sewer laterals.

CONCLUSION: OPPORTUNITIES TO LEVERAGE AGRICULTURE AS ECONOMIC DEVELOPMENT

This case study conducted for Yuba County has shown the integral role that agriculture plays in the local economy and the potential for that role to increase. The study documents current conditions in the agricultural sector as well as the emerging economic opportunity of local food sourcing. Through scenario analysis the second section of the study compared specialty crop production with competing possible futures, noting the correlation between agricultural value, water consumption and labor demand. These various agricultural scenarios can also provide metrics for interim uses of the land as the regional housing market recovers.

Capitalizing on the emerging local market segment to bolster local economic development will require buy-in from numerous groups. This case study concludes by looking at three—growers, investors, and Yuba County—to showcase challenges and opportunities moving forward. Clear market signals for growers coupled with supportive county policies will be needed to entice the agriculture industry to move toward more specialty crop production. With this backdrop, investors may find Yuba County an attractive place to implement what SACOG's analysis shows to be a promising food hub enterprise.

Overall the economic viability of the local market is predicated on a sufficient supply of local specialty crop production; without growers, there is no local system. Through interviews, growers in Yuba County noted their need to see a strong market in order to dedicate production to local market channels, especially given the strength of the export commodity market. The market scan provides data suggesting the local market is a viable option, documenting consumption levels, supply and demand imbalances, and price points for local specialty crops. The model analysis of a local food hub facility also shows how growing for the local market can be profitable for Yuba County growers in aggregate, but that sufficient water and labor supply is critical. A full suite of business tools helps inform food hub investment decisions including a detailed pro forma customizable by specialty crop throughput and other variables. This case study delivers a conceptual facility situated within Yuba County to address a key infrastructure gap. Together these tools can help guide investment to the local food system.

Furthermore, the study provides data and tools to evaluate scenarios and educate stakeholders about current and future agriculture and its impact on the county. The study estimates grower revenue and profit across various future conditions such as drought, establishment, or changing market prices. While the data and models and corresponding results are certainly not definitive, the work provides guidance on building strategies for agriculture and other land uses, as well as a solid foundation for building even more robust tools for future analyses.

Finally, support from Yuba County can help complement grower and investor decisions. Yuba County's General Plan makes clear the commitment to agriculture and the County can continue to support initiatives such as the grower-institution matchmaking of the Yuba-Sutter Economic Development Corporation as well as work to update policy to support the entire local food value chain from production to processing to consumption. In addition, land use planning plays a paramount role in agricultural viability. The model results of the case study show the potential for both the loss of agriculture revenue and the fiscal impacts of development decisions.

We anticipate these findings will be of use to farmers considering local production both on a full-time or supplemental basis. Through continued stakeholder engagement SACOG's RUCS program will continue to share these data and findings on the local specialty crop market opportunity.

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APPENDIX 1. FULL MODELING RESULTS

This appendix provides the full modeling results of the case study. The below matrix reports the economic, water, labor and fiscal indicators of each agricultural scenario across every possible urbanization scenario, resulting in 60 unique scenarios and almost 450 indicators. The fiscal indicators are reported as additions to the County's existing 2012 budget; as such the fiscal indicators in the base year are left blank.

Yuba County Case Study - Scenarios				Urbanization Scenarios				
			Today	2020 - Short Term Land Use		2030 - Long Term Land Use		
		Acreage	**Base Case**	**Non-Contiguous**	**Contiguous**	**Infill Focus**	**Compact Growth**	**Dispersed Development**
		Valley Urban	6,075	7,115	6,675	11,300	15,671	21,212
		Crop Acres	120,942	119,902	120,401	118,319	114,773	109,815
	Range, Nat. Resources & Rural Communities		252,801	252,801	252,742	250,198	249,372	248,790
		Public (e.g. Beale AFB)	25,084	25,084	25,084	25,084	25,084	25,084
Agricultural Uses	**Base Case**	Annual Ag Value	$360,174,281	$358,565,127	$359,408,080	$354,282,154	$348,698,538	$342,579,195
		Average Ag ROI	26%	26%	26%	26%	26%	26%
		County Capital Cost	$0	$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M	from budget	$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue	from budget	$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	2,606,789	2,601,600	2,604,273	2,576,815	2,554,185	2,536,467
		Ag H2O	417,671	413,407	415,502	410,811	397,793	380,912
	High Revenue	Annual Ag Value	$591,842,338	$590,233,183	$591,015,825	$583,305,296	$576,545,054	$569,080,373
		Average Ag ROI	29%	29%	29%	28%	29%	29%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	8,253,271	8,248,082	8,250,760	8,215,268	8,198,167	8,177,478
		Ag H2O	452,799	448,535	450,609	442,992	428,786	408,648
	Low Revenue	Annual Ag Value	$213,018,538	$212,030,538	$212,552,113	$209,735,815	$206,465,975	$202,871,000
		Average Ag ROI	8%	8%	8%	8%	8%	8%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	1,196,434	1,194,801	1,195,618	1,177,877	1,167,569	1,161,045
		Ag H2O	191,575	189,842	190,812	191,575	184,350	179,320

Yuba County Case Study - Scenarios				Urbanization Scenarios				
			Today	2020 - Short Term Land Use		2030 - Long Term Land Use		
		Acreage	**Base Case**	**Non-Contiguous**	**Contiguous**	**Infill Focus**	**Compact Growth**	**Dispersed Development**
		Valley Urban	6,075	7,115	6,675	11,300	15,671	21,212
		Crop Acres	120,942	119,902	120,401	118,319	114,773	109,815
		Range, Nat. Resources & Rural Communities	252,801	252,801	252,742	250,198	249,372	248,790
		Public (e.g. Beale AFB)	25,084	25,084	25,084	25,084	25,084	25,084
Agricultural Uses	**High ROI**	Annual Ag Value	$516,796,080	$515,808,080	$516,275,732	$509,525,732	$504,643,904	$499,812,512
		Average Ag ROI	43%	43%	43%	42%	42%	43%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	6,104,529	6,102,897	6,103,687	6,064,385	6,054,732	6,047,063
		Ag H2O	246,617	244,884	245,748	241,853	235,967	228,349
	High H2O	Annual Ag Value	$434,938,759	$433,329,605	$434,112,247	$427,537,806	$420,959,365	$413,494,683
		Average Ag ROI	24%	25%	24%	24%	24%	25%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	4,377,966	4,372,776	4,375,454	4,325,144	4,300,821	$4,280,132
		Ag H2O	461,272	457,008	459,083	451,428	437,220	417,082
	Low H2O	Annual Ag Value	$283,246,111	$282,258,111	$282,779,686	$279,684,443	$276,414,603	$272,819,628
		Average Ag ROI	13%	13%	13%	13%	13%	14%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	1,425,672	1,424,039	1,424,856	1,406,152	1,395,843	1,389,319
		Ag H2O	190,866	189,132	190,103	187,976	183,640	178,610

Yuba County Case Study - Scenarios				Urbanization Scenarios				
			Today	2020 - Short Term Land Use		2030 - Long Term Land Use		
		Acreage	**Base Case**	**Non-Contiguous**	**Contiguous**	**Infill Focus**	**Compact Growth**	**Dispersed Development**
		Valley Urban	6,075	7,115	6,675	11,300	15,671	21,212
		Crop Acres	120,942	119,902	120,401	118,319	114,773	109,815
		Range, Nat. Resources & Rural Communities	252,801	252,801	252,742	250,198	249,372	248,790
		Public (e.g. Beale AFB)	25,084	25,084	25,084	25,084	25,084	25,084

Agricultural Uses	**Local Consumption**	Annual Ag Value	$368,495,155	$366,886,001	$367,728,954	$362,603,028	$357,304,242	$351,319,349
		Average Ag ROI	25%	25%	25%	25%	25%	25%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	2,930,167	2,924,978	2,927,651	2,900,193	2,878,669	2,861,370
		Ag H2O	418,883	414,619	416,714	412,024	399,018	382,314
	Specialty Crops	Annual Ag Value	$1,824,343,487	$1,808,655,595	$1,816,182,766	$1,784,776,813	$1,731,287,134	$1,656,498,124
		Average Ag ROI	36%	36%	36%	36%	36%	36%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	32,022,547	31,747,179	31,879,303	31,328,037	30,389,137	29,076,372
		Ag H2O	339,940	336,109	338,419	332,567	322,600	308,665
	High Labor	Annual Ag Value	$458,447,698	$456,838,543	$457,643,745	$452,736,056	$447,136,574	$440,137,733
		Average Ag ROI	11%	11%	11%	11%	11%	11%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	9,845,138	9,839,948	9,842,345	9,765,596	9,733,659	$9,706,584
		Ag H2O	371,247	366,983	369,236	364,405	352,725	336,955
	Low Labor	Annual Ag Value	$317,222,288	$316,234,288	$316,752,263	$312,078,364	$308,088,524	$304,493,549
		Average Ag ROI	41%	41%	41%	41%	41%	41%
		County Capital Cost		$52,000,000	$29,000,000	$500,000,000	$530,000,000	$600,000,000
		Annual O&M		$7,500,000	$5,500,000	$78,000,000	$85,000,000	$89,000,000
		Annual Co. Revenue		$5,500,000	$6,300,000	$102,000,000	$95,000,000	$80,000,000
		Ag Labor	595,999	594,366	$595,203	587,948	581,703	575,179
		Ag H2O	205,757	204,024	204,994	202,609	198,173	193,143

APPENDIX 2. EXPLORING LONG-TERM VIABILITY OF WALNUT GROWERS

Walnut production has surged in Yuba County and elsewhere in the SACOG region over the last several years as the growing international market has commanded an ever-higher price. High market prices are excellent news for the County's established walnut growers as their incomes grow, and have induced other growers to convert acres to this new cash crop. All seems well if walnut prices stay high and if these acres were to produce a harvest immediately; however, perennial crops like orchards and vineyards go through a period of "establishment", when costs are high and harvests are low to none. During establishment, growers incur costs to prepare the land, plant trees or vines and tend them (prune, sucker, et cetera). Length of establishment depends on the crop—almond orchards return their first harvest in Year 3 and produce at full capacity in Year 7; wine grapes return their first harvest in Year 3 and produce at full capacity in Year 4 (on average). Walnuts are harvested in Year 4 at only 10% of full production and harvest approximately doubles each year until Year 8, when the harvest plateaus at 6,000 pounds per acre.

Walnut Harvest, in pounds per acre per year

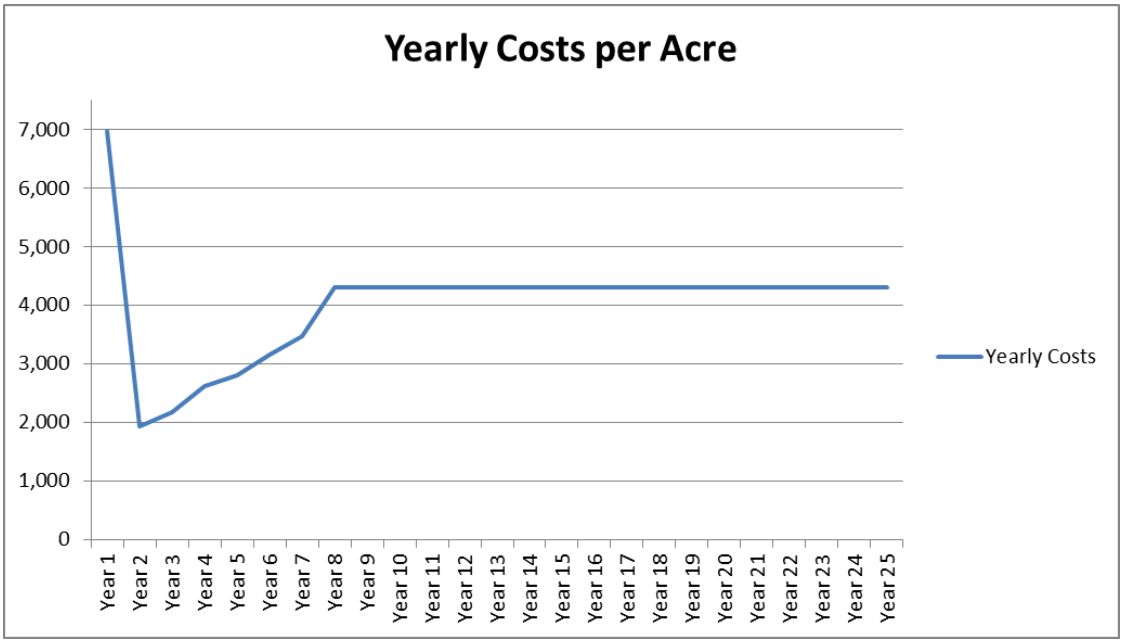
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8+
0	0	0	600	1,200	2,400	5,000	6,000

Walnuts are currently returning high prices in the marketplace and therefore many growers have converted to walnuts; however, these orchards will take up to eight years to start generating a return and even longer for the grower to come into the "black" after the large capital investment of planting. For a time, growers may be in the optimal phase of receiving a full yearly harvest and have repaid the capital loans from establishing the orchards. At approximately Year 25, the orchards' production wanes and growers often tear out old trees to replace with new trees, restarting the cycle of establishment.

The following is an exploration into the long-term financial viability of crops with a high establishment cost, using walnuts as an example. This analysis, however, is relevant for any grower that would need to recapitalize to break into new crop markets, such as the specialty crop expansion outlined in this case study.

Yearly Costs over the Long-Term

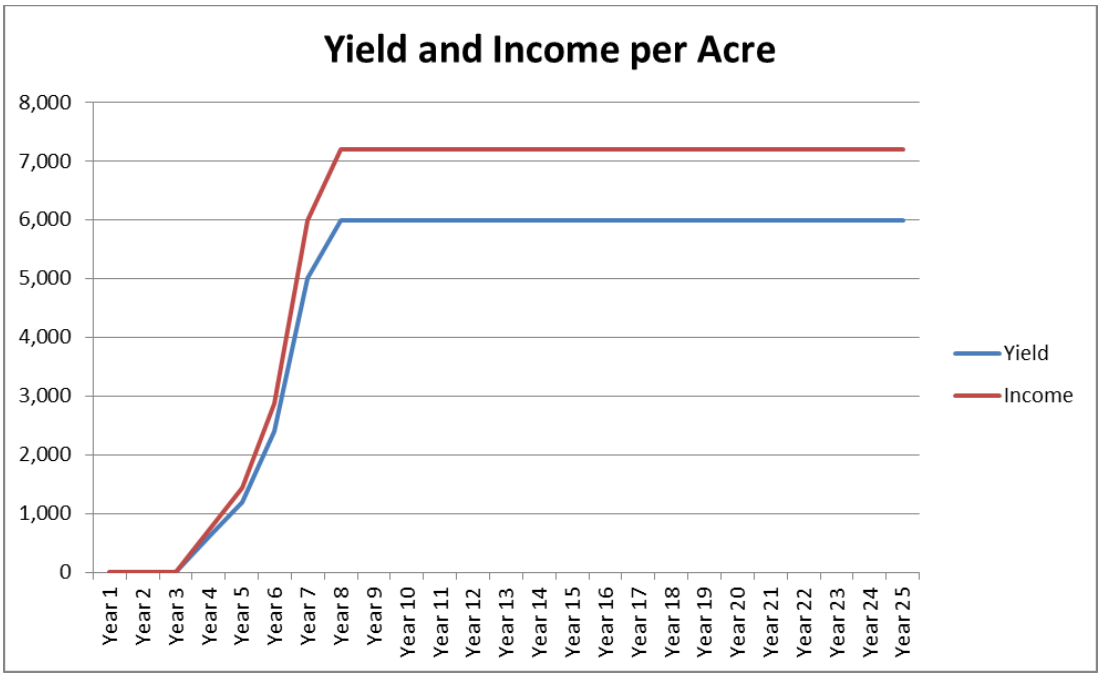
Walnut growers experience on average three phases of yearly costs over a 25-year lifecycle of an orchard (lifecycle may vary, but this analysis uses 25 years). Costs are highest in Year 1 due to preparing land, purchasing and planting tree starts and pruning. Yearly costs decrease after Year 1 as orchards mature but still must be tended with irrigation, fertilizer and pesticide, then rise in Year 4 as growers incur harvest costs. On average, an orchard reaches an average production and harvest year in Year 8, which remains steady for the remaining lifespan of the orchard. In this study, an orchard in an average production year costs the grower approximately $4,300 per acre. These yearly costs are illustrated in the graph below.



This yearly cost analysis would look very similar for other orchard or vine crops such as peaches, kiwis and grapes. While walnuts are used as the example here, the concepts can be readily extrapolated to other specialty crops in Yuba County.

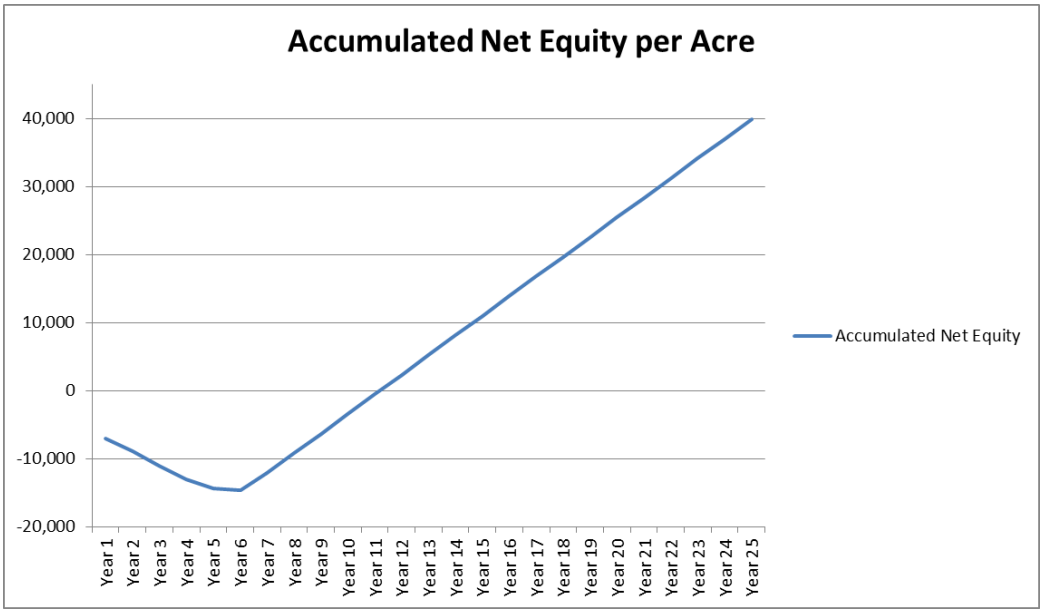
Yields and Income

Yield and the associated income fluctuates over the lifespan of the orchard, as well. In the first three years, yield and income are zero as the orchard is established and matures. With the first harvest in Year 4, income increases yearly until Year 8, when it plateaus at an average yield of 6,000 pounds per acre. At today's market price of $1.20 per pound, this translates to $7,200 return per acre. These yearly yields and income are illustrated in the graph below.

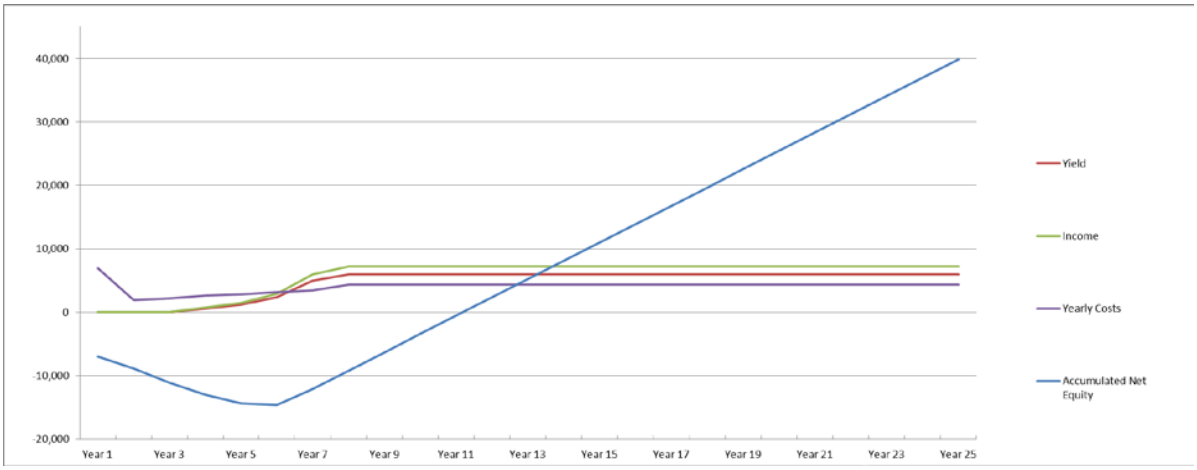


Accumulated Net Equity

Using yearly costs and income associated with establishing a walnut orchard, growers' accumulated net equity—growers' income minus debts over time—can be calculated over the lifecycle of the orchard. This calculation shows accumulated liabilities incurred over the first six years, the point at which growers start to repay these liabilities (Years 7-11), the point at which growers become solvent (repay all liabilities in Year 12), and the growth in net worth over the subsequent 14 years. The market price was held constant and the yield held at 6,000 pounds per year (average yield over the life of the orchard) for Years 8+ over the 25 years in the graph below. The graph below illustrates this cycle in net worth of a walnut production.



When these lines are overlaid, they show the comprehensive timelapse of per acre costs, yield, revenue, and accumulated net equity over the 25-year lifespan of a walnut orchard. This timelapse provides an understanding of the financial landscape of individual growers not seen in the snapshot provided by scenario modeling.

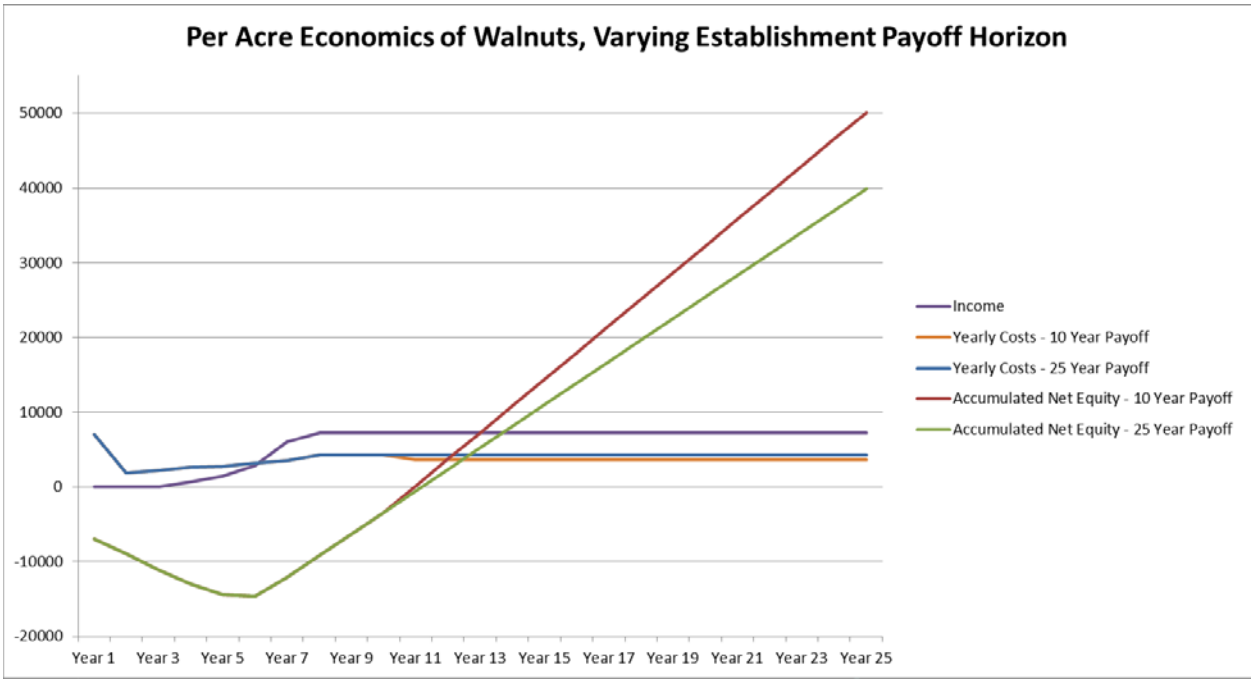


Scenarios

Using the longitudinal platform, we can explore the long-term financial effects of variables such as length of the establishment payback period, land ownership, and orchard re-establishment. These scenarios give a nuanced perspective into the potential financial scenarios of growers given various circumstances.

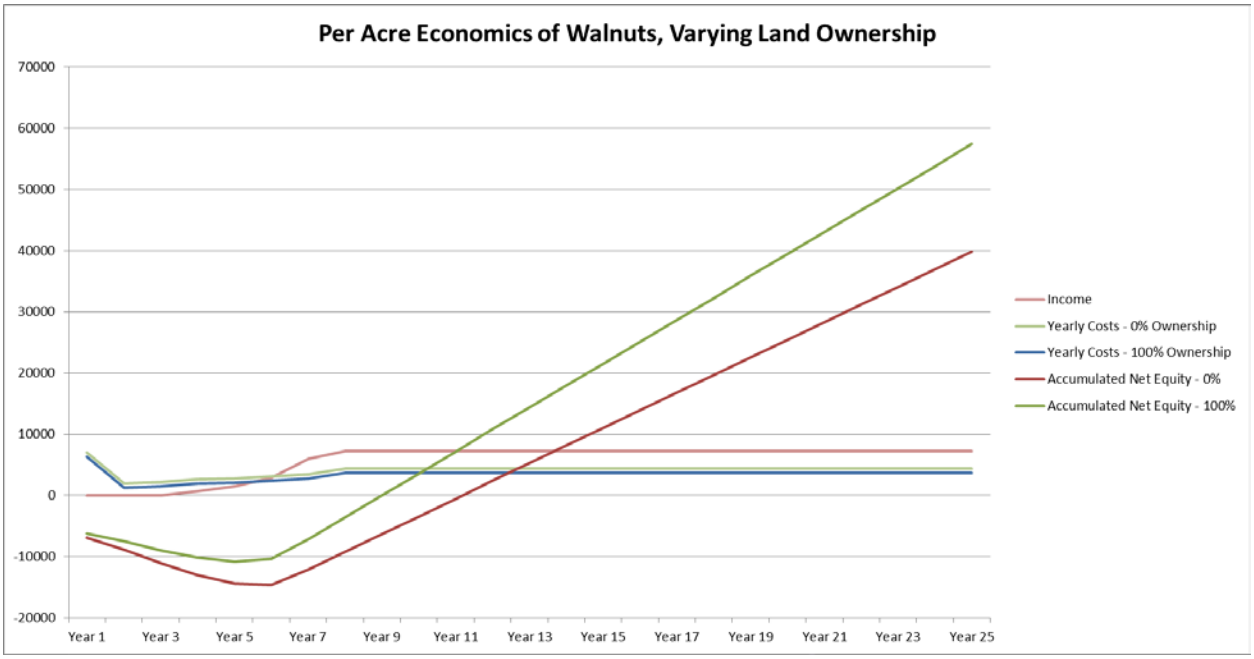
Paying Off Establishment

The graph below illustrates the difference in net equity by Year 25 when a grower repays establishment costs in full in 10 years compared to 25 years. The difference is significant—over $10,000 greater when establishment is repaid in 10 years. A 25-year payback was used by all of UC Cooperative Extension's cost and return studies for orchard crops, in addition to being corroborated by an agricultural lending bank in the SACOG region.



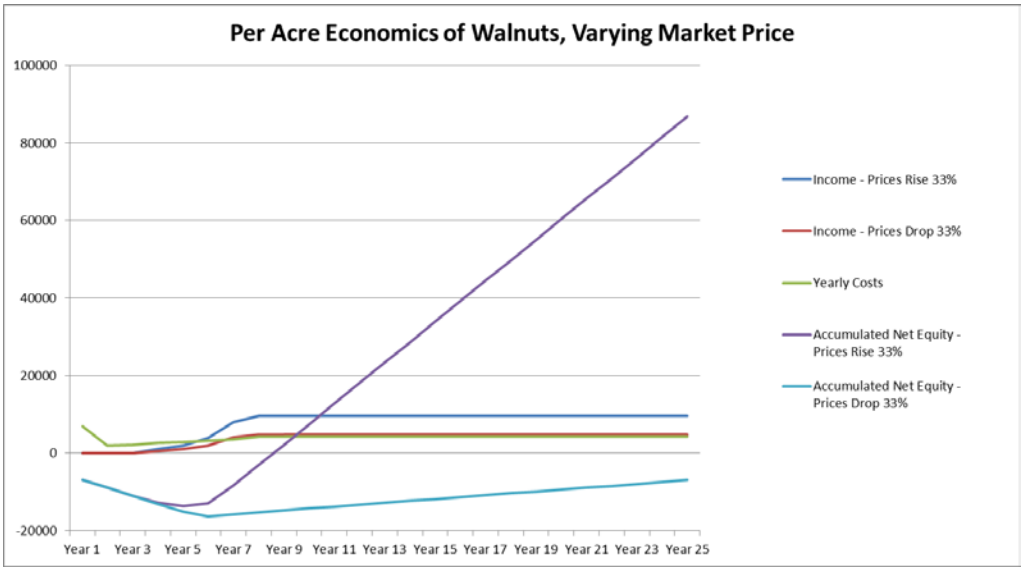
Land Ownership

Land is one of the largest line items in a grower's yearly budget; outright land ownership therefore plays a large role in the viability of certain crops. Growers that own land outright, such as family farmers with inherited land, have lower yearly costs as they are not making rent nor mortgage payments. This yearly savings realizes over $15,000 in net equity over the walnut orchard's 25-year lifecycle.



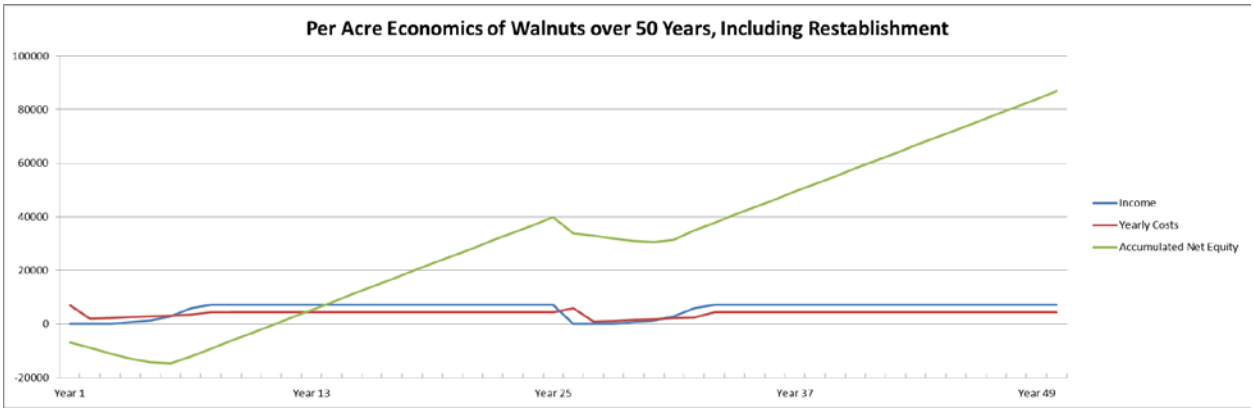
Changes in Market Price

Longitudinal analysis shows what crops will be profitable in the long term, particularly those with high costs to become established, and the market price of walnuts determines viability. As with any good sold, walnut prices fluctuate. Walnut prices have almost tripled in the last 10 years according to the region's crop reports, inducing a surge in walnut acreage. As more and more growers put equity into costly—and potentially lucrative—walnut orchards, an analysis of market prices indicates that these growers are expecting prices to hold if not continue to rise: A 33% increase in walnut prices from today's value shows an excellent return over the 25-year horizon of an orchard; however, a 33% decrease in walnut prices indicate that a grower would not be in the black before Year 25, when they would likely re-establish their walnut crop.



Orchard Re-Establishment

Looking into the second lifecycle of a walnut orchard, a grower tears out their crop at approximately Year 26 and re-establishes it. Years 26 through 30 again have zero harvests and income and costs rise to prepare the land repurchase root stock. Given constant prices, growers' finances over two lifecycles are illustrated in the graph below.



APPENDIX 3. COSTS OF URBANIZING AGRICULTURE LAND

URBANIZATION SCENARIOS METHODOLOGY

The urbanization scenarios constructed in this technical appendix provide comparable metrics and quantifiable data to help inform land use planning. To calculate the fiscal impacts of converting agriculture and open space, the case study draws on SACOG's Integrated Model for Planning and Cost Scenarios (IMPACS). IMPACS provides local governments and planners a means of estimating and evaluating the fiscal costs of providing infrastructure and service in their communities.[44] IMPACS is tailored to help jurisdictions better understand the fiscal implications of different growth patterns, particularly at the rural-urban fringe.

The first two land use scenarios compare the economic and fiscal effects of possible immediate-term development patterns in the valley floor, including a scenario that converts 1,000 acres of agriculture land located away from current urban use, and a scenario that provides the same number of jobs and housing, but located in concomitance to existing communities. The three further urbanization scenarios compare possible valley land uses over the course of the next twenty years, including a Dispersed Development, a Compact Growth, and an Infill Focused scenario. These valley growth scenarios would account for approximately 84,000 of the 100,000 population increase (84%) and 66,000 of the 67,000 job increase (98%) in unincorporated Yuba County estimated over the course of the 2030 General Plan (using the high range estimates from the Plan's buildout).[45] The analysis below describes the full specifications of the urbanization scenarios in comparison to the base case.

Base Land Use Scenario

The base land use scenario is set as the existing crop production, open space and developed use within Yuba County's valley floor. This base is set from SACOG's parcel-level crop map update. As such, the urbanization scenarios only look at development within the valley floor and do not analyze changing land use in the foothills.

Short Term Comparison Scenarios

1. **Non-Contiguous Development**
   This first of the two short term land use scenarios models the effect of urbanizing a generic 1,000 acres of current agriculture production in the valley floor. This scenario occurs away from existing valley communities in what today is full-scale agriculture production. Based on satellite imagery and SACOG's crop map, the scenario assumes these valley agriculture acres to be in rice production. Urbanizing these acres would result in around 3,300 dwelling units and 8,400 new residents to unincorporated Yuba County, as well as about 2,500 private-sector jobs.

[44] For a full explanation of IMPACS functionality see Aecom's, "IMPACS User Guide." Prepared for the Sacramento Area Council of Governments, June 2011.

[45] The remaining 16,000 in population increase and 1,000 jobs are estimated to land in the County's Rural Community designation. Due to the lack of detailed data, the case study did not analyze changing land use patterns outside of Yuba County's valley floor.

2. **Contiguous Development**
   The other near term urbanization scenario models the impact of a project producing a similar level of jobs and housing, located instead next to the existing communities in Yuba County's valley floor. This Contiguous Development scenario encompasses 600 acres to reflect the results of a more compact site design. Compared to the first scenario which replaces full-scale agriculture, SACOG's crop map suggests the land converted in the Contiguous Development scenario to be a combination of commodity agriculture and other open space. This holds with prior RUCS work that found the percentage likelihood of fallowing to be greater at the urban-rural edge compared to farms surrounded by other agriculture use.

Long Term Comparison Scenarios

3. **Dispersed Development**
   This scenario models the impacts of urbanizing an additional 15,000 acres in Yuba County's valley floor from today's base case. Based on SACOG's crop map, about 11,125 of these acres would be in agricultural production, with the remainder other open space. The scenario would add 85,428 new residents and 66,989 jobs in unincorporated Yuba County.

4. **Compact Growth**
   The second of the long term land use scenarios models the effects of a more compact land use pattern, with new development located in immediate proximity to existing valley communities. The scenario urbanizes 9,596 acres to produce 85,919 residents and 66,265 jobs.

5. **Infill Focused**
   The final land use scenario models a land use pattern based on infill development in existing communities, as new growth is allocated within the Valley Neighborhoods of Linda, Olivehurst, and the Arboga and Plumas Lake area. The scenario preserves the agricultural land outside the extent of current development plans. The scenario urbanizes 5,225 acres, resulting in 83,388 new residents and 64,462 new jobs. Note that these population and job levels are slightly lower (around three percent) than the other two long term scenarios.

Comparison of Long Term Valley Urbanization Scenarios

	Dispersed Development	Compact Growth	Infill Focused
New Residents	85,428	85,919	83,388
New Jobs	66,989	66,265	64,462
Additional Urban Acres	15,137	9,596	5,225

URBANIZATION SCENARIOS ANALYSIS

The urbanization scenarios provide a set of data point estimates that may prove helpful in assessing the link between land use and economic development strategies. The scenarios help show how fiscal and economic indicators could operate based on various future conditions. First, the different modeled development patterns to meet the valley floor population and job increases envisioned for unincorporated Yuba County have significant effects on the overall output of the agriculture sector.

For the short term scenarios, both lead to urban development on current agricultural land. As the table below shows however, the existing agricultural crop mix varies between sites.

Modeled Crop Patterns of Short Term Urbanization Scenarios

	Non-Contiguous Development	Contiguous Development
Crop	*# of Acres*	
Rice	1,000	456
Pastureland	-	79
Corn	-	5
Olives	-	1
Open Space	-	59

In urbanizing this land, both scenarios would add housing, jobs and their associated economic output. As the two scenarios contain similar levels of new dwelling units and jobs, the economic contribution of each would be similar as well. What differs between scenarios is the current value of agricultural output replaced by urbanization: the Non-Contiguous scenario would supplant $1.6 million of existing agriculture production, about twice the level of the Contiguous Development scenario ($766,000). The agriculture value differential between scenarios stems from the larger footprint of the Non-Contiguous scenario (replacing more acres in production) compared to the 600 acre Contiguous Development segment, as well as the higher crop value of rice relative to pastureland and open space. Note that these values include only the farmgate value of crops produced and do not capture any multiplier effects or economic value-add further along the supply chain, nor the market value or ecosystem services.

The fiscal effects of each land use plan also differ by scenario. SACOG inputted both scenarios into IMPACS incorporating existing conditions and Yuba County-specific revenue and cost data.[46] Both scenarios operate under the same assumptions, including how much of the capital infrastructure cost of development accrues to the County and what portion is paid by the developer. Both scenarios mimic the draft technical master plan for a recent proposed development in the county[47] that assigns most capital construction cost to the developer. The developer's share of capital costs includes local street construction; water laterals, distribution and mains;

[46] In addition to the land use allocations the major local data points for the scenarios include annual County revenues and expenditures by category; utility district service areas and existing design and capacity for sewer, water and stormwater; existing valley floor infrastructure (transportation, sewer, water, stormwater); and county residents, households, household size and employees (including the portion in unincorporated Yuba County). The sources for these data, reflecting the above order, are: California State Controller's Office, "Local Government Annual Financial Reports: Counties Annual Report, Fiscal Year 2011-12"; MHM Incorporated, "Draft Technical Master Plan: Employment Village Infrastructure," July 12, 2013; Magnolia Ranch Specific Plan, 2013; Olivehurst Public Utility District and Linda County Water District websites; Yuba County 2030 General Plan; California Department of Finance E5 series, 2012; and the SACOG Employment file, 2012.

[47] MHM Incorporated, "Draft Technical Master Plan: Employment Village Infrastructure," July 12, 2013

stormwater laterals, collection and detention; and sewer laterals. The model assigns major off-site street upgrades and sewer trunk, collection and treatment as public costs, which become the prominent cost differential between scenarios. The County pays all operations and maintenance on new infrastructure and for the increase in police, fire and other local services.

Based on the above assumptions, IMPACS models a County expenditure of approximately $50 million in capital construction costs to service the Non-Contiguous scenario compared to $29 million for the Contiguous Development scenario. In addition to the one-time capital costs, IMPACS also provides estimates for ongoing County operations and maintenance (O&M) costs in the project compared to the new revenue generated by the new development. For the Non-Contiguous scenario the model estimates a total annual County O&M expenditure of $7.5 million to cover infrastructure maintenance and general government, public protection, health and sanitation, public assistance, education, and cultural and recreation outlays. The model predicts the Non-Contiguous scenario would provide $5.7 million a year in County revenues from taxes, licenses and permits, fines, forfeitures and penalties, use of money and property, intergovernmental transfers, charges for services and other revenues. For the Contiguous Development scenario IMPACS models an increase of $6.3 million a year in County revenue with an O&M annual cost of $5.5 million, resulting in a positive fiscal contribution to County finances.

The explanation of the different capital and O&M costs is twofold. First, the relatively compact site design of the Contiguous Development scenario reduces the capital and maintenance costs of laterals and collectors for water, stormwater and sewer infrastructure compared to the Non-Contiguous scenario. Additionally, the Contiguous Development scenario's proximity to existing infrastructure also significantly reduces costs. Notably, the Non-Contiguous scenario requires the construction of an entirely new water supply, treatment, storage and conveyance system while the Contiguous Development scenario meets the new demand by connecting to the nearby existing utility water supply and treatment system. Likewise, the Non-Contiguous scenario would need to construct several miles of new sewer infrastructure to reach the Oliverhurst Public Utility District's extent of service area at approximately McGowan Parkway and Rancho Road. In the model both scenarios build a self-contained stormwater infrastructure.

The difference in revenue by scenario stems from the assumptions of the fiscal model. IMPACS estimates the dwelling units in the Contiguous Development scenario to produce annual property taxes 18 percent higher than the dwelling units in the Non-Contiguous scenario given the higher assessed value per occupant in the mixed use designation. [48] The rest of the difference stems from varying revenue produced by job categories.

[48] AECOM "IMPACS User Guide." Prepared for the Sacramento Area Council of Governments, June 2011.

Immediate-Term Urbanization Scenarios

	Non-Contiguous Development	Contiguous Development
Dwelling Units	3,352	3,294
Jobs	2,496	2,619
Urbanized Acres	1,060	600
Value of Existing Ag Production	$1.6 million	$766,000
County Capital Costs of Development*	$52 million	$29 million
Annual County O&M Costs from Development	$7.5 million	$5.5 million
Annual County Revenue from Development	$5.5 million	$6.3 million
*County capital costs include off-site transportation and sewer infrastructure improvements. The developer pays for all other capital costs.		

The case study's long-term scenarios show a similar pattern. The dispersed development scenario converts 11,127 agriculture acres to urban use. In comparison, the compact growth scenario urbanizes 6,169 agriculture acres and only 2,623 acres are developed in the infill scenario.[49] The development of existing agricultural land reduces the agricultural sector's total output, ranging from $5.6 million a year in the infill scenario to over $17 million in dispersed development based on current crop production. The case study's agricultural scenarios show how the loss in agricultural value can be greater if future cropping patterns shift. For example, conversion of land in the specialty crop scenario could lead up to a loss of $150 million in agricultural value.

Loss of Agriculture Land and Value by Urbanization Scenarios

	Infill Focused	Compact Growth	Dispersed Development
Converted Agriculture Acres	2,623	6,169	11,127
Lost Annual Agriculture Production (base scenario)	$5.6 million	$11.2 million	$17.3 million
Lost Annual Agriculture Production (specialty crop scenario)	$39.5 million	$93 million	$150 million

[49] In addition to agriculture acres, each land use scenario also converts current open space and undeveloped land—2,602 acres from the infill, 3,427 from compact growth, and 4,010 from the dispersed development scenarios. This brings the scenarios' total new urbanized acres to 5,225, 9,596 and 15,137 respectively.

In addition to the changing economic impacts, the project team also analyzed the fiscal results of each urbanization scenario using the IMPACS model.[50] The results produce general sketch-level estimates of capital investment and operations and maintenance (O&M) by development pattern. The model assigns most capital construction costs of new development to the developer. The developer's share of capital costs includes local street construction; water laterals, distribution and mains; stormwater laterals, collection and detention; and sewer laterals. The model assigns major off-site street upgrades and sewer trunk, collection and treatment as public costs, which become the prominent cost differential between scenarios. The County pays all operations and maintenance on new infrastructure and for the increase in police, fire and other local services.

Based on the above assumptions, IMPACS models County infrastructure costs to meet approximately 84,000 new residents and 66,000 jobs in the urban land use scenarios ranging from $500 million in the infill focused to $600 million in the dispersed development scenario. Servicing the new development also varies by land use scenario: IMPACS estimates annual operations and maintenance expenditures of $78 million for the infill scenario, rising to $85 million for the compact growth and $89 million in a dispersed development of the valley floor. Operations and maintenance costs include infrastructure maintenance and general government, public protection, health and sanitation, public assistance, education, and cultural and recreation outlays.

Fiscal Costs of Urbanization Scenarios

County Costs	**Infill Focused**	**Compact Growth**	**Dispersed Development**
Capital Infrastructure Costs^	$500 million	$530 million	$600 million
Capital Costs per Equivalent Residential Unit (ERU)*	$5,293	$7,174	$11,884
Gap per ERU per year (assumes 20-year payback)	$268	$359	$780
Ongoing Annual O&M	$78 million	$85 million	$89 million

^County capital costs include off-site transportation and sewer infrastructure improvements. The model assumes the developer pays for all other capital costs.

*ERUs include residential dwelling units plus non-residential space converted to an equivalent unit at the rate of one ERU per gross 2,500 sq. ft. of non-residential space.

The above analysis provides top-level financial data on the costs of various land use patterns. In addition to these fiscal indicators, each scenario carries further opportunities and constraints not reflected in the cost analysis. For example, the infill-focused scenario would have to navigate its own unique set of challenges to realize the above financial metrics. For example, development plans affecting existing communities often face community resistance that can delay, alter, or even prevent the development from moving forward. In addition, the new jobs and housing slated for existing communities in the infill scenario would alter the makeup of these neighborhoods, and in the short term also disrupt residents through construction and redevelopment. Finally, the infill scenario may not match qualitatively with the manner of development envisioned by Yuba County stakeholders. In comparison

[50] The long-term scenarios use the same inputs described in the short-term scenario section.

to the infill-focused scenario, the dispersed development scenario has its own unique challenges, with the compact scenario a balance between the two. Notably, the dispersed valley growth scenario involves the risk of substantial upfront investment that only pays off if there is a market for the new development. This case study's agricultural analysis suite can provide the county transitional land use strategies as the regional housing market rebounds.

Like other growing areas, Yuba County aims to balance agriculture and other land uses to accommodate long-term population growth, preserve quality of life and foster economic development. This case study reports agriculture data and economic modeling results that may help the County in its broader local assessment of various possible future land uses, but does not delve into the qualitative opportunities and constraints of each land use scenario such as new amenities from urban development that could help attract the modeled new residents and jobs.

APPENDIX 4. YUBA COUNTY ALTERNATIVE FOOD HUB MODEL

As part of this Yuba county case study the project team has prepared a cost estimate and financial analysis of a receiving station and processing facility within Yuba County that can serve as an interim model before construction of a full facility. This technical appendix of the case study presents a proposed conceptual layout and associated cost estimate to construct and equip the facility of approximately 16,800 sq. ft. It also contains an overall estimate for the financial viability of the enterprise. The concept was developed based on:

- An assessment of local and regional market conditions conducted by SACOG and the project team, including site visits and interviews with local government officials, local growers, the Yuba-Sutter Farm Bureau, UC Cooperative Extension, agricultural specialists including lenders and real estate agents, economic development representatives, and North Yuba Grown, a collaborative of growers and value-added producers from Yuba, Sutter and Butte counties.
- The increasing interest on the part of local government officials and agricultural stakeholders in the economic development potential of building local food system infrastructure.
- The role that such a facility could play within the context of broader development of the six-county (and beyond) regional food system infrastructure – the Sacramento Valley Food Hub –providing dedicated market channels for the aggregation, packaging, processing and distribution of fresh local produce.

The conceptual model for the Yuba County facility provides for three core functions, designed to generate revenue from different markets and across seasons as much as possible:

1) To serve as an enhanced receiving station to receive, grade, sort, and aggregate fresh produce for transfer to regional markets;
2) To serve as a local-serving hub to handle the balance of the produce with activities such as trimming and packing for distribution to the local market, especially institutions and businesses;
3) To provide a niche value-added processing line, using as a prototype, walnuts purchased from local sources to produce honey-glazed walnuts.

This piece of added agriculture infrastructure in Yuba County helps address some barriers to growing for the local market. The facility builds market channels for locally grown fresh produce to existing distribution companies and food operations contractors, including those serving schools, hospitals, government facilities and other institutions. In addition, the facility creates a link between growers and Yuba County restaurants, grocery stores and other businesses seeking to increase their selection of local specialty crop. Finally, the Yuba County facility also will provide a market outlet on the grower side, for efforts such as North Yuba Grown.

Overall the Yuba food hub could provide a variety of services. Shown in the table below, some of these activities could generate an additional revenue stream due to the types of services provided, as well as to assist growers in business planning and market development. Research shows that many growers who work with hubs increase the scope and profitability of their farming operations.[51]

[51] SACOG Regional Agricultural Infrastructure Project, "Research Analysis of Food Hub Trends and Characteristics." Conducted by Applied Development Economics, Inc. with Foodpro International Inc., The Hatamiya Group and DH Consulting. June 2014.

SERVICES AND ACTIVITIES OFFERED BY REGIONAL FOOD HUBS

Operational Services	Producer Services	Community/Environmental Services
Distribution	Actively linking producers and buyers	Increasing community awareness of "buy local" benefits
Aggregation	Transportation, on-farm pick up	Distributing to nearby "food deserts"
Brokering	Production and post-harvest handling training	Food bank donations
Branding and market promotion	Business management services and guidance	Youth and community employment opportunities
Packaging and repacking	Value-added product development	SNAP (food stamp) redemption
Light processing (trimming, cutting and freezing)	Food safety and good agricultural process (GAP) training	Health screenings, cooking demonstrations
Product storage	Liability insurance	Recycling and composting programs

Source: Regional Food Hub Resource Guide, USDA Agricultural Marketing Service, April 2012, p. 6

Initially the conceptual facility in Yuba County would provide primarily operational services—receiving, grading and aggregating fresh produce to transfer to the regional food hub and distribution to the immediate local market—as well as value-adding activities on the walnut processing line. The table below summarizes assumptions regarding the estimated levels of production and acreage required to support this alternative facility model, for both fresh produce and processing of honey-glazed walnuts.

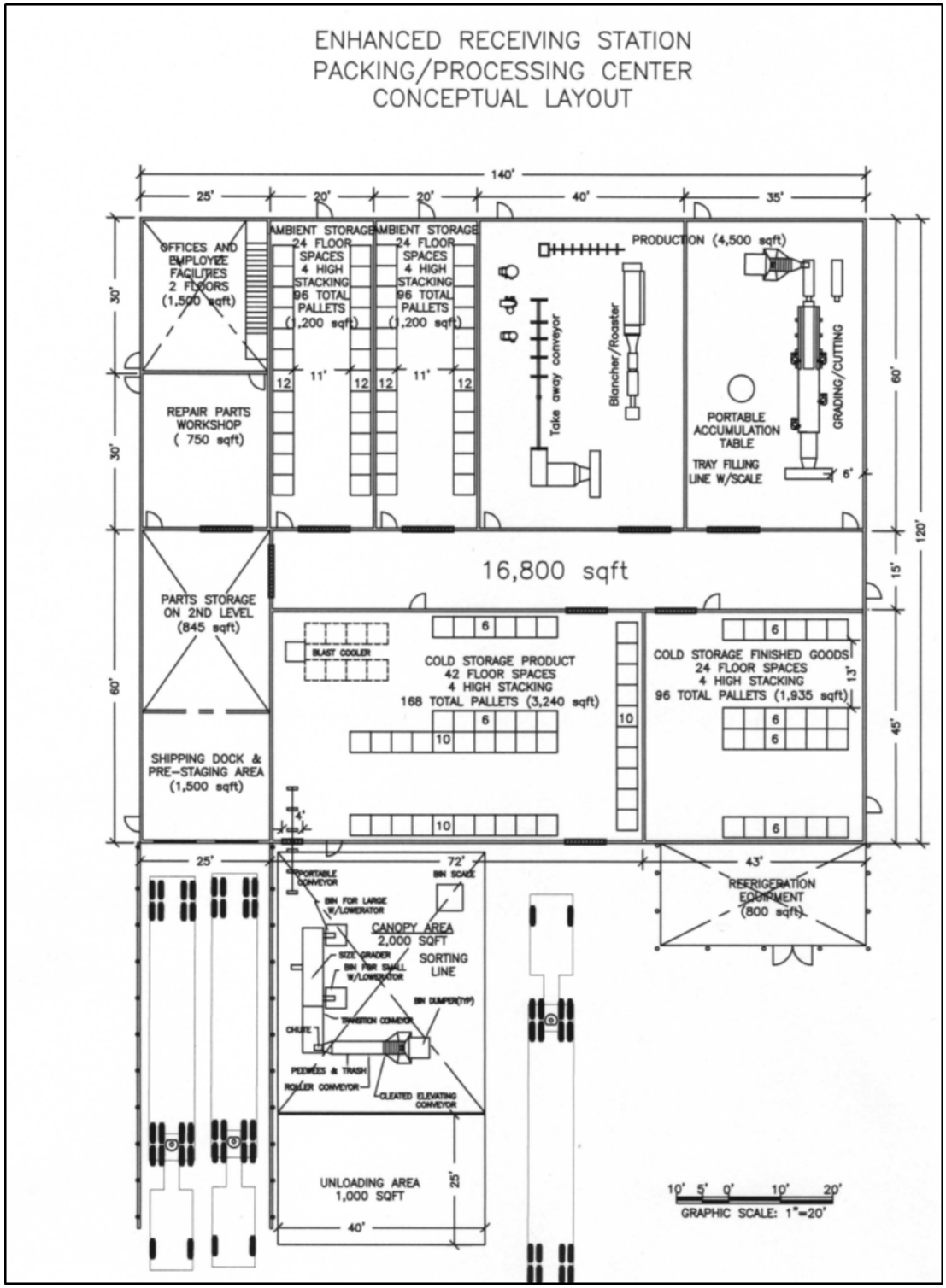
Facility Capital Costs

The graphic below provides schematic of the conceptual layout of a proposed facility to meet these functions. The main body of the facility is 16,800 sq. ft., with additional second level office space and mezzanine space for parts storage, and additional outside areas. The facility is designed for flexibility to accommodate diverse types of produce. The schematic illustrates areas for unloading, the shipping dock and pre-staging area, sorting line, production space for fresh pack, cold storage for raw produce and finished goods, ambient storage for supplies and walnuts, office space, and workshop (production space).

YUBA HUB FACILITY OPERATING ASSUMPTIONS
Operating Times. The facility would operate 7.5 hours per day, five days a week, 50 weeks per year. It assumes that the growers would drop off their produce at the facility.
Production Levels for Fresh Produce. The facility will aggregate/package 1,000 pounds (lbs.) of fresh produce per hour. That adds up to 937.5 tons per year, or 18.75 tons per week (37,500 lbs. per week and 1,875,000 lbs. per year). The facility also will receive, cool and transfer 1,000 lbs. of fresh produce per hour to a larger, regional-serving hub. This adds up to another 937.5 tons per year, for a total of 1,875 tons per year for the two markets.
Fresh Produce Acreage Requirements. The facility's fresh produce line requires a dedicated supply of local fruit and vegetable crop. While the crop acreage needed to provide this supply will vary on the exact crop mix, the project team estimates the alternative food hub model customized to Yuba County would need between 60 and 270 acres of specialty crop production. The range would fall somewhere in between as the hub would provide for a mix of crop types. Given that there was a total of 6,480 acres of harvested acreage in Yuba County in 2012 for miscellaneous fruits and nuts (not including walnuts, almonds, cling peaches, kiwis, or prunes/dried plums) and miscellaneous field and vegetable crops (not including rice and other crops), the acreage requirements are minimal to start.
Processing Line for Glazed Walnuts. The facility will process 300 pounds per hour of honey-glazed walnuts. That adds up to 281 tons per year (11,250 lbs. per week and 562,500 lbs. per year).
Walnut Acreage Requirements. The average yield per harvested acreage of English walnuts in Yuba County in 2012 was 2.1 tons per acre, with 11,560 acres in production. The facility requirements would require production from 134 acres. While most of the County's walnut crop is exported, the project team validated the availability of locally grown crops for the proposed processing line.
Labor: Three employees for the start up

Data Sources: Estimated tons per acre crop yields: 2012 National Agricultural Statistical Services, USDA, for California, UC Davis Cost of Production Studies, and *2012 Yuba County Agricultural Commissioner's Report*; 2012 harvested acreage: *2012 Yuba County Agricultural Commissioner's Report*

Conceptual Layout of Yuba Hub Facility



The table below provides a summary of the major cost categories for the Yuba Facility construction budget estimate. The facility is proposed to be new construction to best meet the needs for the hub's operational functionality, including for a processing line, as determined by the project team engineers. It is often more expensive to retrofit an existing agricultural-related facility than to build a new facility, especially to meet newer environmental and other regulatory requirements. It also must be centrally located to serve its receiving, transfer and distribution functions efficiently.

Table 3. YUBA FACILITY PROJECT INVESTMENT BUDGET BY MAJOR COST CATEGORY	
Cost Center Category	**Total Cost**
Building (140 x 120 sq. ft.) (includes additional mezzanine space for parts storage and second floor office space, and outdoor unloading area, sorting line and area for refrigeration equipment)	$1,205,366
Refrigeration (includes materials and installation)	$ 248,571
Production Equipment (fresh fruits/vegetables/greens) (includes outdoor pre-grading, packing line, walnut glazing line, production related systems and equipment, contractors' services, freight	$ 694,897
Produce Handling/Storage (includes racks in storage areas)	$ 91,200
Fire Protection	$ 3,300
Auxiliary Systems and Equipment (includes power service connections, product moving equipment, utilities, office and employee space equipment)	$ 617,000
Mobilization (includes permits, testing, surveys, etc.)	$ 46,302
Engineering and Management (includes design services and construction management)	$ 348,796
Contingency (at 10%)	$ 325,543
Project Value (capital required to build)	$3,580,976

The project could be developed by a for-profit, nonprofit, or blended model enterprise. A companion document prepared for SACOG on Hub Research Findings provides examples of various hub business models. The total estimated project investment for this hub model is approximately $3,580,976, with $1,926,008 for the total building costs (including permits, testing, surveys – mobilization, design services, construction management, and contingency) and $1,654,968 for production equipment, refrigeration equipment, utilities and other costs. The budget does not include costs for the site (land). It is possible that a subsidy or assistance could be provided by the jurisdiction where the facility would be located, based on the project's economic and social benefits, or that federal or state funding could be secured to assist with project development costs. New state programs are providing resources such as rebates on manufacturing equipment and there are utility programs, which can provide incentives to increase energy efficiencies, including for food processing companies. It is assumed that the facility will be located in an area already serviced with infrastructure, and that water for fire protection will be available at appropriate pressure. The costs for hydrants and associated piping are not included. The budget also does not include produce traceability and inventory software, which would be part of operating expenses. This technical appendix ends with a detailed estimate of the construction budget by major cost category and sub-category.

Facility Operating Expenses and Revenues

In addition to the capital costs of construction, once the facility is up and running it will incur ongoing operating expenses. Major operating expense categories include the purchase of fresh produce inputs (cost of goods sold – COGS), as well as labor, utilities, packing and storage supplies (including pallets, bins, and labeling materials), maintenance supplies, transportation, advertising and promotion, insurance, and produce tracking system. The result of these ongoing operations is value-adding activity through the facility's aggregation and light processing functions that generate revenue to the facility operator. The table below compares the conceptual facility's estimated annual revenue to ongoing costs including amortization of the initial capital investment, including earnings before interest, taxes, depreciation and amortization (EBITDA), an indicator of potential profitability.[52]

Yuba County Alternative Food Hub Model: Estimated Financial Feasibility
Annual Revenue - $4,446,700 ($2,198,700 from fresh produce and $2,248,000 from glazed walnuts)
Estimated Expenditures - $3,433,000 (costs of goods sold, labor, operating costs)
Net Operating Income (EBITDA) - $1,013,700
Annual Profit - $273,000

Source: Foodpro International, Inc.

[52] The COGS include the cost of raw produce and the cost of packaging. As a general rule, the COGS should average about 50 percent of revenue but vary by crop. The project team's screening criteria identified higher margin crops.

The initial financial assessment indicates that the facility would initially provide a positive although relatively small return on investment. This finding imitates the detailed pro forma the project team developed for a generic food hub in the region that realizes increasing returns by scaling up operations.[53] The goal would be to operate the facility eventually for at least two shifts per day, which would provide the opportunity for an even higher rate of return.

[53] The Pro Forma Toolkit prepared for the Sacramento Valley Food Hub provides information on how to conduct a more detailed financial analysis for a food hub facility.

Line-Item Costs of Yuba Facility

Job-Cost-Center Category	Quantity	Units	Unit-Cost	Total Cost
BUILDING* (140 x 120 SF)	**16,800**	**S.F.**	**70**	**1,205,366**
Main Floor Building	16,800	S.F.	50	840,000
Production space, fresh pack	4,500	S.F.		
Cooler, raw produce (product)	3,240	S.F.		
Cooler, finished produce (goods)	1,935	S.F.		
Shipping dock & prestaging area	1,500	S.F.		
Workshop and corridor	2,475	S.F.		
Ambient storage - supplies	1,200	S.F.		
Ambient storage - produce (walnuts)	1,200	S.F.		
1st floor offices	750	S.F.		
Cold Store Doors, Horizontal Slide, 8x10, installed	3	EA.	9,456	28,368
Rapid Rollup Door, Staging Area, 8X10	1	EA.	12,000	12,000
Electrical Single Slide Door, Ambient Spaces, 8x8	3	EA.	4,562	13,686
Rollup Door, Conditioned Production space	1	EA.	5,210	5,210
Metal Rollup Door, Repair Shop, 12x12	1	EA.	3,050	3,050
Man doors, 3x8, cold store, installed	6	EA.	1,605	9,632
Dock equipment (doors, seals, levelers)	2	EA.	12,960	25,920
Offices & Employee facilities on 2nd Level	750	S.F.	50	37,500
Mezzanine (parts storage, second level)	845	S.F.	50	42,250
Depressed truck dock	1,850	S.F.	35	64,750
Slabs on grade w/canopy, outdoor refrigeration	2,800	S.F.	35	98,000
Unloading area	1,000	S.F.	25	25,000
** Includes structures & general MEP (mechanical, engineering, plumbing)*				
REFRIGERATION*	**25.71**	**TR**	**9,667**	**248,571**
Pre-cooler unit, portable	1.00	EA.	30,000	30,000
Raw produce storage, 385 SF/TR	-	TR	8,500	71,532
Finished produce storage, 385 SF/TR	-	TR	8,500	42,721
Staging area & dock, 200 SF/TR	-	TR	8,500	63,750
Process area at 50 dF, 440 SF/TR	4.77	TR	8,500	40,568
** includes materials and installation*				
PRODUCTION EQUIPMENT (FRESH PRODUCE AND VALUE ADDED)				**694,897**
OUTDOOR PRE-GRADING, 10 TONS/HR				***107,044***
Bin Dumper, used	1	EA.	2,000	2,000
Receiving hopper w/take-away conveyor	1	EA.	15,000	15,000
Transition conveyor	1	EA.	10,000	10,000
Size grader (e.g. Kerian)	1	EA.	28,674	28,674
Take-away conveyors, variable speed, 6 ft., 30" w	3	EA.	3,000	9,000
Telescopic transfer conveyor, totes	1	EA.	9,000	9,000

Job-Cost-Center Category	Quantity	Units	Unit-Cost	Total Cost
Bin fill lowerator	3	EA.	10,000	30,000
Floor platform scale	1	EA.	1,620	1,620
Peewees/trash/cull take-away conveyor	5	LF	350	1,750
PACKING LINE FOR FRUITS & VEGETABLES	**2**	**TON/HR**		***141,356***
Receiving hopper w/cleated take-away conveyor	1	EA	5,500	5,500
Peewees/trash/cull take-away conveyor	10	LF	350	3,500
Brush washer	0	EA	24,000	-
Peeler	0	EA	24,000	-
Combo washer/peeler (Magnuson), 1 Ton/Hr.	1	EA	36,000	36,000
Sanitation system for the washer	1	EA.	7,560	7,560
Dewatering	1	EA.	7,000	7,000
Transfer conveyor (vibratory)	2	TON/HR	8,000	16,000
Take-away conveyors, variable speed, 6 ft., 30" w	3	EA.	3,000	9,000
Sorting conveyor	25	LF	1,000	25,000
Rotary packing table, 4 ft. dia.	1	EA	4,000	4,000
Roller conveyor, caster stand, 12 ft., 30" wide	2	EA	9,000	18,000
Roller conveyor, caster stand, 24 ft., 24"-30" wide	0	EA	15,000	-
Metal detector & check weigher combo, used	1	EA	6,000	6,000
Inkjet coder, industrial	0	EA	1,615	-
Inkjet coder, handheld	2	EA	350	700
Carton closer/sealer, mechanical	0	EA	2,160	-
Carton sealer, handheld	2	EA	200	400
Labeler	1	EA	1,296	1,296
Manual scales	4	EA	350	1,400
WALNUT GLAZING LINE	***200***	***LB/HR***		***83,766***
Belt feeder	1	EA	8,359	8,359
Conveyor	1	EA	12,636	12,636
Blancher/roaster	1	EA	15,044	15,044
Spreading conveyor	1	LF	1,296	1,296
Take-away conveyor, variable speed, 6 ft., 30" w	2	EA	3,240	6,480
Kettles (sugar solution, cooking, oil solution)	3	EA	5,130	15,390
Coating tumbler	1	EA	2,160	2,160
Tray dryer	1	EA	10,000	10,000
Bagger, semi-mechanized, used	1	EA	5,000	5,000
Manual scales	4	EA	350	1,400
Metal detector & check weigher combo, used	1	EA	6,000	6,000
PRODUCTION RELATED SYSTEMS & EQUIPMENT	***200***	***LB/HR***		***19,900***
Traceability hardware (computer, scale, printer, etc.)	1	SET	8,000	8,000
Drip pans	80	LF	80	6,400
QC check weighing cart	1	EA.	1,500	1,500
Metal detectors	1	EA.	4,000	4,000
Box making machine	0	EA.	34,560	-

Job-Cost-Center Category	Quantity	Units	Unit-Cost	Total Cost
CONTRACTOR SERVICES	***200***	***LB/HR***		***332,866***
Mechanical Installation, Process Equipment	40	percent	324,766	132,866
Electrical Installation	800	Amps	250	200,000
FREIGHT	***3***	***percent***	***324,766***	***9,965***
PRODUCE HANDLING/STORAGE				**91,200**
Racks, Cooler, raw produce	168	position	200	33,600
Racks, Cooler, finished produce	96	position	200	19,200
Racks, ambient storage	192	position	200	38,400
FIRE PROTECTION				**3,300**
Sprinkler system	-	SF	2.8	-
Fire extinguishers - allowance	11	EA	300	3,300
Fire hydrant system	0	LF	200	-
Water tank	0	EA	52,000	-
Pump house	0	EA	50,000	-
Sprinkler system	-	SF	2.8	-
AUXILIARY SYSTEMS & EQUIPMENT				**617,000**
Power service (PG&E), 3/480, 1000 Amps	1	cnnct	50,000	50,000
NG service (PG&E), 2000 MBTUH, allowance	1	cnnct	50,000	50,000
CIP skid	0	EA.	75,000	-
Hot water pressure washer, electric, portable	1	EA.	12,000	12,000
Forklift trucks, electric, w/misc. attachments	1	EA.	36,000	36,000
Pallet jacks, electric	1	EA.	12,000	12,000
Pallet jack, manual	2	EA.	2,000	4,000
"Big Joe" lift truck	0	EA.	15,000	-
Forklift battery charging station	1	EA.	10,000	10,000
Floor scale, for pallets	1	EA.	12,000	12,000
Truck scale	0	EA.	75,000	-
Air compressor, packaged unit	15	HP	1,200	18,000
Compressed air piping system, installed	40	CFM	650	26,000
Water well	0	LOT	50,000	-
Water treatment system allowance	0	LOT	40,000	-
Wastewater treatment allowance	1	LOT	25,000	25,000
Septic system (for black sewer)	1	EA.	40,000	40,000
Site grading incl. for retention ponds & bldg. pad prep.	1	LOT	80,000	80,000
Spent process water collection system	1	LOT	100,000	100,000
Storm water retention pond	0	EA.	180,000	-
Site fencing	1200	LF	15	18,000
Pavement (roads & parking)	40000	SF	2.5	100,000
OFFICE & EMPLOYEE SPACE				**24,000**
Furniture (allowance)	1	LOT	6,000	6,000
Computers & other hardware (allowance)	1	LOT	6,000	6,000
Lunch room equipment, counters & cabinets	1	LOT	12,000	12,000

Job-Cost-Center Category	Quantity	Units	Unit-Cost	Total Cost
Commissary kitchen (allowance)	0	LOT		-

MOBILIZATION				**46,302**
Permits, 0.5% OF VALUATION	1	prjct	12,326	14,302
Testings	1	prjct	7,000	7,000
Surveys, stacking, temporary facilities, etc.	1	prjct	25,000	25,000
ENGINEERING & MANAGEMENT				**348,796**
Design services	7%	prjct		203,465
Construction Management	5%	prjct		145,332
CONTINGENCY	10%			**325,543**
PROJECT VALUE (CAPITAL TO BUILD)*				**$ 3,580,976**

* Does not include traceability & inventory software

Sales Tax Rate: 8% Yuba County