

Economic Contributions of Santa Barbara County Agriculture



"Crop Report PLUS" Series

Agricultural Impact Associates 

"Quantifying the value of California agriculture"



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Economic Contributions of Santa Barbara County Agriculture

OVERVIEW: Santa Barbara County Agriculture:

...contributes a total of \$2.8 billion to the local economy, including:

- ✓ \$1.8 billion in direct economic output.
- ✓ \$1.0 billion in additional economic output in the form of expenditures by agriculture companies and their employees.

...provides 25,370 jobs in Santa Barbara County economy, including:

- ✓ 15,971 direct employees.
- ✓ 9,399 additional jobs, made possible by expenditures by agriculture companies and their employees.

...infuses \$53.5 million in indirect business tax payments, which represents 6.2% of the county's entire annual \$866 million budget.

...has exceptional diversity that provides economic stability within agriculture and to the county economy as a whole (Diversity Index of 2.49).

...provides a wide range of non-market values to the county through "ecosystem services" such as scenic beauty, water purification, and carbon sequestration.

Introduction

Residents and visitors alike know and value the rural character of Santa Barbara County. Farmers markets overflow with fresh produce and community spirit. Cattle, sheep, emu and other livestock graze the hillsides. Strawberries, grapes, and more than a hundred other crops grow in the fertile soils and moderate micro-climates. Clearly, agriculture plays a key role in sustaining a healthy local economy. What's not so clear, however, is the true size of that role. How much income does agriculture pump into the local economy? How many jobs does agriculture support? In other words, just how important is agriculture as a driver of the county's economic health?

This report sheds light on these and related questions. Using multiple data sources and advanced economic modeling techniques, it analyzes agriculture's total contribution to the Santa Barbara County economy. The report also examines agricultural diversity and its role in supporting economic resiliency, including a first-ever quantitative measure. Last, the report discusses the value of scenic beauty, carbon sequestration, and several other "ecosystem services" provided by the county's agricultural lands. On the whole, the findings offer important new information for policy makers, the public, and anyone who values a vibrant local economy.



Our Approach

When it comes to economic analysis, it is important to examine the fullest possible range of economic contributions. This report does that by focusing not just on *direct* economic effect such as farm production and employment, but also on *multiplier effects*. *Multiplier effects* are ripples through the economy. These ripples include inter-industry "business to business" supplier purchases, as well as "consumption spending" by employees. The **Multiplier Effects** section explains this further. Since 1988, the county's annual Crop Reports have always included a single, generic sentence about multiplier effects. This report takes that tradition to a whole new level.

It is appropriate to calculate *multiplier effects* when analyzing what economists call a *basic industry*. A *basic industry* is one that sells most of its products beyond the local area and thus brings outside money into local communities. Agriculture is a basic industry in Santa Barbara County, so this report includes *multiplier effects* when describing agriculture's total economic contribution.

Our analysis only examines agriculture's economic contributions. To understand agriculture's full economic impact, one would also need to assess agricultural-related costs to society, for example net impacts on water and other natural resources. These impacts are important but lie beyond the scope of this study.

Our calculations draw from local and national data sources. Local sources include annual Crop Reports and industry experts. Local experts included agriculture industry organizations and individuals who provided critical input into the research. National data sources included federal government statistics and a widely used economic modeling program called IMPLAN®. Where data judgments were required, we used the most conservative (lowest) numbers and adjusted IMPLAN figures based on consultations with local experts and other sources. Except where otherwise noted, all figures are from the year 2011. Please contact the authors for additional details on the methods used.

Historical Perspective

Santa Barbara County's long agricultural tradition offers important perspective. This short section provides a glimpse into the County's rich agricultural past. We include it as a reminder of the agriculture's central role and profound changes over time: changes that continue to affect everyone who lives, works, and plays in the county.

One of the original 27 California counties, Santa Barbara County was created 1850 at the time of California statehood. At that time, it was home to the Presidio of Santa Barbara and Mission Santa Barbara, both of which were surrounded by pasture lands.

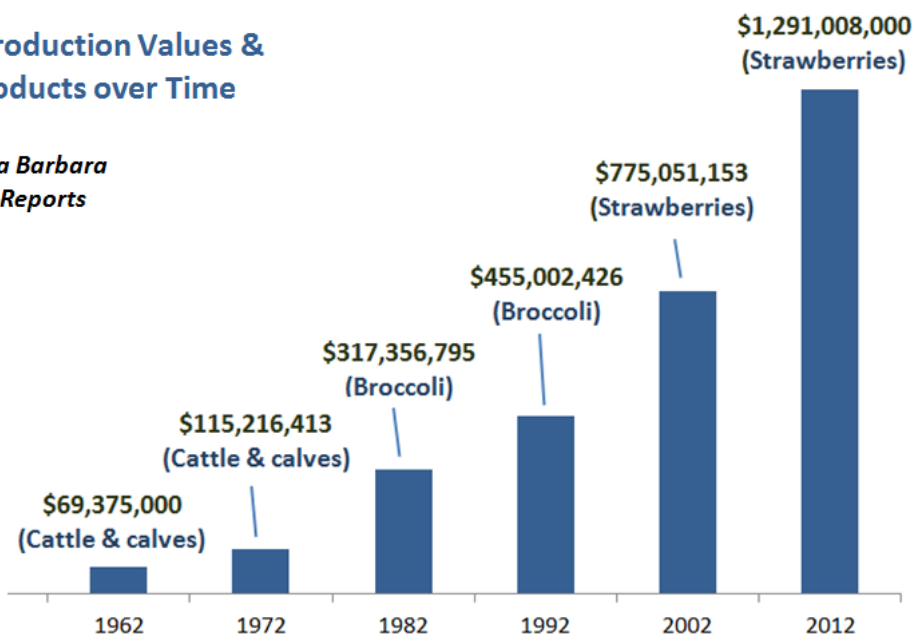


Lawmakers eventually divided pasture lands into ranches and granted them to local residents. Agriculture continued to thrive over the ensuing century and a half. Today, agriculture is a major economic force in the county and statewide. Among 48 California counties, Santa Barbara currently ranks 12th for overall production value, with strawberries leading the way. **Figure 1** on the next page shows growth in total production for the latter half of this period. It also shows how top crops have shifted over time.

Why has agriculture done so well for so long? Several possible reasons exist, among them a uniquely favorable landscape and the county's supportive local population. Regarding the landscape, a combination of topographical diversity, rich loamy soils, and moderate coastal climate combine to create micro-climates with near perfect growing conditions for a wide variety of crops. Early agriculture focused on animals such as cattle, calves, dairy, horses, sheep and pigs. Over time, however, cropping patterns shifted from field crops and irrigated pasture to more labor intensive, high value crops. Strawberries, broccoli, wine grapes, lettuce, and avocado now top the list of leading crops. All told, today's growers produce more than 200 different crops commercially, compared to only 50 crops in 1942.

Figure 1. Production Values & Leading Products over Time

Source: Santa Barbara County Crop Reports



Regarding the second reason – supportive local population – county residents and their elected officials have long recognized agriculture's economic and cultural importance. County governments have taken concrete steps to preserve agriculture and its critical role in the county economy. One example of this commitment is participation in the Agricultural Preserve Program, a long-term conservation program for agricultural and open space lands. The program enrolls land under The Williamson Act, a 1965 state law allowing Farmland Security Zone contracts. The contracts restrict land to agricultural, open space, or recreational uses in exchange for reduced property tax assessments.

Landowners dedicated the majority of the county's Williamson Act agricultural preserves in the late 1960s and early 1970s. Since then, landowners have enrolled additional properties in the Cuyama area, Los Alamos, and along the Gaviota Coast, including some lands just west of Goleta. The County currently has approximately 1,275 agricultural preserve contracts. These contracts cover nearly 550,000 acres of the 709,000 acres of productive agricultural lands that are in private ownership.



Despite these successes, the county's agriculture faces constant challenges. Urban sprawl is a key one. As a coastal county in a heavily populated state, Santa Barbara County faces constant pressure from expanding human population centers. Shifts in where people live have brought new challenges, including land use conflicts. Such conflicts often lead to costly new regulations on growers such as permit requirements and conditions on operations. Local government agencies face a tough balancing act. They must respond to the needs of all constituents (including a growing urban population) without creating onerous regulations that result in more conversion of agricultural lands to other uses. The rest of this report provides critical economic analysis that can help inform these important decisions.

"Direct Effects" of Santa Barbara County Farm Production

This section focuses on the simplest measures of economic output: production and employment. It describes total farm production and how production has changed over recent years, as well as the number of agriculture jobs.

Figure 2 shows the various categories that make up Santa Barbara County farm production value. Fruit and Nut Crops are the single largest production category by dollar value (44%). Key crops in this \$520 million category include strawberries (\$367 million), wine grapes (\$77 million), and avocados (\$58 million). Vegetable Crops represent the second largest category (\$437 million), including key crops such as broccoli (\$127 million) and lettuce (\$93 million). Together, these two categories account for just over 80% of the county's direct farm production values.

Total farm production value for 2011 was \$1.19 billion. This figure comes from the annual Crop Report survey administered by the Office of the Agricultural Commissioner, with validation by the federal government's economic data and by modeling from IMPLAN. This is a gross value that does not reflect net profit or loss experienced by individual growers or by the industry as a whole. Also, the figure does not include certain sectors that some California counties include under Agriculture, for example, forest products (\$1.3 million) and commercial fishing (\$3.2 million).

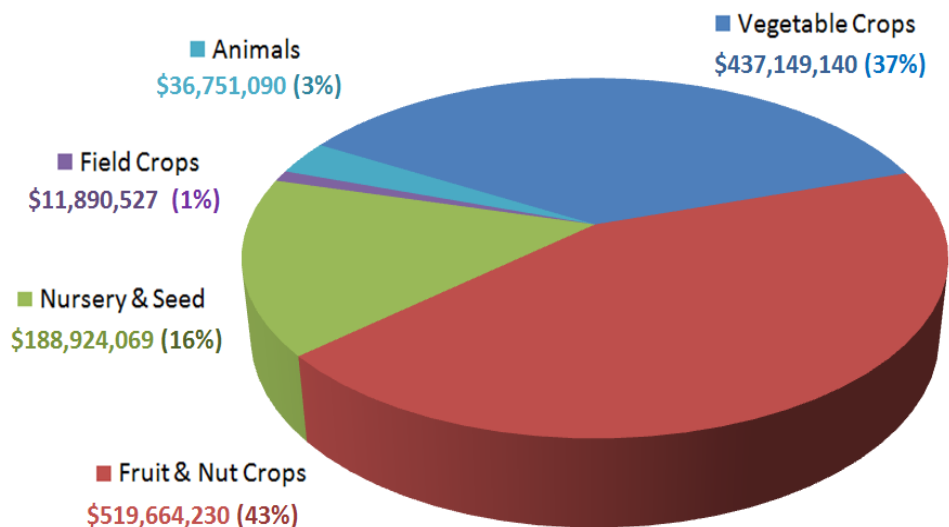


Figure 2. Distribution of Santa Barbara County Agriculture by Production Value

Source: IMPLAN and 2011 Santa Barbara County Crop Report

How has farm production changed over time? Crop Reports often show production trends for the ten previous years.

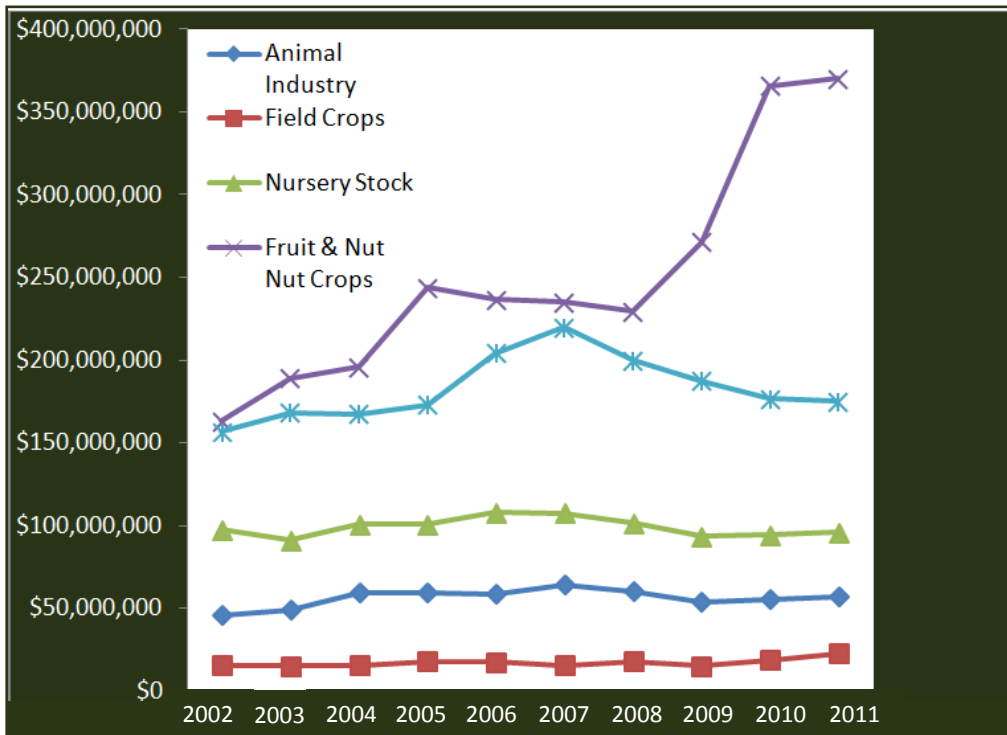
Figure 3 takes the 10 year trend a step further by specifying not just the production trend, but also the growth rates. It also adjusts for inflation using a standard measure called the Consumer Price Index (CPI).



For example, the cumulative growth in agricultural production for ten years following 2001 was 67.4% (from \$713.1 million to \$1.2 billion). This growth is especially impressive given that two economic recessions occurred during this time. Based on the federal government's Consumer Price Index, inflation totaled 27% over the decade, meaning the "real" (inflation adjusted) production increase was 40.4%, much less than the original figure. Growers reported more revenue than ever in 2011, but they also paid 27% more for tractors, seed, gas, and everything else compared to a decade prior. **Figure 3** also shows inflation-adjusted effects on specific production categories. For example, Field Crops and the Animal Industry were both negative for the decade.

Figure 3. Ten Year Trends in Gross Production Values

Selected Farm Production Sectors	Production Value		Total Change	Inflation-Adjusted
	2001	2011		
Vegetable Crops	\$282,524,294	\$437,149,140	54.7%	27.7%
Fruit & Nut Crops	\$242,102,144	\$519,664,230	114.6%	87.6%
Nursery & Seed	\$133,989,754	\$188,924,069	41.0%	14.0%
Field Crops	\$12,048,232	\$11,890,527	-1.3%	-28.3%
Animal Industry	\$43,025,723	\$36,751,090	-14.6%	-41.6%



Employment in Farm Production

How many people work in agricultural production? For 2011, agricultural production directly employed 14,298 people in Santa Barbara County. This figure represents 5.9% of the 243,860 jobs known to exist in Santa Barbara County. It includes farm workers as well as proprietors but does not include food processing jobs, which we discuss below. The total also excludes minor employment attributable to the forestry sector (5 jobs) and commercial fishing (55 jobs). Unfortunately, employment data for prior years are incomplete and poor quality, making historical comparisons impractical. Also, local experts indicate a growing labor shortage problem, with potentially large economic implications stemming from fewer workers and higher costs.



"Multiplier Effects" of Santa Barbara County Farm Production

This section quantifies the economic "ripples" that farm production creates in the local economy. These ripples take two forms: *indirect effects* and *induced effects*. The first consist of "business to business" supplier purchases. For example, when a grower buys farm equipment, fertilizer, seed, insurance, banking services, and other inputs, the grower creates *indirect effects*. The second ripple type, *induced effects*, consist of "consumption spending" by agriculture business owners and employees. They buy housing, healthcare, leisure activities, and other things for their households. All of this spending creates ripples in the economy.

Figure 4 shows agriculture's direct, indirect, and induced economic effects within the county, for major production categories. The numbers are based on IMPLAN, which is rooted in U.S. Bureau of Economic Analysis production categories and data, with adjustments based on local research and expert input. Note that category names differ from Crop Reports. They follow a standard classification system used nationwide called the North American Industrial Classification System (NAICS). Each NAICS category has an explicit definition. For example, "Support activities for agricultural production" refers to soil preparation, planting, cultivating, harvesting, labor contracting, postharvest crop activities, and various other farm management services.

Figure 4: Economic Effects of Farm Production

Farm Production Sectors	Output Effect (\$ Millions)			TOTAL
	Direct	Indirect	Induced	
Vegetable and melon farming	\$399.2	\$119.4	\$123.0	\$641.5
Fruit farming	\$326.9	\$97.0	\$117.7	\$541.6
Support activities for agriculture & forestry	\$180.7	\$17.1	\$97.7	\$295.5
Greenhouse, nursery, & floriculture production	\$184.5	\$23.4	\$79.0	\$286.8
All other crop farming	\$43.6	\$18.0	\$10.3	\$71.9
Cattle ranching and farming	\$19.3	\$8.8	\$2.6	\$30.7
Tree nut farming	\$8.3	\$2.2	\$3.3	\$13.8
Grain farming	\$4.2	\$1.8	\$0.7	\$6.6
Dairy cattle and milk production	\$3.9	\$1.2	\$0.4	\$5.5
Poultry and egg production	\$3.8	\$0.8	\$0.5	\$5.2
Animal production (except cattle/poultry/eggs)	\$2.7	\$0.6	\$0.5	\$3.7
TOTAL ECONOMIC OUTPUT:	\$1,177.1	\$290.3	\$435.7	\$1,902.8
	Employment Effect (# Jobs)			
	Direct	Indirect	Induced	
TOTAL EMPLOYMENT:	14,298	3,623	3,623	21,544

Sources: IMPLAN, U.S. Bureau of Economic Analysis, and local industry experts



BOTTOM LINE: Agricultural production created \$1.9 billion in total economic output within Santa Barbara County. The indirect and induced spending supported an additional 7,246 jobs within the county, bringing agricultural production's total employment to 21,544.



Locally Sourced, Value Added Food Processing

Farm production tells only part of the story. Santa Barbara County is home to *locally sourced, value added* food processors that play a key role in the local economy. This section captures the economic value of local food processing. It is neither an exact science nor a full assessment, but rather gives the reader a basic overview of the topic.

To avoid overstating the numbers, we only included food manufacturers and sectors that fit two strict criteria: 1) they use mostly local agricultural inputs; and 2) they are unlikely to exist here without the presence of the associated agricultural sector. Many processing facilities would not exist in Santa Barbara County were it not for the abundant supply of animals, vegetables, fruit, and other raw agricultural products. We did not include sectors that source raw products outside the county, for example Santa Barbara's \$86 million per year soft drink manufacturing sector which gets its sweeteners, flavoring agents, and other key ingredients elsewhere.

We also took precautions to avoid double-counting. For example, we did not factor wine grape production into this section because the Farm Production section above already captures the dollar value of wine grapes. We only calculated the dollar value that wineries add to wine grapes by producing wine. Note that the local wine industry (e.g., Santa Barbara Vintners' Association) has commissioned studies providing in-depth analysis beyond what is possible in this shorter, more general study.

Figure 5 shows the economic effects of locally sourced, value added food processing. As described earlier, it uses relevant categories and data adapted from IMPLAN, which come from the U.S. Bureau of Economic Analysis and the NAICS. For example, the category "All other food manufacturing" includes processed leafy greens, peeled or cut vegetables, and other perishable prepared foods. We selected categories and validated the numbers in consultation with local agriculture experts and other sources.



Figure 5: Economic Effect of Locally Sourced, Value-added Food Processing

Selected Food Processing Sectors	Output Effect (\$ Millions)			TOTAL
	Direct	Indirect	Induced	
Wineries	\$534.1	\$168.3	\$87.2	\$789.6
Frozen food manufacturing	\$69.9	\$20.7	\$10.0	\$100.6
Other animal food manufacturing	\$26.1	\$4.6	\$1.9	\$32.6
Fruit & vegetable canning, pickling, & drying	\$7.6	\$2.0	\$0.9	\$10.5
Ice cream and frozen dessert manufacturing	\$3.9	\$0.8	\$0.5	\$5.2
TOTAL ECONOMIC OUTPUT:	\$641.6	\$196.4	\$100.5	\$938.5
	Employment Effect (# Jobs)			
	Direct	Indirect	Induced	
TOTAL EMPLOYMENT:	1,673	1,317	836	3,826

Sources: IMPLAN, U.S. Bureau of Economic Analysis, and local industry experts

BOTTOM LINE: Local food processing produced an estimated \$641.6 million in direct output. Multiplier effects brought the total value to \$938.5 million. The sector directly employed 1,673 workers. These workers and their employers spent enough money in the local economy to support an additional 2,153 jobs, bringing the total food processing employment effect to 3,826. Wineries accounted for 84.1% of total output and 85.3% of total employment.

Total Economic Contribution of Santa Barbara County Agriculture

The previous sections have provided key pieces to an economic puzzle. This section combines those puzzle pieces into a final picture showing the overall economic effect of Santa Barbara County agriculture.

As **Figure 6** shows, the total economic contribution of Santa Barbara County agriculture is just over \$2.8 billion. This consists of \$1.8 billion in direct output from production and processing, plus \$1.0 billion in multiplier effects. Total employment is 25,370. This entails 15,971 jobs directly in agriculture, or about 1 out of every 15 county jobs. Agriculture companies paid \$53.5 million in indirect business taxes. This included excise taxes, property taxes, fees, licenses, and sales taxes, but did not include taxes on profit or income. To put that number in perspective, it represents about 6.2% of the entire \$865.9 million Santa Barbara County budget for 2011-2012.

Figure 6. Overall Economic Effect of Santa Barbara County Agriculture

Type of Effect	Direct	Indirect	Induced	TOTAL
FARM PRODUCTION				
Output Effect (\$ Millions)	\$1,177	\$290	\$436	\$1,903
Employment Effect (# Jobs)	14,298	3,623	3,623	21,544
LOCALLY SOURCED, VALUE-ADDED FOOD PROCESSING				
Output Effect (\$ Millions)	\$642	\$196	\$101	\$939
Employment Effect (# Jobs)	1673	1,317	836	3,826
TOTAL VALUE OF AGRICULTURE				
Output Effect (\$ Millions)	\$1,819	\$486	\$537	\$2,842
Employment Effect (# Jobs)	15,971	4,940	4,459	25,370

The Value of Agricultural Diversity



Economists may disagree on a lot of things but there is one thing they all can agree on: a diverse economy is a resilient economy. Any region that depends on a large number of economic sectors will generally be less vulnerable to catastrophic shocks. This important economic principle applies to agricultural diversity, too. For example, a county with just one or two main crops faces higher vulnerability to shocks in the form of price drops, disease outbreaks, new regulations, new competitors, spikes in the cost of key inputs, and other unpleasant surprises. Meanwhile, a county with a diverse agricultural industry can withstand shocks to certain crops without unraveling the entire agricultural economy. Bottom line: having "all your eggs in a single basket" is never a good idea, especially when it comes to something as economically important as agriculture. Agricultural diversity is like a valuable insurance policy against economic calamity, the premiums and coverage for which have never been calculated.

Unfortunately, robust measures of Santa Barbara County's agricultural diversity do not exist. People see diverse crops growing in well-tended fields and farmers markets overflowing with different kinds of food. They know the county ships a wide range of products to more than three dozen countries worldwide. But no one has attempted to quantify that diversity. Part of the reason is that measuring diversity is a complex job. It requires more than just counting the different things for sale at the farmers market or listed in the annual Crop Report. Measuring diversity includes the number of different crops grown as well as assessing their economic abundance or evenness.

For example, imagine two California counties where the annual farm production value is \$100 million each. Both counties grow ten different kinds of crops. In County "A," a single crop contributes 91% of the revenue and the nine other crops make up 1% each (see **Figure 7** below). In County "B" the ten crop types all contribute equally, at 10% each. *Both counties have the same number of crops and total revenues, but County "B" is much more diverse.* Thus, we could expect County "B" to be much more resilient to economic shocks than County "A".

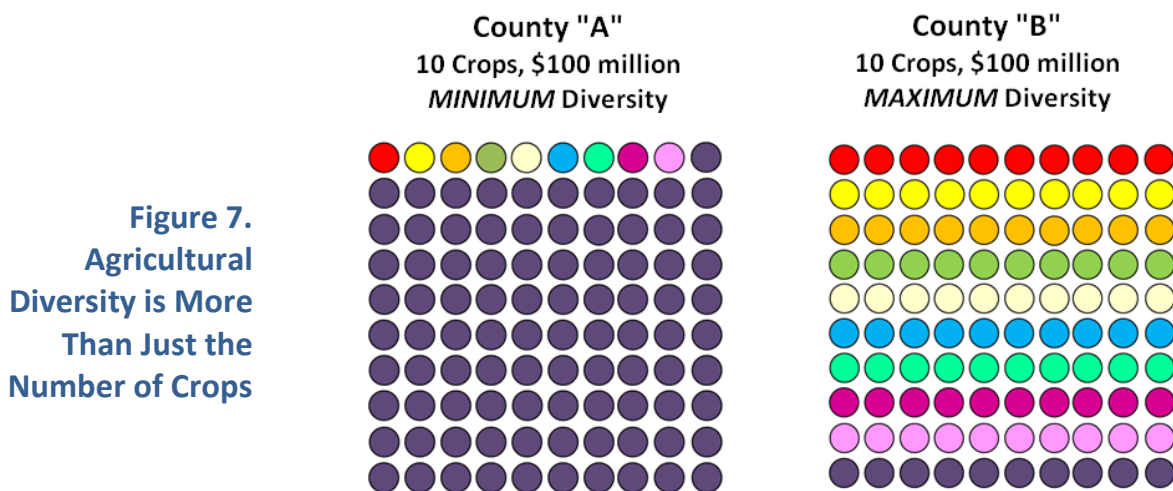


Figure 7.
Agricultural
Diversity is More
Than Just the
Number of Crops

Because economic diversity is so important, economists have developed sophisticated tools for measuring it. The most popular one is a summary statistic called the Shannon-Weaver Index. The index is based on the Shannon-Weaver entropy function, which was created in 1949 and is widely used in both ecology and economics. Economists and ecologists alike use the same formula to calculate the Shannon-Weaver Index, which we share here and can explain further to interested readers:

$$SW_t^k = - \sum_{n=1}^k p_n * \ln (p_n)$$



The lowest possible index score is 0.00. Zero represents an extreme case where all economic output occurs in only one sector. In ecology, this could be a rainforest with only one species. In agriculture, it would be a county with just one commercial crop. The other extreme – an open system where potential diversity is unlimited – would have a much higher score. The higher the score, the greater the diversity and economic resiliency.

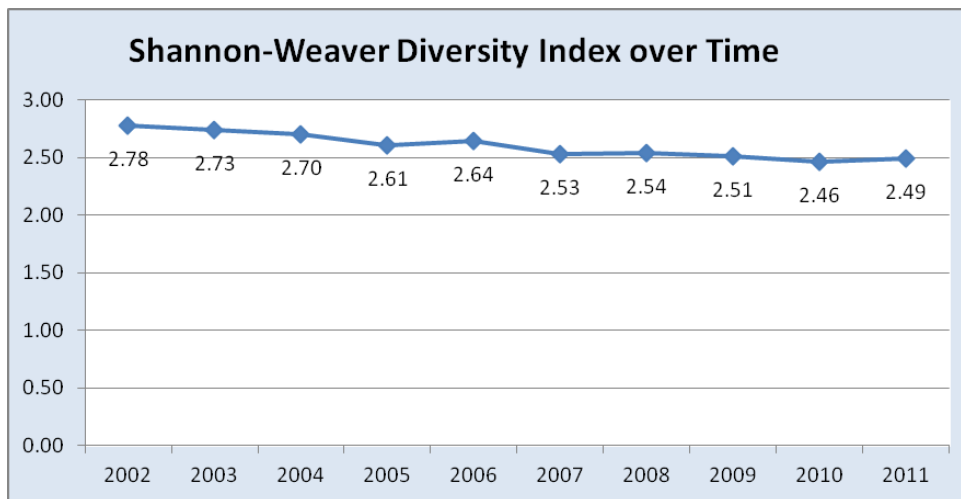


To measure agricultural diversity in Santa Barbara County, we started by creating a list of specific crops mentioned in Crop Reports. We only used crops for which production values were provided, even though the total number of commercial crops grown in the county is much larger. For example, head lettuce had \$68.2 million in revenues for 2011 and lemons had \$12.2 million. Careful lumping and splitting resulted in 34 different crop categories consistently reported over the past decade. Next, we applied the list of crops and production values to the formula above. This resulted in a 2011 Shannon-Weaver Diversity Index score of **2.49**.

By itself, the index score says little. Where it comes in handy is making internal and external comparisons. Internally, the agricultural community can track the score over time to ensure that overall agricultural economic diversity remains high. Maintaining high economic diversity in agriculture will minimize the risk of significant economic shocks.

For example, **Figure 8** shows how the Shannon-Weaver Diversity Index score has changed over the past decade. Note that the diversity index was 2.78 in 2002. Except for 2006 and 2011, the index has trended downward for the past decade, with a total drop of 12%. This does not mean that fewer crop types are being grown in the county. It means that a small number of crops have grown to represent larger pieces of the economic pie, especially strawberries.

Figure 8. How Economically Diverse is Santa Barbara County Agriculture?



Externally, the score can allow useful comparisons to other industries within the county, for example to real estate, manufacturing, and tourism. It can also make comparisons possible between Santa Barbara County agriculture and other counties in California and beyond. Santa Barbara is an innovator when it comes to measuring agricultural economic diversity, so the number of external comparisons remains limited at this time. Potential comparisons will no doubt grow over time as more counties follow Santa Barbara's example.

In addition to comparing the index score internally and externally, future efforts could also quantify diversity in terms of organic and conventional production, as well as the proportion of farms in small, medium, and large categories of farm sizes. Both of these topics lie beyond the scope of this study and readily available data. In the meantime, Santa Barbara County residents can take pride in having one of the most economically diverse agricultural industries anywhere, with numbers to prove it.

The Value of Agricultural "Ecosystem Services"

Most people accept that certain public services such as waste water treatment and emergency response have an economic value. As citizens, we support these services for our safety, security and comfort. Yet many other functions happen every day, throughout the county, that do not receive direct support but still enable the county's favorable living conditions. Farms and ranches stop wildfires. Bees pollinate crops. Forests absorb excess carbon dioxide. Insects and bacteria break down animal waste. Such functions are called *ecosystem services*.



Put simply, ***ecosystem services are the benefits people obtain from ecosystems. They are the direct and indirect contributions ecosystems make to human well-being.*** This section explores multiple aspects of ecosystem services, with an emphasis on the value of ecosystem services that Santa Barbara County agricultural lands provide.

Ecosystem Services and the USDA

Recognizing the importance of ecosystem services in agriculture, the U.S. Department of Agriculture (USDA) has launched multiple initiatives to elevate our understanding of these functions. USDA's Office of Environmental Markets (OEM) leads the various efforts. Created in 2010, OEM is developing markets for carbon, water quality, wetlands, and biodiversity.

OEM also coordinates ecosystem services work across USDA, for example in the Natural Resources Conservation Service (NRCS) and the Forest Service (USFS). A key priority (and Farm Bill requirement) is to create a system for quantifying, registering, and verifying environmental benefits produced by land management activities. USDA believes such a system could lead to multiple benefits, including becoming a new economic driver for rural America.

Clearly, the nation's leading agriculture agency realizes that farms produce a wide range of ecosystem services, and that when these services function well, they benefit not just the farms but also society in general. USDA will continue to develop approaches to understanding and valuing these services, enabling society to support such services well into the future.

Ecosystem Services and the CDFA

In keeping with its national leadership role in agriculture, California is on the forefront of supporting and valuing ecosystem services on agricultural lands. In August 2011, the California Department of Food and Agriculture (CDFA) created the Environmental Farming Act Science Advisory Panel (EFA-SAP). The panel exists to document, study, recognize and incentivize environmental stewardship efforts on farms and ranches.

EFA-SAP recognizes that agricultural management practices that contribute to improving net environmental quality can qualify as ecosystem services. The panel defines ecosystem services by California agriculture as:

"The multiple benefits we gain from farming and ranching including crop and livestock production. In addition to maintaining valuable open space and wildlife habitat, the management decisions and conservation practices of farmers and ranchers also enhance environmental quality, provide recreational opportunities and offer social benefits."

The panel has developed a Qualitative Assessment Model (QAM) to identify ecosystem services provided by various farming practices. The QAM illustrates the net environmental benefits from management practices implemented by growers and ranchers to enhance the environment. This in turn, can help CDFA educate a wide audience about net social, economic and environment benefits (and tradeoffs) of on-farm management practices. CDFA plans to develop the tool further and integrate it into more quantitative models such as the Sustainable Winegrowing Program.

“California’s working farms and ranches are an important part of our natural landscape. The commitment to ecosystem services demonstrates clearly that beyond the productivity of fields and pastures, resource management decisions by farmers and ranchers provide us with wildlife and pollinator habitat, contribute to clean water and air and much more.”

Karen Ross, CDFA Secretary

In September 2013, CDFA announced what is believed to be the nation's first ecosystem services database for agriculture. The CDFA Ecosystem Services Database documents and communicates the many social and environmental benefits offered by growers and ranches in California, including food production. One on hand, the new database helps CDFA discuss multiple benefits provided by California agriculture. On the other hand, it assists growers, ranchers and others who want to learn more about ecosystem services.

Information in the database comes from farm and ranch websites, growers who voluntarily enter their farm details via the website, and online case studies. Users can search the database by key word and categories as well as through the interactive map. The database then identifies different benefits from the farm management practices, such as, food, fiber, fuel, nutrient cycling and water quality for each farm. An interactive map allows users to view where the services are taking place throughout California.

Figure 9. Screenshot from CDFA's New Ecosystem Services Database

(see: <http://apps.cdfa.ca.gov/EcosystemServices>)



NOTE: At the time of writing, the database had 400 California farms, including 16 from Santa Barbara County. The new database is a work in progress. Growers are encouraged to visit the website, enter their farm details, and be recognized for the ecosystem services they provide.

Ecosystem Services and Santa Barbara County Agriculture

The discussion so far has provided a general overview of ecosystem services and how federal and state agencies are working with them. This section drills down to the deeper level. Based on CDFA's categories, it describes 13 specific types of ecosystem services that Santa Barbara County agricultural lands provide.

Figure 10. Ecosystem Services Provided by Santa Barbara County Agricultural Lands



Note that additional types exist. For example, many Santa Barbara County farms and ranches contribute to **fire suppression**. They provide natural breaks that keep wildfires from reaching urban areas. Also, many farms have hedgerows and windbreaks that enhance air quality by reducing movement of wind-borne dust and pathogens. Finally, many of the 13 categories above consist of multiple, smaller categories. The next page, for example, describes nine different kinds of "Recreation & Cultural" services that Santa Barbara County agricultural lands provide.

Specific Examples of Recreation & Cultural Ecosystem Services

- 1 Cultural Diversity.** Local agricultural diversity supports rich cultural diversity rooted in ranching, farming, winemaking, and other cultures.
- 2 Spiritual and Religious Values.** Many residents have a profound relationship with the land that includes a powerful spiritual or religious component.
- 3 Educational Value.** Schools and local communities explore and study the county's agricultural landscapes, using them as living laboratories.
- 4 Local Historical Value.** Generations of growers working the land have provided valuable local knowledge that is not written in books, but rather passed down.
- 5 Inspiration.** The county's striking agricultural landscapes provide a rich source of inspiration for art, folklore, architecture, music & advertising.
- 6 Social Relations and Networks.** Food festivals, county fairs, farmers markets, Farm to Fork programs, and Community Supported Agriculture/Aquaculture programs promote relationships with farmers, ranchers, laborers, and community.
- 7 Recreation and Ecotourism.** Agricultural lands help support farm tours, wine-tastings, bike rides, and other leisure activities.
- 8 Aesthetic Values.** Beautiful agricultural landscapes provide critical "open space" for the community, even to the point of affecting where people decide to live.
- 9 Sense of Place.** Many residents value the "sense of place" associated with the county's striking landscape, including its beautiful agricultural lands.



The Link to Human Well-being

Ecosystem services play an important role in our quality of life. They contribute to four key areas that social scientists have identified as keys to living well: **being healthy**, **being physically secure**, **enjoying good social relations**, and having **material resources to live a good life**. With these four ingredients in place, we have freedom to live life to its fullest potential. Note, however, that all four keys to "living well" depend on clean air, safe water, healthy soil, and other natural resources that sustain us. In other words, ecosystem services directly support our quality of life. **Figure 11** shows this relationship.

Figure 11. Ecosystem Services Support Human Well-being



What is the Dollar Value of Ecosystem Services?

Economists have attempted with varying success to assign monetary values to benefits from ecosystem services. Studies have quantified the value of recreation, impact on property values, natural water filtration, aesthetic values and other many other benefits. The total value of all ecosystem services worldwide is estimated to surpass \$33 trillion per year.

This raises an important question: what is the annual dollar value of ecosystem services provided by agricultural lands in Santa Barbara County? No one has yet attempted to answer this question. Collecting primary data on every ecosystem service type would require considerable time and effort. Fortunately, economists have developed a cost-effective approach that takes full advantage of existing research. Called the **Benefit Transfer Methodology**, the approach estimates economic values by transferring existing benefit estimates from studies already completed for another location or issue.





For example, if several studies have already quantified the per acre value of ecosystem services on cattle ranches in Oregon, Arizona, and northern California, then perhaps some of the study's findings may transfer to cattle ranches in Santa Barbara County, given reasonable changes in the weightings based on differences among the cattle ranches.

Applying the **Benefit Transfer Methodology** in Santa Barbara County would entail three steps. First, researchers would document types and amounts of ecosystem services provided by the county's agricultural lands. How much carbon sequestration takes place? How many tourists visit local farms and wineries? How much water soaks into vegetation-covered ground and recharges aquifers instead of running to the sea? How many people attend farmers markets, agricultural festivals, and related cultural events? This step entails counting acres, species, people, events, and other things. Some of this information may already exist in the offices of local non-profit organizations, university researchers, and government agencies.

The second step would entail reviewing existing literature to determine dollar amounts typically attributed to each ecosystem service. This requires locating and reviewing a large number of studies, perhaps as many as several hundred scholarly publications. It also requires screening each study for its relevance and quality, and determining how applicable they are to Santa Barbara County. Several databases and software programs can help inform and validate estimates. Examples include InVEST (www.naturalcapitalproject.org), ARIES (www.ariesonline.org), and coastal research studies stored at the National Ocean Economics Program (www.oceanomics.com).

The final step is to "localize" these values. This entails assigning dollar values to ecosystem services provided by the county's agricultural lands. Transferring the results of other studies to Santa Barbara County requires making careful, systematic judgments regarding the relevance and credibility of specific measures from other sites and studies. It's a rigorous approach using a decision-tree that considers the quality of the study site data and the correspondence between the study site and Santa Barbara County. One must check each study for data issues, site correspondence issues, temporal issues, and spatial issues.

The bottom line is that the methodology combines complexity and rigor with feasibility and cost-effectiveness. In summary, to determine what the annual dollar value is of each of the ecosystem services provided by the county's agriculture would require a significant amount of resources. The cost may range from \$35,000 to \$50,000 for a desk study that utilizes existing methodology and literature, or more than \$250,000 for a comprehensive study that generates new data.



Current Markets for Ecosystem Services

The county's farms and ranches provide numerous public benefits (see **Figure 10** above), especially through their conservation activities. Yet society tends to only pay them for traditional products such as food and timber. To fill this gap, public agencies have developed incentive programs for private landowners to implement conservation practices.

Existing mechanisms that offer compensation or incentives to farmers and ranchers for social and environmental contributions include voluntary private payments, government grants and loans, the Williamson Act, conservation easements, mitigation banks, and reduced regulatory costs. These programs help fill an important gap, but do not capture the full value of ecosystem services. A "market-based" approach might work better.

Three types of ecosystem service "markets" already exist in preliminary forms. First, *voluntary markets* occur when individuals or companies purchase ecosystem services without being required to do so. We pay extra for organic produce, grass-fed beef, and other products with certifiable benefits to society. Second, *pre-compliance markets* emerge when buyers and sellers of ecosystem services anticipate that a certain resource will be regulated in the future. For example, some companies pay private landowners to sequester carbon.

Third, *compliance markets* exist when regulations require compensation for ecosystem services. For example, certain California counties require that real estate developers who build on agricultural land must set aside funds that offset the loss of ecosystem services. Local governments then use the developers' funds to secure ecosystem services on other properties, for example along a biological corridor connecting two parks.

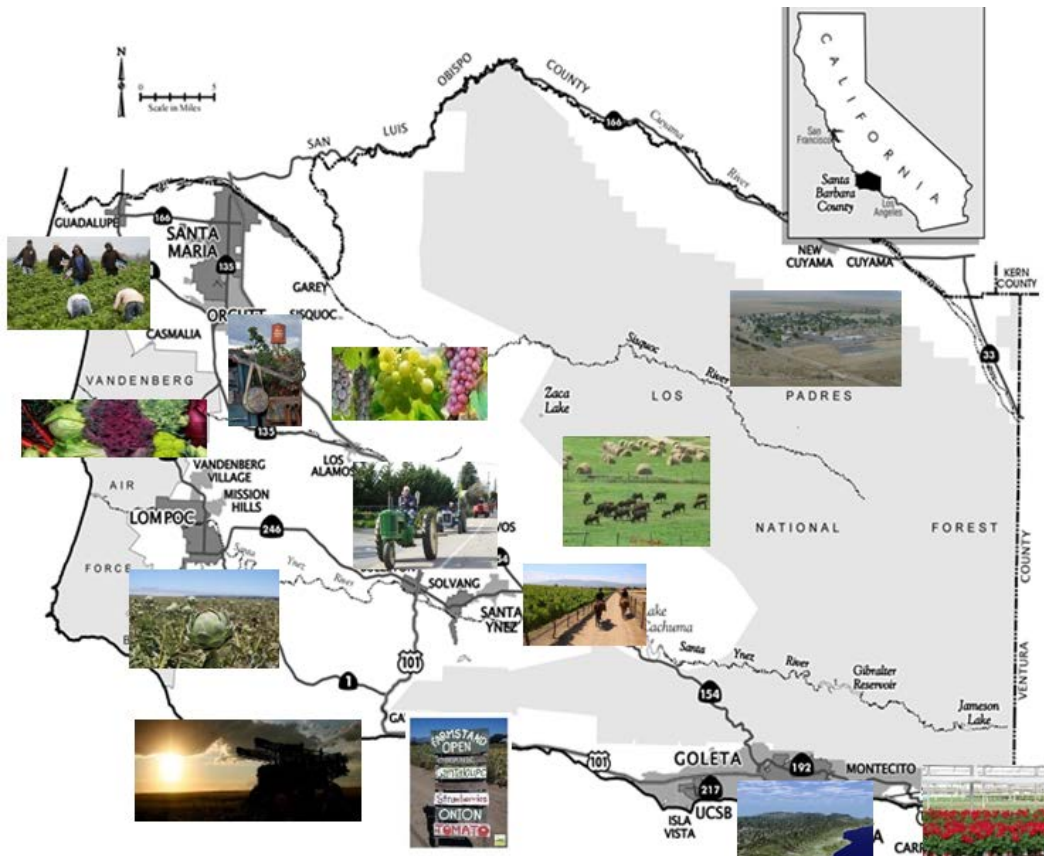


Future Markets for Ecosystem Services

The markets described in the previous section remain in their infancy. Producers have difficulty accessing them for various reasons, including high transaction costs and regulatory barriers. Compensation amounts rarely account for all the ecosystem services provided. That said, these initial efforts suggest that market-based tools have the potential to provide a valuable alternative in resource management.

Several public and private organizations are experimenting with newer and better approaches. On the national level, the Natural Resources Conservation Service, U.S. Environmental Protection Agency, U.S. Forest Service, U.S. Army Corps of Engineers and other agencies have recognized the value of market development for ecosystem services. For example, the USDA's Office of Environmental Markets is developing market infrastructure and uniform standards that will facilitate market-based approaches to agriculture, forest, and rangeland conservation.

While no one can predict the future, the hope is that Santa Barbara County landowners will someday enjoy access to an efficient, user-friendly marketplace for all their ecosystem services. The market would bring buyers and sellers together to exchange payments for ecosystem services, similar to a commodity share in a stock exchange. Santa Barbara County landowners would generate "credits" (units of ecological value) by protecting and restoring ecological "assets" that provide needed services. Once their work has been reviewed by a third party expert in marketplace protocols and standards (possibly CDFA's Ecosystem Services Database), landowners would post their credits in a marketplace's credit registry. Buyers – including regulated entities and conservation-conscious consumers – could then purchase credits from the registry.



In sum, rather than relying on a landowner's environmental altruism or fear of regulatory restrictions, markets may provide financial incentives to protect and enhance ecologically significant lands in an efficient and cost-effective way. Markets can harness the power of economic incentives to protect and restore the diverse benefits that agricultural lands provide to society.

A Final Word on Ecosystem Services

This section has described several aspects of ecosystem services on agricultural lands. The five main points are:

- 1 USDA, CDFA, and other key agencies are providing tools, momentum, and high level support for valuation of ecosystem services.
- 2 Santa Barbara County's agricultural lands provide several types of ecosystem services to society, all of which directly support human well-being. Many residents may take these benefits for granted and have never before seen them listed as they are here.
- 3 All these ecosystem services make an extremely large economic contribution to Santa Barbara County every year. No one has yet attempted to quantify the total dollar value of this contribution.
- 4 We have described a rigorous, cost-effective methodology for calculating the annual dollar value of ecosystem services provided by Santa Barbara County agricultural lands. Such quantification would represent an important and feasible next step forward.
- 5 Current ecosystem service compensation programs for growers and ranches are limited. Eventually, they may evolve into marketplaces that reflect the true value of what these agricultural lands provide to society.

Regarding the final item – markets for ecosystem services – Santa Barbara County is well positioned to play a leadership role. With its rich agricultural lands and a strong social and environmental interest in preserving and enhancing these lands and the associated ecosystem services they provide, the county could develop and test new valuation models and markets that support the region's valuable resources.

Toward the Future

This report has documented the powerful role that Santa Barbara County agriculture plays as a local economic driver. Agriculture contributes just over \$2.8 billion to the county economy. This far exceeds direct production values reported in Crop Reports, for example the \$1.3 billion figure reported for 2012. Agriculture also plays a key role in county employment, directly or indirectly supporting 25,370 jobs. Third, agriculture's impressive diversity lends valuable economic stability, helping insure the county against economic calamity. Finally, agricultural lands deliver several ecosystem services to county residents and to society at large, the dollar value of which remains undetermined at this time but is no doubt quite large.

Agriculture is one of Santa Barbara County's economic pillars and represents a vital link to both the county's cultural past and competitive future. Although the report has presented many facts and figures, it has barely begun to fill key information gaps about agriculture's role. The process of developing this report has raised several additional questions that lie beyond the scope of this report but may warrant future research (**see below**). In the meantime, the findings here provide the clearest picture yet of agriculture's important economic role in Santa Barbara County.

Additional Questions to Answer

- How does Santa Barbara County's impressive agricultural diversity compare internally to diversity of other economic sectors in the county such as real estate, construction, and tourism? How does it compare externally to agricultural diversity in other counties? What options exist for reversing the ongoing decline of agricultural economic diversity?
- What diversity trends exist with respect to production type (organic or conventional) and size (small, medium, large)? What implications might such trends have for future economic stability and growth?
- What are the appropriate next steps for calculating the dollar value of wildlife habitat, open space, scenic beauty, pollination, and other ecosystem services that the county's agricultural lands provide to society? How can society best compensate farmers for these services, for example those provided by riparian habitat?
- What is the "net" economic impact of Santa Barbara County agriculture after subtracting natural resource impacts and other costs to society? (This study has examined just one side of the coin).
- How would "shocks" affect agriculture's economic results, for example significant new regulations, labor policies, or changes in the price of key inputs? What affect could a worsening labor shortage affect agriculture over the coming years?

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