

Contribution of Agriculture to the Maricopa County and Gila River Indian Community Economies

*Dari Duval
Ashley Kerna Bickel
George Frisvold
Xinye Wu
Chenyang Hu*

Contribution of Agriculture to the Maricopa County and Gila River Indian Community Economies

Dari Duval

Economic Impact Analyst

Ashley Kerna Bickel

Economic Impact Analyst

George Frisvold

Professor and Extension Specialist

Xinye Wu

Graduate Research Assistant

Chenyang Hu

Graduate Research Assistant

Department of Agricultural and Resource Economics

Cooperative Extension

The University of Arizona

January 2018



THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
**Agricultural &
Resource Economics**



THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
Cooperative Extension



© 2018 The Department of Agricultural and Resource Economics, The University of Arizona.

Any products, services or organizations that are mentioned, shown or indirectly implied in this publication do not imply endorsement by The University of Arizona.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Jeffrey C. Silvertooth, Associate Dean & Director, Extension & Economic Development, College of Agriculture and Life Sciences, The University of Arizona.

The University of Arizona is an equal opportunity, affirmative action institution. The University does not discriminate on the basis of race, color, religion, sex, national origin, age, disability, veteran status, or sexual orientation in its programs and activities.

Contents

Executive Summary	5
Introduction	7
Agriculture in Maricopa County	8
Crops	10
Livestock	13
Farm Characteristics	16
Agriculture in the Gila River Indian Community	19
Economic Contribution Analysis	22
Direct Contribution of On-Farm Agriculture to Maricopa County and Gila River Indian Community Economies	23
Multiplier Effects and Total Economic Contribution	24
Summary	26
References	27
Appendices	29
Appendix A. Food Production and Local Foods Activity	29
Appendix B. Definition of On-Farm Agriculture and Update of Maricopa County IMPLAN Model	33

Figures

Figure 1. Map of Maricopa County and the Gila River Indian Community, Arizona	8
Figure 2. Market Value of Agricultural Sales and Number of Farms with Sales by Crop Commodity, Maricopa County, 2012	10
Figure 3. Market Value of Agricultural Sales and Number of Farms with Sales by Livestock Commodity, Maricopa County, 2012	13
Figure 4. Value of Animal and Crop Production Sales in Maricopa County, 1978–2012	14
Figure 5. Milk and Dairy Products as a Percentage of Total Livestock, Poultry, and Products Sales in Maricopa County, 1978–2012	15
Figure 6. Number of Farms in Maricopa County by NAICS Code Specialization, 2012	16
Figure 7. Maricopa County Farms and Sales by Farm Economic Class, 2012	16
Figure 8. Number of Farms in Maricopa County by Farm Size, 2012	17
Figure 9. Maricopa County Farms and Associated Acreage by Legal Status for Tax Purposes, 2012	17
Figure 10. Number of Gila River Indian Community Farms by Crop Commodity Produced or Activity, 2012	19
Figure 11. Number of Gila River Indian Community Farms with Inventory of Livestock by Type, 2012	19

- Figure 12. Value of Agricultural Products Sold by Gila River Indian Community Farms by Crop and Livestock, 2007 and 2012, with Crop / Livestock Breakdown in 2012 **20**
- Figure 13. Gila River Indian Community Farms by Value of Sales, 2012 **20**
- Figure 14. Gila River Indian Community Farms by Farm Size, 2012 **21**
- Figure 15. Relationship between Components of Economic Output (Sales) **22**
- Figure 16. Direct Economic Contribution of On-Farm Agriculture to Maricopa County Sales by Industry, 2015 **23**
- Figure 17. Components of Economic Contribution of On-Farm Agriculture to Maricopa County Sales, 2015 **24**
- Figure 18. Food Crop and Livestock vs. Non-Food Crop and Livestock Production in Maricopa County, 2012 **29**

Tables

- Table 1. Maricopa County Rankings by Value of Sales by Agricultural Commodity, 2012 **9**
- Table 2. Farms and Acres Harvested for Grain Crops in Maricopa County, 2012 **10**
- Table 3. Farms and Acres Harvested for Fruit and Nut Crops in Maricopa County, 2012 **11**
- Table 4. Farms and Acres Harvested for Vegetable, Potato, and Melon Crops in Maricopa County, 2012 **12**
- Table 5. Farms, Operators, and Land in Farms for All Operators and Primary Operators by Race in Maricopa County, 2012 **18**
- Table 6. Farms, Operators, and Land in Farms for All Women Operators and Primary Women Operators in Maricopa County, 2012 **18**
- Table 7. Economic Contribution of Agriculture to Maricopa County Economy, 2015 **25**
- Table 8. Maricopa County and Gila River Indian Community Food Crop and Livestock Value of Production by Type, 2012 **30**
- Table 9. Average Sales per Direct Marketing Channel for Southwest Region, 2015 **31**
- Table 10. BEA Cash Receipts Data and Study Estimates of Farm Income **33**

Executive Summary

What Is the Issue?

Strategies to promote local and regional food systems benefit from a baseline understanding of existing agricultural activity and its role within the regional economy. To encourage growth or changes in regional food systems, it is important to understand what is being produced, where and how it is being sold, and the potential economic impacts of shifting production and marketing channels. This study provides an estimate of the economic contribution of on-farm agriculture to the Maricopa County economy, as well as an estimate of the regional economic contribution of agricultural activity taking place within the Gila River Indian Community. It includes an overview of commodities produced, their direct sales effects, and an estimate of multiplier effects within the regional economy. Additionally, information on farm attributes, food versus non-food agricultural production, and existing data on local foods activity is provided within the larger context of agriculture as a whole in the region.

What Did the Study Find?

Economic Contribution

- ▶ The total sales contribution of on-farm agricultural production to the Maricopa County economy was an estimated **\$1.95 billion** in 2015, including direct, indirect, and induced multiplier effects.
- ▶ The total value-added contribution, also known as gross state product (GSP), was \$831 million, including \$586 million in labor income, \$192 million in profits and other property type income, and \$52 million in taxes on production and imports.
- ▶ Agricultural production within the Gila River Indian Community generated \$38.4 million in cash receipts in 2012, part of which is located in Maricopa County.

Jobs Contribution

- ▶ On-farm agricultural production directly and indirectly supported roughly **14,200 jobs** in the Maricopa County economy, of which an estimated 9,190 were directly supported on

farm. These estimates include full- and part-time jobs as well as both hired labor and farm proprietors.

Major Crops and Livestock Produced

- ▶ According to study estimates, in 2015 Maricopa County generated roughly \$469 million in sales from crops and \$584 million in sales from livestock, poultry, and their products. The commodity with highest sales was milk from cows with \$418 million in sales.
- ▶ The top 5 crop and livestock industries in Maricopa County are milk and dairy; greenhouse, nursery, and floriculture production; all other crop farming (includes hay and alfalfa); vegetable and melon farming; and cattle ranching and farming.
- ▶ Commonly produced crops within the Gila River Indian Community are forage for livestock, cotton, corn for silage or greenchop, and barley for grain.

Farm Characteristics

- ▶ Family or individually owned farms are the most common type of legal organization of farms in Maricopa County, followed by partnerships and family-held corporations, as of 2012. Partnerships represents the greatest amount of farm acreage in the county, with 36% of total county farm acreage.
- ▶ Most farms in Maricopa County are small, both in terms of acreage and sales. Of 2,479 farms, 868 have less than \$1,000 in annual sales and 1,495 are between 1 and 9 acres in size. Just 7.5% of farms had sales of more than \$500,000 and 1.7% had acreage of 2,000 acres or more.
- ▶ 95% of total farm sales in Maricopa County come from just 7.5% of farms. Though by number most farms are small, a few large farms are responsible for most sales in the county.
- ▶ In the Gila River Indian Community, 17 of 39 farms had over \$100,000 in annual sales and the most common farm size was between 10 and 49 acres (12 of 39 farms).

Food Production Versus Non-Food Production and Local Foods (Appendix A)

- ▶ In 2012, \$129 million of fruit, vegetable, nut, and food grain crops were sold by Maricopa County farms. An additional \$542 million in sales came from milk, meat, and eggs.
- ▶ While \$318 million of Maricopa County's agricultural production was for non-food crops, much of that was production of feed crops for livestock, of which the dairy industry is an important user. That said, production of feed and alfalfa can be viewed as part of the dairy industry value chain.
- ▶ Direct to consumer sales of agricultural products in Maricopa County totaled \$2 million from 218 operations in 2012.
- ▶ Existing research indicates that most local food sales are not direct to consumer, but rather occur through intermediated marketing channels such as retail, restaurants, or food hubs.
- ▶ Rough estimates of local foods activity suggest that local foods sales/spending in Maricopa County could total in the tens of millions of dollars annually, based upon national averages.

How Was the Study Conducted?

This study relies on data from several sources. First and foremost, the study draws from the Census of Agriculture, the most comprehensive source of information on agricultural production at the county level. Released every 5 years, the most recent available agricultural census was the 2012 Census of Agriculture, released in 2014. Bureau of Economic Analysis data on farm income and expenses were used to estimate 2015 agricultural production, assuming relative production by industry as captured in the Census of Agriculture held constant from 2012. Data from the Bureau of Economic Analysis, Bureau of Labor Statistics, and 2012 Census of Agriculture were used to update farm employment estimates. The IMPLAN 3.1 input output model and software for Maricopa County, AZ was used to estimate the total economic contribution of agriculture to the county economy, including multiplier effects. Unlike other recent studies of agribusiness's economic contribution in Arizona (Kerna Bickel, et al, 2017; Kerna & Frisvold, 2014), this study looks only at on-farm activities, including crop production, livestock production, and agricultural support services.

Introduction

Agriculture is woven into the history of central Arizona and has been a strong influence in determining how the region came to be what it is today. Economically, the role of central Arizona agriculture has evolved over time: the mix of commodities produced (food versus non-food), to whom and where commodities are sold, and the region's general reliance on agriculture as a source of income has shifted significantly over the last century. Current efforts to promote local foods activity seek to understand the role of agriculture in today's economy and build upon opportunities to expand the local food ecosystem. This analysis provides an overview of the current state of agricultural production in Maricopa County and the Gila River Indian Community and their respective contributions to the regional economy. Within that larger context, it also estimates the scale of agricultural

production for food, and of that food production, the amount that is retained for local consumption.

The study begins by providing an overview of primary agriculture¹ in Maricopa County and the Gila River Indian Community, including the most recent data available on the variety of crops, animals, and animal products produced in the region. The study also provides an estimated breakdown of food versus non-food primary agricultural production. In addition to cash receipts for agricultural commodities and agricultural support services, the analysis estimates the full economic contribution of agriculture to the county economy in 2015, including direct, indirect, and induced multiplier effects as measured by sales, gross state product, incomes, and jobs supported. Finally, the Appendix includes a summary of available information on estimates of local foods activity in the region, such as direct-to-consumer sales and intermediated local market channels.

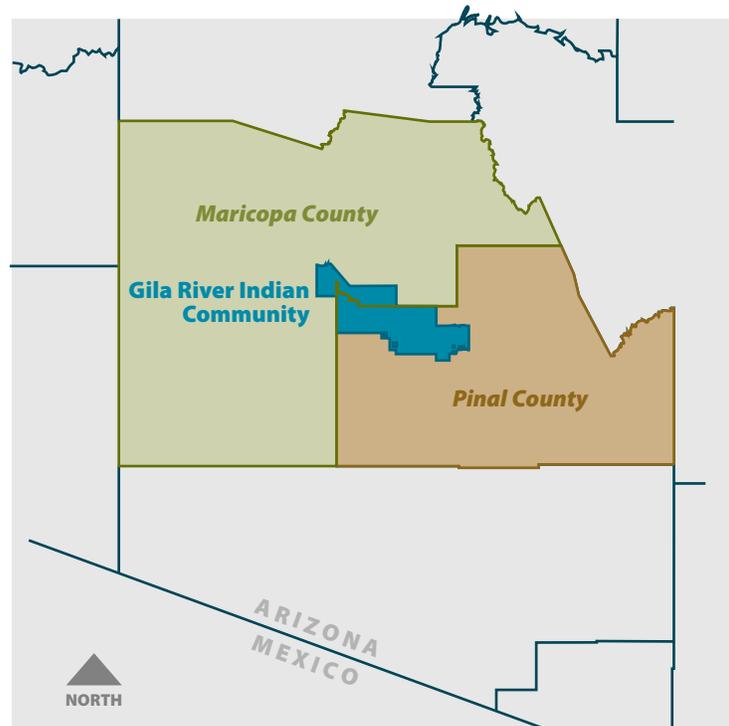
1. This study examines the economic contribution of on-farm (primary) agriculture, as opposed to agribusiness. On-farm agriculture is limited to the production of raw, unprocessed agricultural commodities and agricultural support services such as harvesting and planting. Other economic contribution studies measure the economic contributions of the agribusiness industry cluster (of which on-farm agriculture is a subset) which includes downstream agricultural processing and food and fiber manufacturing industries (see Kerna Bickel, et al., 2017 and Kerna & Frisvold, 2014).

Agriculture in Maricopa County

Maricopa County, located in central Arizona, is the state's most populous county, encompassing the state capital and the state's largest urban area both in terms of size and population. Statewide, Maricopa County also has the largest county economy as measured by employment and gross state product. Not only that, it has the largest agricultural sector in the state in terms of number of farms and value of primary agricultural sales. The Gila River Indian Community straddles the county line between Maricopa and Pinal counties (Figure 1), two central Arizona counties that also happen to be some of the most agriculturally productive counties in the state. The Gila River Indian Reservation was established in 1859, and the Gila River Indian Community was created in 1939. Two tribes reside within the Gila River Indian Community, the Akimel O'odham and the Pee-Posh (Maricopa) tribes (GRIC, 2015).

Agriculture has a long history in central Arizona. The Hohokam civilization occupied the fertile area surrounding the confluence of the Salt and Gila Rivers beginning around the fifth century. Hundreds of miles of irrigation canals were dug by hand in a sophisticated system that laid the groundwork for the modern-day canal system that still serves the region (Sheridan, 2012). In the late 19th century, settlers began to arrive in the Salt and Gila River valleys in central Arizona and the need to regulate water deliveries to cropland eventually led to investment in major infrastructure projects such as the Salt River Project after federal funding became available for water reclamation projects in the early 1900s (SRP, 2017). Around the turn of the twentieth century, agriculture in the area was characterized by a diversity of food and forage crop production. However, after the onset of World War I, tire companies such as Goodyear began investing in cotton production in the Salt River valley to supply fiber for tires and airplanes in support of war efforts, thereby beckoning the arrival of industrial-scale agriculture into the valley (Sheridan, 2012).

Figure 1. Map of Maricopa County and the Gila River Indian Community, Arizona



Source: University of Arizona Spatial Data Explorer
<https://geo.library.arizona.edu/>.

Contribution of Agriculture to the Maricopa County and Gila River Indian Community Economies

Continued growth of agriculture in the state in the first half of the twentieth century and persistent overdraft of groundwater supplies in part fueled the push for development of surface water supplies through the Central Arizona Project (CAP) (Hanemann, 2002). The CAP started delivering water to central Arizona in the late 1980s and today represents an important source of irrigation water, and serves as a mechanism for groundwater recharge in the state's major urban areas.

While secondary and tertiary sectors in Maricopa County and the Gila River Indian Community have diversified and grown significantly over the last century, primary agriculture continues to contribute to the local economy. In fact, in terms of the total value of agricultural sales, Maricopa County ranks first among Arizona counties and 29th among all 3,079 counties in the United States (Table 1). At the state level and even at the national level, Maricopa County is a

leading producer of many commodities. In 2012, Maricopa County ranked first among Arizona counties and in the top 20 among U.S. counties for sales of nursery, greenhouse, floriculture, and sod (15th nationally), other crops and hay (7th nationally), milk from cows (11th nationally), and horses, ponies, mules, burros, and donkeys (5th nationally). Maricopa County is also a national leader in the production of vegetables, melons, potatoes and sweet potatoes, and cotton and cottonseed, ranking 27th and 29th in the nation for sales, respectively (Table 1).

As of 2012, the last agricultural census, there were 2,479 farms and ranches in Maricopa County, encompassing 475,898 acres of land. The value of market products sold totaled over \$1.003 billion, 55% of which was from sales of livestock and 45% of which was from sales of crops. In terms of value of sales of agricultural commodities, Maricopa County is a livestock-dominant

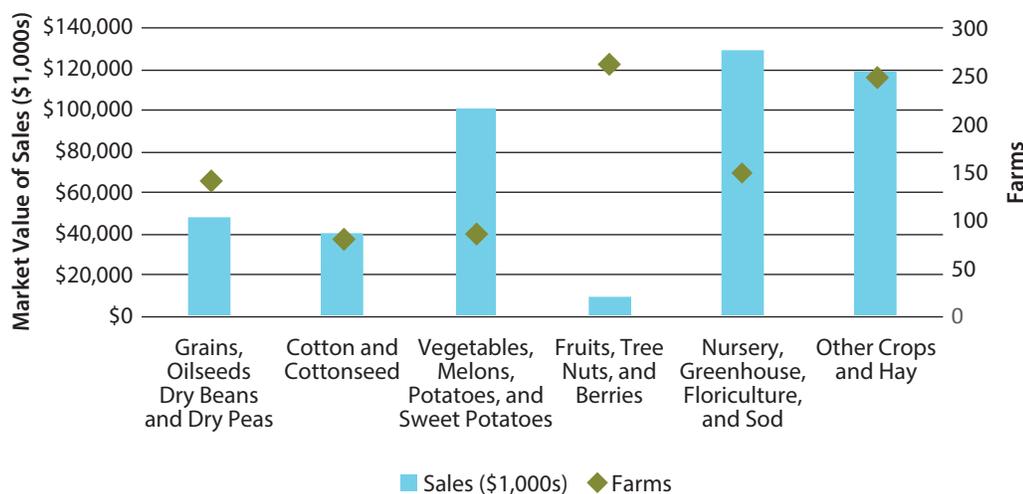
Table 1. Maricopa County Rankings by Value of Sales by Agricultural Commodity, 2012

	State Rank	National Rank
Market Value Of Agricultural Products Sold (\$1000)		
Total Value of Agricultural Products Sold	1	29
Value of Crops Including Nursery and Greenhouse	2	40
Value of Livestock, Poultry, and their Products	2	34
Value of Sales by Commodity Group (\$1000)		
Food Crops		
Grains, Oilseeds, Dry Beans, and Dry Peas	3	859
Vegetables, Melons, Potatoes, and Sweet Potatoes	2	27
Fruits, Tree Nuts, and Berries	4	151
Poultry and Eggs	1	(D)*
Cattle and Calves	3	(D)
Milk from Cows	1	11
Hogs and Pigs	2	906
Sheep, Goat, Wool, Mohair, and Milk	6	323
Non-Food Crops		
Cotton and Cottonseed	2	29
Horses, Ponies, Mules, Burros, and Donkeys	1	5
Aquaculture	1	94
Nursery, Greenhouse, Floriculture, and Sod	1	15
Other Crops and Hay	1	7
Other Animals and Other Animal Products	1	(D)

Source: 2012 Census of Agriculture.

* (D) indicates data is not disclosed for purposes of confidentiality.

Figure 2. Market Value of Agricultural Sales and Number of Farms with Sales by Crop Commodity, Maricopa County, 2012



Source: 2012 Census of Agriculture.

county. However, nearly \$400 million of livestock sales (over two-thirds) are from the dairy industry. The following section takes a closer look at the commodities produced in Maricopa County.

Crops

Nursery, greenhouse, floriculture, and sod, as well as *other crops and hay* are leading crops in Maricopa County as measured by their market value of sales (Figure 2). Leading food crops in

2012 were *vegetables, melons, potatoes, and sweet potatoes*, as well as *grains*. Although relatively small in terms of their market value of sales, farms with sales of *fruits, tree nuts, and berries* were the most common type of crop operation in Maricopa County in 2012, with 261 farms. That was followed by farms producing *other crops and hay*, with 247 farms.

Although grains are often considered a food product, over half of the market value of grain production in Maricopa County, barley and oats in particular, is destined for the livestock industry as feed (Duval, et al., 2017). In Maricopa County, 60 farms produced barley for grain in 2012, with over 1,800 acres harvested (Table 2) and 1,717,413 bushels of production. Other grains, such as wheat, are food products. Farms in Maricopa County produced 1,847,354 bushels of wheat for grain in 2012, generating \$16.3 million in sales, the largest grain crop by value in the county. Most wheat production in Maricopa County was durum wheat (1,775,894 bushels) which is used for pasta production (Duval, et al., 2017). Generally speaking, grains are used as a rotational crop in combination with vegetable production, promoting soil health and water use efficiency (Frisvold, 2015).

Other crops and hay also represent important feedcrops for livestock. In 2012, Maricopa County harvested 84,210 acres of hay, 75,189 acres of which were alfalfa hay, producing 546,971 dry tons of alfalfa hay, over a quarter of the state's

Table 2. Farms and Acres Harvested for Grain Crops in Maricopa County, 2012

	Farms	Acres Harvested
Barley for Grain	60	1,838
Corn for Grain	12	1,374
Dry Edible Beans	1	(D)*
Oats for Grain	8	1,842
Sorghum for Grain	7	681
Wheat for Grain	44	19,483
Winter Wheat for Grain	5	(D)
Durum Wheat for Grain	39	18,806
Other Spring Wheat for Grain	1	(D)

Source: 2012 Census of Agriculture.
* (D) indicates data is not disclosed for purposes of confidentiality.

Table 3. Farms and Acres Harvested for Fruit and Nut Crops in Maricopa County, 2012

Commodity	Farms	Acres Harvested	Commodity	Farms	Acres Harvested
Apples	34	12	Grapefruit	94	(D)
Apricots	8	9	Lemons	77	474
Dates	2	(D)*	Limes	1	(D)
Figs	5	(D)	Oranges	217	2333
Grapes	19	4	Tangelos	17	28
Nectarines	2	(D)	Tangerines	18	88
Olives	1	(D)	Other Citrus	3	(D)
Peaches	28	40	Almonds	5	1
Plums & Prunes	8	3	Pecans	32	(D)
Pomegranates	9	3	Pistachios	11	6
Other Non-Citrus Fruit	4	4	Walnuts	10	3

Source: 2012 Census of Agriculture.

* (D) indicates data is not disclosed for purposes of confidentiality.

alfalfa production in 2012. In total, Maricopa County had 88,862 acres of land dedicated to cultivation of forage and produced 641,942 dry ton equivalents of forage, an important input to dairies and feedlots in central Arizona.

In 2012, Maricopa County had 290 farms with orchards,² managing 5,444 acres of land in orchards. Most orchard production was dedicated to cultivation of citrus, including oranges, lemons, and grapefruits (Table 3).

2. This figure differs from the number of farms with sales of fruits, tree nuts, and berries (261 farms), suggesting that some farms with land in orchards do not have sales of those commodities.

Table 4. Farms and Acres Harvested for Vegetable, Potato, and Melon Crops in Maricopa County, 2012

Commodity	Farms	Acres Harvested	Commodity	Farms	Acres Harvested
Artichokes	2	(D)	Lettuce, Leaf	16	479
Beans, Snap	6	1	Lettuce, Romaine	13	(D)
Beets	9	(D)	Mustard Greens	8	(D)
Broccoli	11	(D)	Onions, Dry	3	(D)
Brussels Sprouts	1	(D)	Onions, Green	2	(D)
Cabbage, Chinese	3	(D)	Parsley	2	(D)
Cabbage, Head	5	(D)	Peppers, Bell	2	(D)
Cantaloupes & Muskmelons	19	(D)	Peppers, Other than Bell	1	(D)
Carrots	13	(D)	Potatoes	5	(D)
Cauliflower	3	(D)	Pumpkins	1	(D)
Celery	1	(D)	Radishes	4	(D)
Collards	4	(D)	Spinach	4	(D)
Cucumbers & Pickles	1	(D)	Squash	10	32
Eggplant	1	(D)	Sweet Corn	10	220
Herbs, Fresh Cut	2	(D)	Tomatoes in the Open	39	44
Honeydew Melons	1	(D)	Turnip Greens	1	(D)
Kale	4	117	Turnips	1	(D)
Lettuce, All	23	(D)	Watermelons	10	980
Lettuce, Head	13	(D)	Other Vegetables	10	497

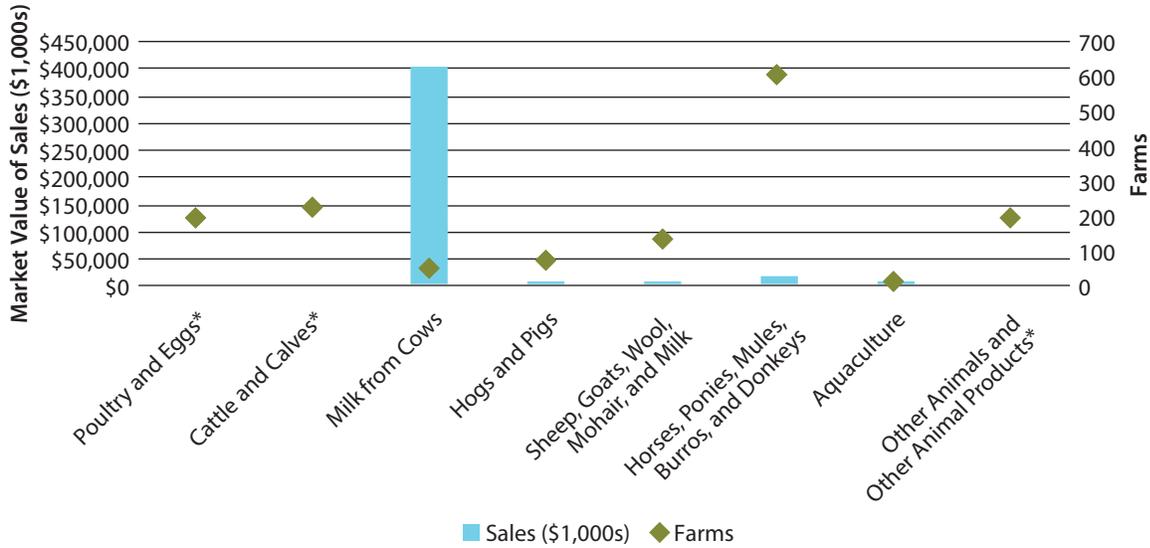
Source: 2012 Census of Agriculture.

* (D) indicates data is not disclosed for purposes of confidentiality.

As mentioned previously, Maricopa County ranked second in the state and 27th nationally among counties in terms of its production of vegetable, potato, and melon crops in 2012. According to these statistics, Maricopa County was in the top 1.0% of all counties growing vegetables and melons. In fact, it was ranked in the top 10 kale-producing counties in the U.S. in terms of acreage harvested, ranking 7th nationally, and was ranked 10th in the nation for leaf

lettuce acreage (Kerna, et al., 2017). Arizona's top-ranked county for vegetable and melon production is Yuma County, one of the largest vegetable and melon production regions in the country and the largest producer of winter lettuce in the country (Kerna, et al., 2017). In terms of vegetable, potato, and melon commodities produced in Maricopa County, most acreage is in watermelon production, followed by other vegetables and leaf lettuce (Table 4).

Figure 3. Market Value of Agricultural Sales and Number of Farms with Sales by Livestock Commodity, Maricopa County, 2012



Source: 2012 Census of Agriculture

* Sales of these commodities not disclosed to protect confidentiality of individual operations. Sales of other disclosed commodities such as hogs and pigs are not visible on graph due to size.

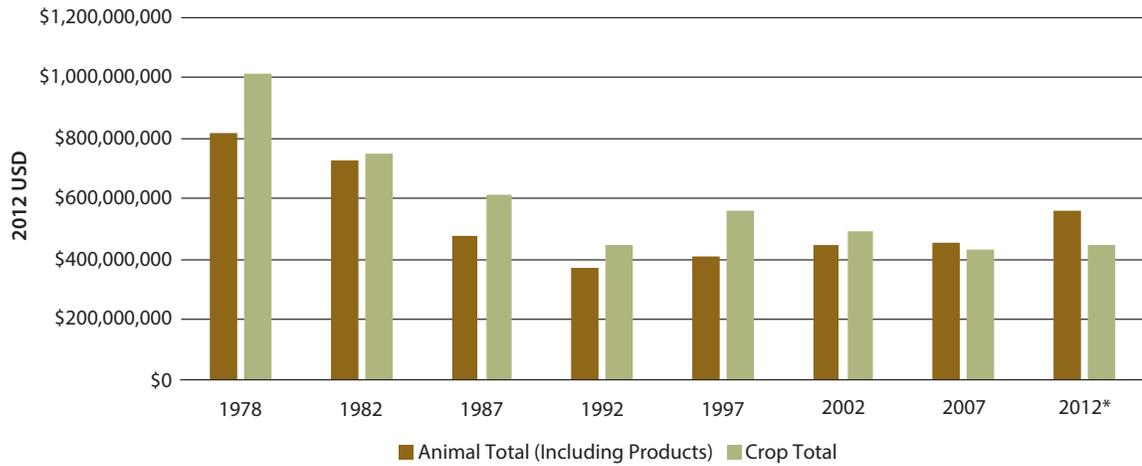
Livestock

Maricopa County’s livestock industry is heavily dominated by the production of milk from cows, with nearly \$400 million in annual sales in 2012 from 45 operations (Figure 3). The county’s milk production serves Arizona’s major urban areas, in particular the Phoenix-Mesa-Scottsdale Metropolitan Statistical Area (MSA), the 12th largest MSA in the nation (US Census Bureau, 2017). Cattle and calves, poultry and eggs, and other animals and other animal products, combined, totaled roughly \$140 million in sales in 2012, though individually their sales are not

disclosed to protect the confidentiality of individual farm data. Yet, state-level rankings indicate that Maricopa County is first among Arizona counties for the value of production of poultry and eggs, horses, ponies, mules, burros, and donkeys, and other animal products, second in the state for hogs and pigs, and third in the state for cattle and calves.

Additionally, sales of hay and other feed crops can be considered as an input to production for the ranching and dairy industries. Other crops and hay represented nearly \$120 million in sales in 2012, which in large part could be considered as part of the dairy and ranching value chain.

Figure 4. Value of Animal and Crop Production Sales in Maricopa County, 1978-2012



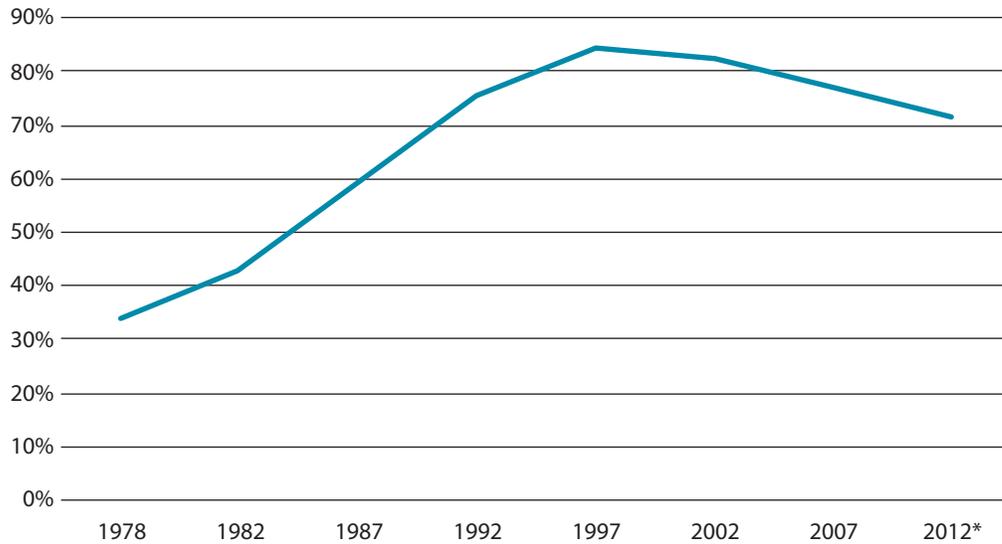
Source: 1978, 1982, 1987, 1992, 1997, 2002, 2007, & 2012 Censuses of Agriculture.

* In 2012, the Agricultural Census began including only fluid milk, not including dairy products in this category.

The value of agricultural production in Maricopa County over time exhibits two contrasting trends (Figure 4). The value of production of crops, when adjusted for inflation, has fallen over the past 35 years, from from over \$1 billion in 1978 to roughly \$447 million in 2012. This reflects the development of agricultural lands on the periphery of the Phoenix metropolitan area for residential real estate, coupled with limits on the expansion of irrigated agriculture in

Active Management Areas and Irrigation Non-Expansion Areas under the Arizona Groundwater Management Act. The value of livestock production has also fallen since the late 1970s, though it has risen since 1992, from around \$373 million to \$557 million in 2012, when adjusted for inflation. Given that livestock sales are dominated by sales of fluid milk, this increasing trend is reflective of demand for dairy products in the growing urban areas of central Arizona.

Figure 5. Milk and Dairy Products as a Percentage of Total Livestock, Poultry, and Products Sales in Maricopa County, 1978–2012



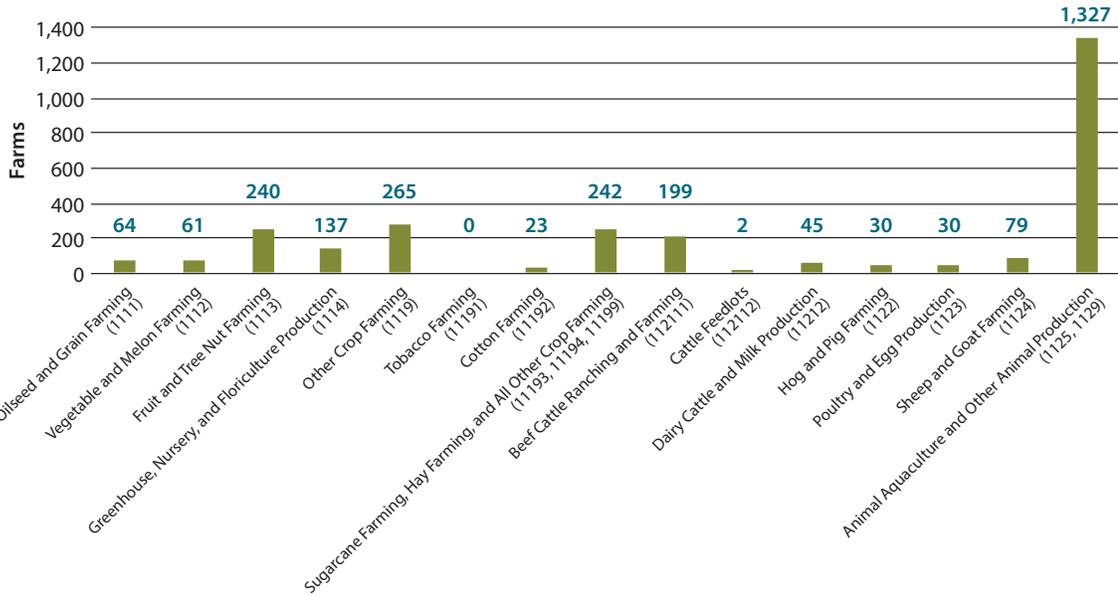
Source: 1978, 1982, 1987, 1992, 1997, 2002, 2007, & 2012 Censuses of Agriculture.

* In 2012, the Agricultural Census began including only fluid milk, not including dairy products in this category.

Underlying this trend is a shift of the *livestock, poultry, and their products* industry towards dairy production. In the late 1970s, milk and dairy products represented a little over 30% of animal

and animal product sales. That share gradually rose over time and in recent years has represented between 70% and 80% of animal and animal product sales (Figure 5).

Figure 6. Number of Farms in Maricopa County by NAICS Code Specialization, 2012



Source: 2012 Census of Agriculture.

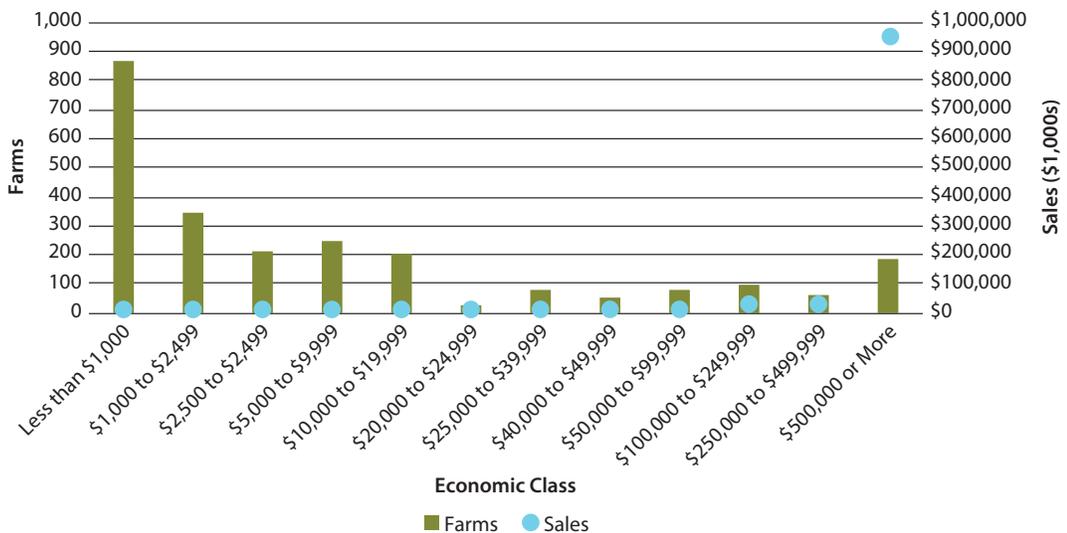
Farm Characteristics

Examining the number of farms by NAICS code³ specialization, there are over 1,300 animal aquaculture and other animal production farms (Figure 6). Considering Maricopa County is

heavily urban, this statistic likely captures many domestic animal breeding operations.

Most farms in Maricopa County are small, with 868 of 2,479 with under \$1,000 in annual sales in 2012 (Figure 7). While on average most farms are small in terms of their economic class, most

Figure 7. Maricopa County Farms and Sales by Farm Economic Class, 2012

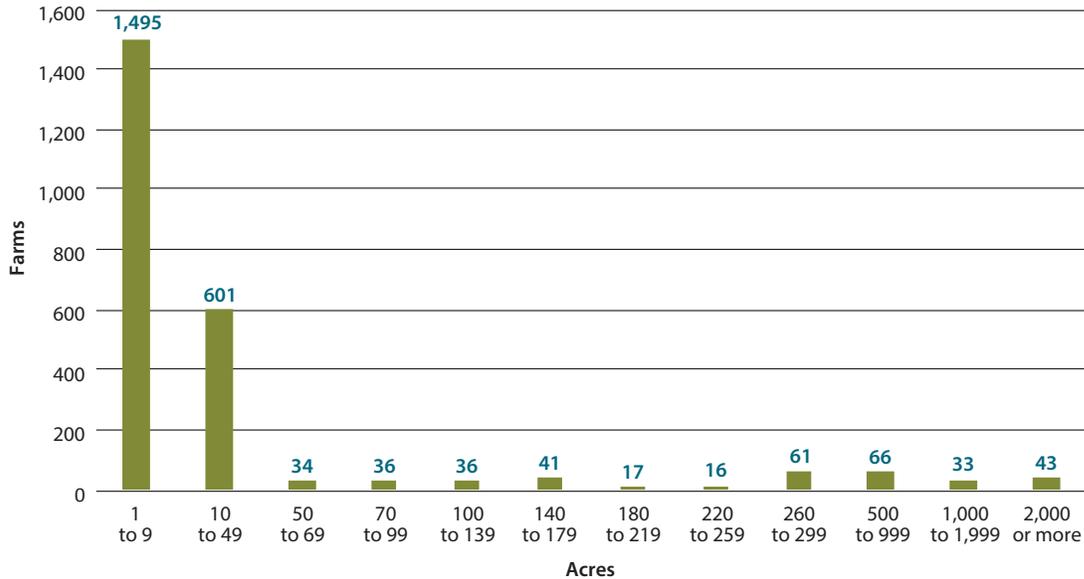


Source: 2012 Census of Agriculture.

3. The North American Industry Classification System (NAICS) is a system of codes used in the United States, Mexico, and Canada to categorize enterprises (as

well as their sales, value added, employment, etc.) for statistical purposes based upon the economic activity or activities in which they are engaged.

Figure 8. Number of Farms in Maricopa County by Farm Size, 2012



Source: 2012 Census of Agriculture.

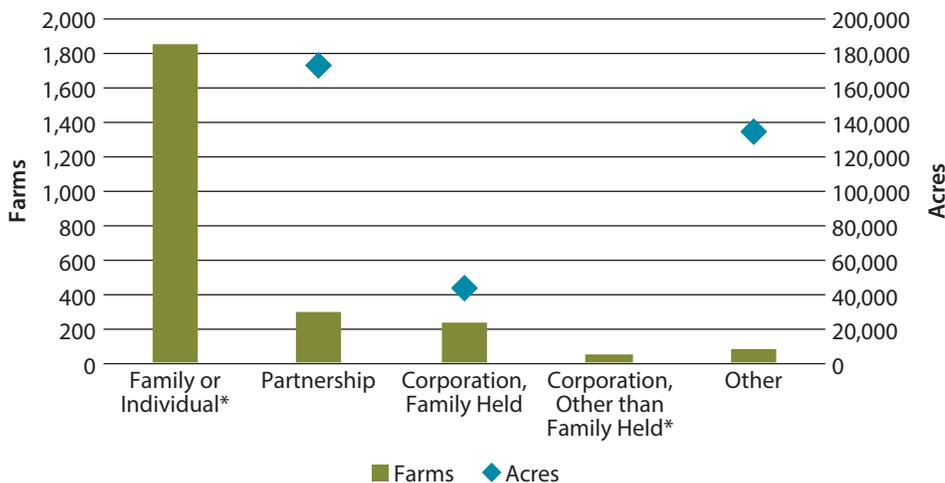
farm sales in Maricopa County come from a small number of large farms having over \$500,000 in annual sales. Nearly \$950 million in sales came from the 185 farms with over \$500,000 in annual sales in 2012. In other words, nearly 95% of sales came from just 7.5% of farms in 2012.

In 2012, nearly 476,000 acres of land were in farms in Maricopa County. In terms of land in farms by type of use, 46.7% was dedicated to cropland, 40.5% was dedicated to pastureland, and 12.8% went towards other uses (Census of Ag

County Profiles, Maricopa County, 2012). Most farms are small in terms of farm size, with 1,495 of 2,479 farms with under 10 acres of land. The median farm size was just 5 acres, while the average was 192 acres (Figure 8).

Most farms (1,838 of 2,479) in Maricopa County were family or individual owned farms. This was followed by partnerships, and family-held corporations. By acres, most acreage within the county falls under partnerships, with over 172,000 acres (Figure 9).

Figure 9. Maricopa County Farms and Associated Acreage by Legal Status for Tax Purposes, 2012



Source: 2012 Census of Agriculture.

* Acreage not disclosed to protect confidentiality of individual farm data.

Contribution of Agriculture to the Maricopa County and Gila River Indian Community Economies

Of a total of 4,041 farm operators, 92% reported their race as white, 6.2% as Spanish, Hispanic, or Latino origin, 2.6% as American Indian or Alaska Native, 1.6% as Asian, and under 1% as Black or African American (Table 5). Those shares closely mirror the breakdown by race of primary farm operators.

In 2012, out of 4,041 total farm operators in Maricopa County, there were 1,686 women operators. 747 primary farm operators were

women in 2012, representing over 30,000 acres in farms (Table 6).

Of the total 2,479 farms in Maricopa County in 2012, 1,263 principal operators considered farming as their primary occupation while 1,216 considered their primary occupation to be something other than farming, close to a 50-50 split. 1,620 principal operators worked any number of days off farm in 2012 and 1,136 worked 200 days or more off farm. The average age of principal operators was 60.4 years in 2012, up from 55.8 in 2007.

Table 5. Farms, Operators, and Land in Farms for All Operators and Primary Operators by Race in Maricopa County, 2012

	All Operators			Primary Operators	
	Farms	Operators	Land in Farms (acres)	Farms	Land in Farms (acres)
American Indian or Alaska Native Operators	99	106	114,558	70	114,370
Asian Operators	54	64	333	50	(D)*
Black or African American Operators	22	36	1,533	12	1,432
Native Hawaiian or Other Pacific Islander Operators	0	0	0	0	0
Spanish, Hispanic, or Latino Origin Operators	205	249	42,258	168	(D)*
White Operators	2,399	3,718	359,983	2,337	359,593
Total	2,479	4,041	475,898	2,479	475,898

Source: 2012 Census of Agriculture.

* Acreage not disclosed to protect confidentiality of individual farm data.

Table 6. Farms, Operators, and Land in Farms for All Women Operators and Primary Women Operators in Maricopa County, 2012

Operators*	All Operators			Primary Operators	
	Farms	Operators	Land in Farms (acres)	Farms	Land in Farms (acres)
Women Operators	1,545	1,637	101,288	747	30,325
Male Operators	—	2,404	—	1,732	445,573
	2,479	4,041	475,898	2,479	475,898

Source: 2012 Census of Agriculture County Data, Table 47.

* Data collected for a maximum of three operators per farm; therefore, there is some discrepancy between counts of women operators from Table 47 data and Table 45 (Selected Operation and Operator Characteristics).

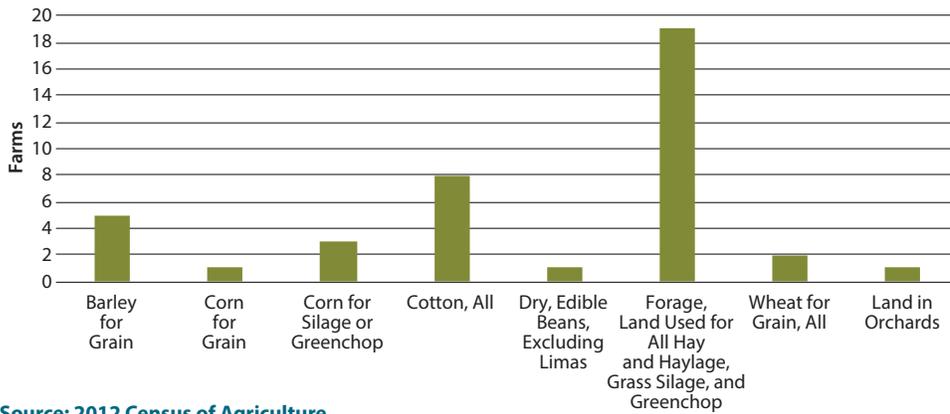
Agriculture in the Gila River Indian Community

According to the 2012 Census of Agriculture report on American Indian Reservations, the Gila River Indian Community had a total of 41 farms and 346,551 acres of land in farms in 2012. Of the 41 total farms, 25 were operated by American Indians or Alaska Natives. 32 farms were engaged in cultivation of crops with 38,498 acres of cropland in 2012 (USDA, 2014b). Of those farms cultivating crops, 23 were operated by American Indians or Alaska Natives. USDA

reports 27,152 acres of cropland were irrigated and 27,132 acres were harvested in 2012. Agricultural production in the Gila River Indian Community is heavily dominated by crops. The most common type of agricultural operation in the Gila River Indian Community in 2012 was operations cultivating forage crops, with 19 farms cultivating forage and hay. Forage was followed by cotton, with 8 operations growing cotton (Figure 10).

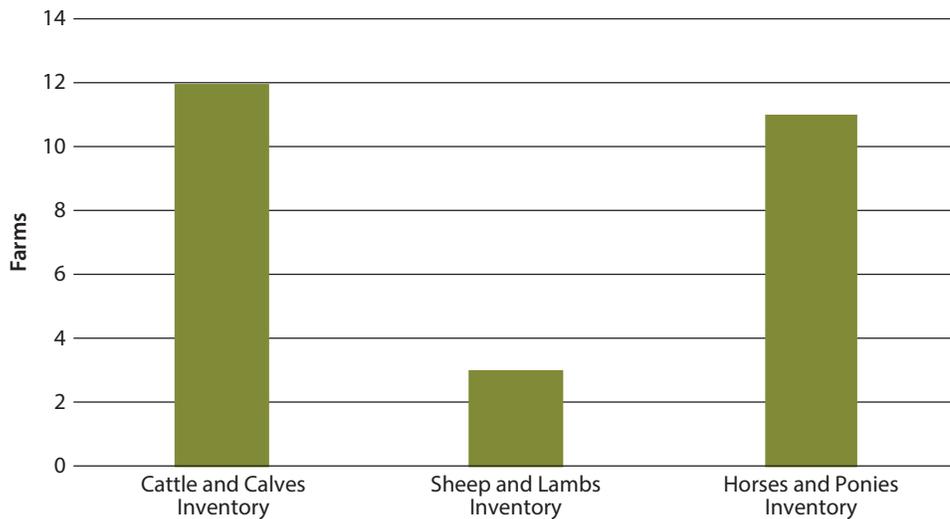
In terms of livestock, 12 operations had inventory of cattle and calves in 2012, 3 had inventory of sheep and lambs, and 11 had inventory of horses and ponies (Figure 11).

Figure 10. Number of Gila River Indian Community Farms by Crop Commodity Produced or Activity, 2012



Source: 2012 Census of Agriculture.

Figure 11. Number of Gila River Indian Community Farms with Inventory of Livestock by Type, 2012



Source: 2012 Census of Agriculture.

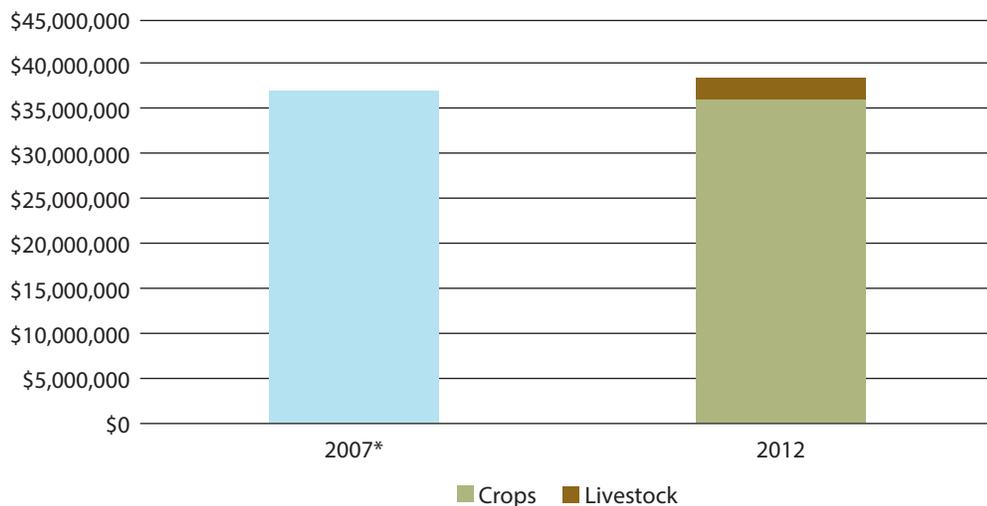
Contribution of Agriculture to the Maricopa County and Gila River Indian Community Economies

Though only two years of agricultural data are available for the Gila River Indian Community through the Census of Agriculture, the value of agricultural products sold remained relatively stable between 2007 and 2012, when adjusted for inflation. In 2012 data was available on the breakdown between crops and livestock, with production heavily dominated by crops (Figure 12). Total market value of agricultural products sold was \$38.4 million

in 2012, of which farms operated by American Indians or Alaska Natives accounted for \$1.3 million.

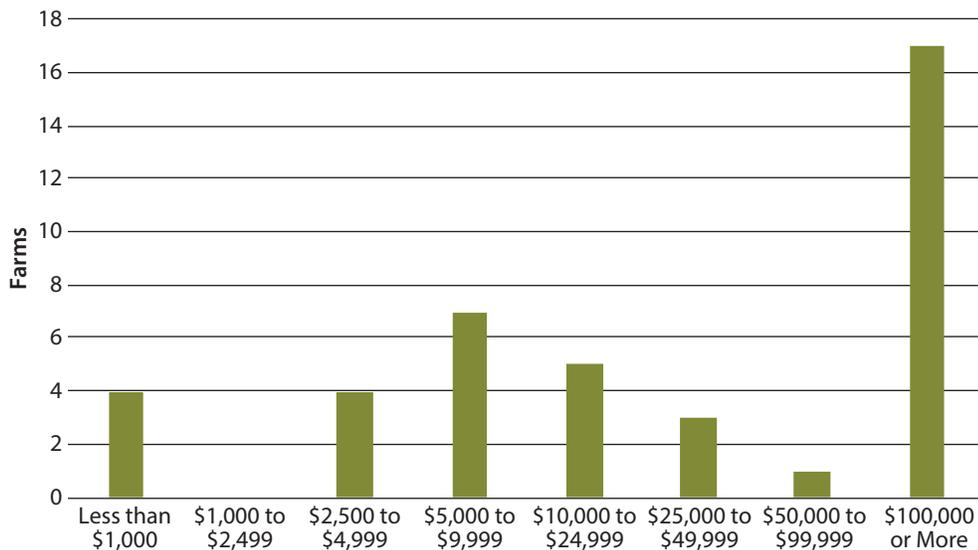
Interestingly, over half of farms located within the Gila River Indian Community have sales of over \$100,000 or more, with just a few farms having sales in each lower economic class (Figure 13). Of the total number of farms operating in the Gila River Indian Community, 16 were not operated by American Indians or

Figure 12. Value of Agricultural Products Sold by Gila River Indian Community Farms by Crop and Livestock, 2007 and 2012, with Crop/Livestock Breakdown in 2012



Source: 2012 Census of Agriculture.
* Value of Sales by Crop and Livestock not available for 2007.

Figure 13. Gila River Indian Community Farms by Value of Sales, 2012



Source: 2012 Census of Agriculture.

Contribution of Agriculture to the Maricopa County and Gila River Indian Community Economies

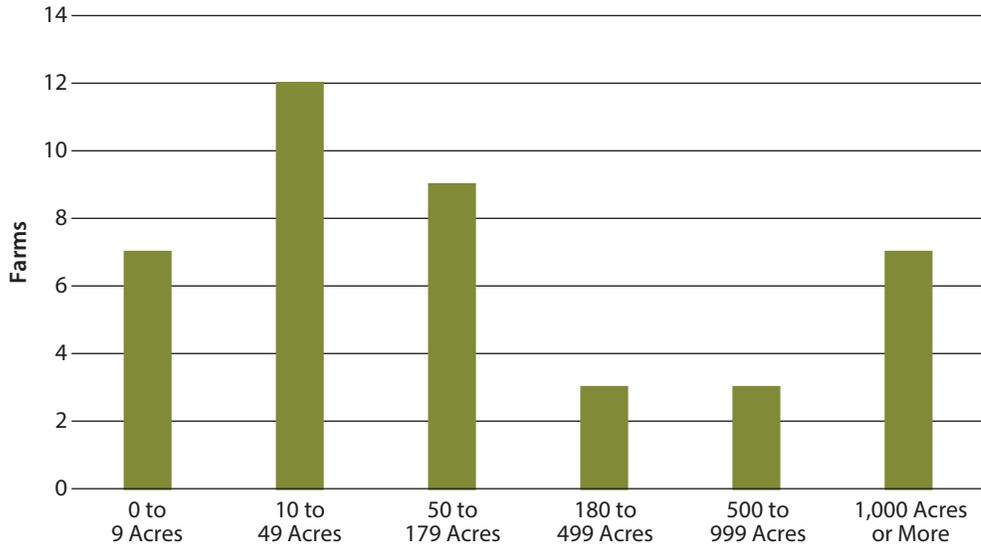
Alaska Natives, and all 16 of those operations fell under the sales class of \$100,000 or more in annual sales.

The number of farms by size is more evenly distributed, with the largest number of farms (12)

having between 10 and 49 acres (Figure 14).

Data on rankings by commodity and specialization by NAICS code are not available for the Gila River Indian Community through the 2012 Census of Agriculture.

Figure 14. Gila River Indian Community Farms by Farm Size, 2012



Source: 2012 Census of Agriculture.

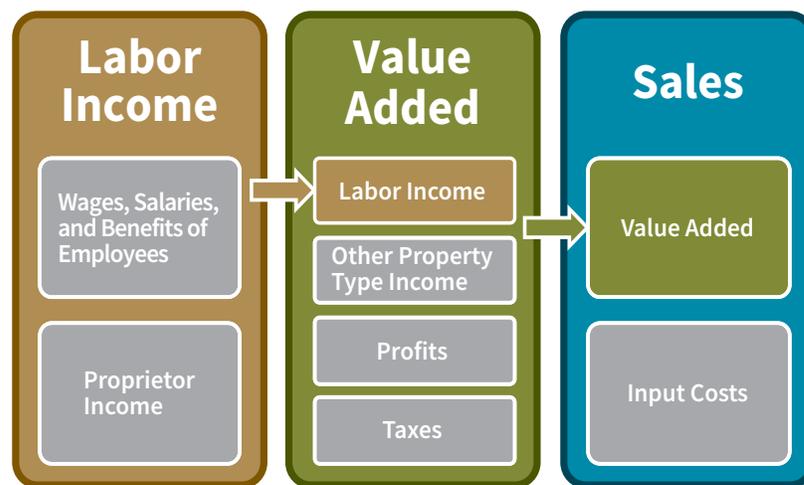
Economic Contribution Analysis

While the value of agricultural production in a region is measured directly by the value of sales of agricultural commodities, the contribution of agriculture to a regional economy goes beyond the value of farm gate sales. Businesses that supply farms with inputs to production exist in large part because of that regional agricultural production, and they too require inputs and labor in order to operate. Furthermore, individuals employed by farms and ranches earn income which they in turn spend in the local economy on household goods, generating additional economic activity in the region. These business-to-business and household-to-business relationships are commonly referred to as **multiplier effects** and include **direct effects**, **indirect effects**, and **induced effects**. Direct effects measure cash receipts or farm gate sales of raw agricultural commodities. Indirect effects measure the economic activity stimulated in industries that supply agriculture with inputs to production such as fertilizer, water, or machinery. Induced effects measure the economic activity that takes place as a result of individuals employed in agriculture spending their incomes within the local economy on rent, groceries, or doctors' visits, for example. Combined, these three effects constitute

the total economic contribution of an industry to a regional economy. This analysis provides an estimate of the economic contribution of agriculture⁴ to the Maricopa County economy in 2015. It also provides a separate estimate of the regional economic contribution of agriculture occurring within the Gila River Indian Community. These contributions are not additive and are estimated separately because the two geographies overlap.

Economic contributions are measured in a number of ways: sales (output), value added (gross state product [GSP] or gross domestic product [GDP]), labor income, and employment. Sales (or output) is an intuitive way to measure economic activity as most day-to-day transactions occur as sales. Sales, however, double count local economic activity as goods and services are purchased as inputs and then resold as part of a subsequent output. For example, the cost of beef to consumers includes the cost of inputs (feed, including hay and grains), which, when purchased from a farm within the same county, also represents an agricultural sale. In this case, the sale value of the feed is being counted twice. Another measure of economic activity is value added, also known as gross domestic product or gross state product. Value added includes labor income, business owner income, profits and other property-type income, and taxes. Figure 15 demonstrates the relationship between output (sales), value added, and labor income.

Figure 15. Relationship between Components of Economic Output (Sales)



4. Agriculture in this analysis is defined as NAICS codes 111 (Crop Production), 112 (Animal Production

and Aquaculture), and 115 (Support Activities for Agriculture and Forestry).

Figure 16. Direct Economic Contribution of On-Farm Agriculture to Maricopa County Sales by Industry, 2015



Source: Author calculations, IMPLAN Group LLC.

In the next section, this analysis takes the direct value of farm sales and agricultural support services and presents an estimate of the total economic contribution of agriculture including direct, indirect, and induced multiplier effects, as measured by sales, value added, labor income, and jobs. It is important to emphasize that this study examines the case of **on-farm agriculture**, as opposed to **agribusiness**. On-farm agriculture is limited to the production of raw, unprocessed agricultural commodities and agricultural support services such as harvesting and planting. Recent studies of Arizona’s agricultural economy estimate the economic contribution of the agribusiness system to the state economy⁵ (Kerna Bickel, et al., 2017; Kerna and Frisvold, 2014). The results of this analysis are best contextualized against the direct contribution of primary on-farm agriculture (and not agribusiness). Furthermore, direct contributions should only be compared against direct contributions (as opposed to total contributions including multiplier effects) estimated in the same year.

Direct Contribution of On-Farm Agriculture to Maricopa County and Gila River Indian Community Regional Economies

In 2015, crop production in Maricopa County contributed an estimated \$469 million to direct sales,⁶ including both food and non-food crops, while livestock and dairy production had an estimated direct contribution of \$584 million in sales, of which 72% was milk and dairy (Figure 16). Agricultural support services, which includes service providers such as farm labor contracts, had an estimated direct economic contribution of \$116 million in sales in 2015 (IMPLAN Group, 2014). Combined, the estimated direct economic contribution of on-farm agriculture to the Maricopa County economy in 2015 was roughly \$1.2 billion in sales, \$393 million in gross state product, and nearly 9,200 jobs generating \$331 million in labor income.

Agricultural production taking place within the Gila River Indian Community in 2012 totaled \$38.4 million. Without further information to estimate 2015 production, the 2012 figure adjusted for inflation would total \$39.6 million in 2015 USD.

5. In the most recent economic contribution study of Arizona’s agribusiness system (Kerna Bickel, et al., 2017), the total economic contribution of agribusiness to the state economy was estimated at \$23.3 billion in sales in 2014. Of that \$23.3 billion, primary on-farm agriculture had a direct sales contribution of \$5.5 billion.

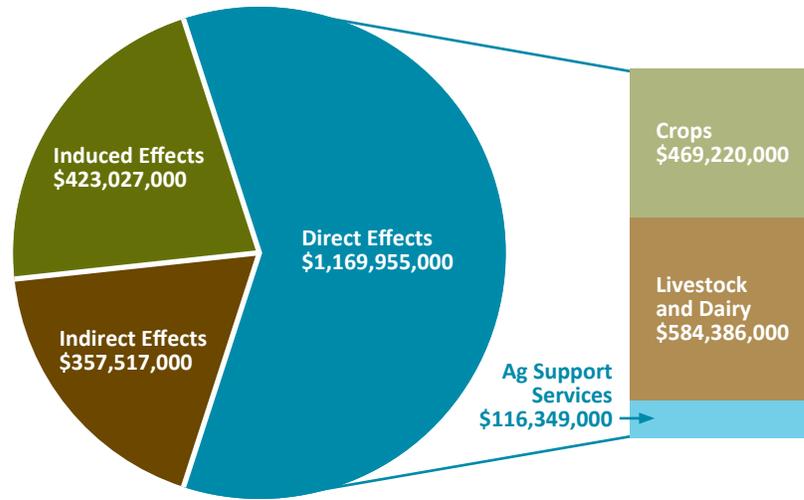
6. Sales estimates include estimated *other farm-related income* in addition to cash receipts for agricultural commodities.

Multiplier Effects and Total Economic Contribution

Direct sales of agricultural industries only represent a share of agriculture’s total contribution to Maricopa County’s economy. Those sales support indirect and induced multiplier effects, creating additional rounds of business-to-business and household-to-business transactions in the economy, and thereby supporting additional

sales, value added, income, and jobs in other industries. Direct sales effects of roughly \$1.2 billion in 2015 supported an additional \$358 million in indirect effects in industries that supply the agricultural sector with goods and services used to operate and \$423 million in induced effects through individuals employed in agricultural industries spending their income on household goods and services within the local economy (Figure 17).

Figure 17. Components of Economic Contribution of On-Farm Agriculture to Maricopa County Sales, 2015



Source: Author calculations, IMPLAN Group LLC.

Contribution of Agriculture to the Maricopa County and Gila River Indian Community Economies

Combining direct, indirect, and induced multiplier effects, the total sales contribution of agriculture to the Maricopa County economy was an estimated \$1.95 billion in 2015 (Table 7). The total value-added contribution, also known as gross state product (GSP), was \$831 million, including \$586 million in labor income, \$192 million in profits and other property-type income, and \$52 million in taxes on production and imports. Agriculture supported roughly 14,200 jobs in the Maricopa County economy, of which an estimated 9,190 were directly supported on farm.⁷ In the case of agricultural production in the Gila River Indian Community, commodity-level sales data is not available; therefore, estimating the regional economic contribution cannot be done as it was with Maricopa County data. Furthermore, considering that part of the Gila River Indian Community lies within Maricopa County and another part within Pinal County, estimating the

economic contribution to a two-county region would not provide a consistent comparison. That considered, a rough estimate of the economic contribution of Gila River Indian Community agriculture, assuming the 2012 value of production levels of \$38.4 million adjusted for inflation, and assuming the multipliers from Maricopa County apply to Gila River Indian Community production (assuming the same mix of commodities produced), the regional economic contribution of Gila River Indian Community agriculture in 2015 would be roughly \$66 million in sales, including direct, indirect, and induced multiplier effects. It is important to emphasize that this number cannot be added to the Maricopa County economic contribution estimate because the two regions overlap geographically, and therefore to do so would be double counting agricultural activity occurring within portions of the Gila River Indian Community that also are within Maricopa County.

Table 7. Economic Contribution of Agriculture to Maricopa County Economy, 2015

Impact Type	Direct Effect	Indirect Effect	Induced Effect	Total Effect
<i>Output</i>	\$1,169,955,000	\$357,517,000	\$423,027,000	\$1,950,499,000
Value Added	\$392,921,000	\$191,484,000	\$246,719,000	\$831,124,000
Labor Income	\$330,560,000	\$110,679,000	\$145,084,000	\$586,322,000
<i>Employee Compensation</i>	\$184,088,000	\$94,758,000	\$124,720,000	\$403,566,000
<i>Proprietor Income</i>	\$146,472,000	\$15,921,000	\$20,363,000	\$182,756,000
Other Property Type Income	\$51,368,000	\$61,328,000	\$79,608,000	\$192,304,000
Taxes on Production and Imports	\$10,993,000	\$19,477,000	\$22,028,000	\$52,498,000
Employment	9,190	1,970	3,050	14,200

Source: Author calculations, IMPLAN Group LLC.

7. Studies from California suggest that the number of unique farm workers can be double the number of directly supported on-farm laborers (Martin, et al, 2017). Recent analyses of Arizona agricultural industries have drawn from these studies to estimate the number of unique workers employed on farm through agriculture (Kerna, et al., 2017; Kerna Bickel, et al., 2017; Kerna, et al., 2016).

Summary

On-farm agricultural production in Maricopa County contributed roughly \$2 billion in sales to the county economy in 2015, of which \$1.2 billion in sales occurred directly, on farm, through agricultural cash receipts and agricultural support services. An estimated 14,200 jobs were supported directly and indirectly through multiplier effects, with 9,190 directly supported jobs on-farm through crop and livestock production and agricultural support services. A large portion of the county's agricultural economy is linked with the dairy industry, either directly or indirectly through feed crops, supplying large urban areas in central Arizona.

The Gila River Indian Community, located partially in Maricopa County and partially in Pinal County, had agricultural cash receipts of \$38.4 million in 2012. Agriculture in the Gila River Indian Community is heavily dominated by crops, and of those crops, most production (as measured by farms and acreage) is in livestock feed crops and cotton. The estimated total economic contribution of Gila River Indian Community agriculture in 2015 is \$66 million in sales; however, this figure includes agricultural activity within Maricopa County and therefore cannot be combined with Maricopa County figures due to double counting.

References

- BEA (2017a). Local Area Personal Income and Employment, CA25N Total Full-Time and Part-Time Employment by NAICS Industry, Maricopa County, AZ.
- BEA (2017b). Local Area Personal Income and Employment, CA45 Farm Income and Expenses, Maricopa County, AZ.
- BLS (2015). Average Price Data, Consumer Price Index (CPI) Databases. Accessed at <https://www.bls.gov/cpi/data.htm>
- BLS (2015). Quarterly Census of Employment and Wages (QCEW).
- BLS (2017). CPI Inflation Calculator. U.S. Bureau of Labor Statistics. Accessed at <https://data.bls.gov/cgi-bin/cpicalc.pl>
- Duval, D., Kerna, A., Frisvold, G., and Avery, C. (2017). The Contribution of Small Grains Production to Arizona's Economy. University of Arizona Department of Agricultural & Resource Economics. Accessed at <https://www.ag.arizona.edu/arec/publication/contribution-small-grains-production-arizona%E2%80%99s-economy>
- ERS (2017). Food Availability (Per Capita) Data System. Accessed at <https://www.ers.usda.gov/data-products/food-availability-per-capita-data-system/>
- Frisvold, G. (2015). Developing Sustainability Metrics for Water Use in Arizona Small Grain Production: Final Report to the Arizona Grain Research and Promotion Council. Department of Agricultural & Resource Economics, University of Arizona. Accessed at https://www.ag.arizona.edu/arec/sites/cals.arizona.edu.arec/files/publications/Developing_Sustainability_Metrics_for_Water_Use_in_Arizona_Small_Grain_Production.pdf
- GRIC (2015). History. Gila River Indian Community. Accessed at <http://www.gilariver.org/index.php/about/history>
- Hanemann, W. (2002). The Central Arizona Project. University of California, Berkeley, Department of Agricultural & Resource Economics, CUDARE Working Papers, Paper 937.
- Kerna, A. and Frisvold, G. (2014). Agriculture in Arizona's Economy: An Economic Contribution Analysis. Department of Agricultural & Resource Economics. University of Arizona.
- Kerna, A., Duval, D., Frisvold, G., and Uddin, A. (2016). The Contribution of Arizona's Vegetable and Melon Industry Cluster to the State Economy. University of Arizona Department of Agricultural & Resource Economics, Cooperative Extension. Accessed at <https://cals.arizona.edu/arec/publication/contribution-arizona%E2%80%99s-vegetable-and-melon-industry-cluster-state-economy>
- Kerna, A., Duval, D., and Frisvold, G. (2017). Arizona Leafy Greens: Economic Contributions of the Industry Cluster—2015 Economic Contribution Analysis. University of Arizona Department of Agricultural & Resource Economics, Cooperative Extension. Accessed at <https://cals.arizona.edu/arec/publication/arizona-leafy-greens-economic-contributions-industry-cluster>
- Kerna Bickel, A., Duval, D., and Frisvold, G. (2017). Arizona's Agribusiness System: Contributions to the State Economy. University of Arizona Department of Agricultural & Resource Economics, Cooperative Extension. Accessed at <https://cals.arizona.edu/arec/publication/arizonas-agribusiness-system-contributions-state-economy>
- Low, Sarah A., Aaron Adalja, Elizabeth Beaulieu, Nigel Key, Stephen Martinez, Alex Melton, Agnes Perez, Katherine Ralston, Hayden Stewart, Shellye Suttles, Stephen Vogel, And Becca B.R. Jablonski (2015). Trends in U.S. Local and Regional Food Systems. AP-068, U.S. Department of Agriculture, Economic Research Service.

Contribution of Agriculture to the Maricopa County and Gila River Indian Community Economies

- Low, S. and Vogel, S. (2011). Direct and Intermediated Marketing of Local Foods in the United States. United States Department of Agriculture Economic Research Service, Economic Research Report Number 128.
- Martin, P., Hooker, B., Muhammad, A., and Stockton, M. (2017). "How Many Workers Are Employed in California Agriculture?" *California Agriculture* 71(1): 30–34.
- Salt River Project (2017). A History of Service. Accessed at <https://www.srpnet.com/about/history/ourstory.aspx>
- Sheridan, T. (2012). *Arizona: A History*. The University of Arizona Press, Tucson, AZ.
- U.S. Census Bureau (2017). Estimates of Resident Population Change and Rankings: July 1, 2015 to July 1, 2016—United States—Metropolitan Statistical Area; and for Puerto Rico. United States Census Bureau, Population Division. March 2017. Retrieved October 13, 2017.
- USDA (2014a). 2012 Census Volume 1, Chapter 2: County Level Data. 2012 Census of Agriculture. Accessed at https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Arizona/
- USDA (2014b). American Indian Reservations. Volume 2, Subject Series, Part 5. 2012 Census of Agriculture. Accessed at https://www.agcensus.usda.gov/Publications/2012/Online_Resources/American_Indian_Reservations/AMINDIAN.pdf
- USDA (2015). 2015 Farm to School Census. United States Department of Agriculture. Accessed at <https://farmtoschoolcensus.fns.usda.gov/>
- USDA (2017). 2015 Local Food Marketing Practices Survey. Region 1. Accessed at https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Local_Food/Views/region.php

Appendices

Appendix A. Food Production and Local Foods Activity

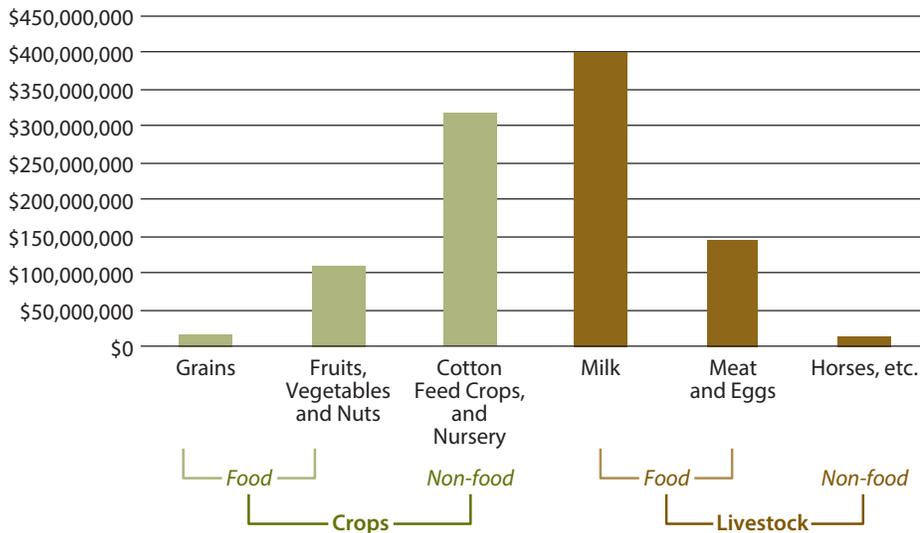
While this analysis is targeted at understanding the contribution of on-farm agriculture to the Maricopa County and Gila River Indian Community economies, information specific to food crops is helpful in building a context for estimating the scale of local foods activity. A mix of food and fiber crops are produced within the Maricopa County and Gila River Indian Community region, and some livestock production is for non-consumptive uses, such as horse and domestic animal breeding. Therefore, the data must be parsed out between food and non-food uses.

In 2012, \$129 million of fruit, vegetable, nut, and food grain crops were sold by Maricopa County farms. Approximately \$542 million in sales came from milk, meat, and eggs (Figure 18). Of that \$542 million, \$398 million was fluid milk sales. It is worth emphasizing again that

many non-food crops are feed crops for livestock, including hay, barley, corn, and sorghum. While including the value of these crops as part of the livestock industry would amount to double counting since livestock sales are reflective of costs of production including feed, it is helpful to think of these crops as contributors to the livestock and dairy industry value chains, further swaying the balance of economic activity between crops and livestock within the county.

In 2012, \$38.4 million of agricultural sales originated from farms within the Gila River Indian Community. Of these sales, the vast majority (\$36.2 million) was from crops, whereas only \$2.2 million was from livestock. Though sales data for individual commodities are not available for the Gila River Indian Community, acreage by crop is available, and crop acreage is heavily dominated by corn for silage or greenchop, cotton, and hay. Accordingly, all crops originating from the Gila River Indian Community are assumed to be non-food crops. In terms of sales of livestock, almost all animal sales were cattle; therefore, total livestock sales of \$2 million are assumed to be livestock for food.

Figure 18. Food Crop and Livestock vs. Non-Food Crop and Livestock Production in Maricopa County, 2012



Source: 2012 Census of Agriculture.

Table 8. Maricopa County and Gila River Indian Community Food Crop and Livestock Value of Production by Type, 2012

Total Food Crop and Livestock Production	\$671,954,000
Fruit, Vegetables, Nuts, Grains	\$128,516,000
Livestock, Poultry, Eggs	\$145,182,000
Milk	\$398,256,000

Combining food crop and livestock numbers for Maricopa County, and the estimated livestock for food number for the Gila River Indian Community (based upon the roughly half of total Gila River Indian Community economic activity taking place outside of Maricopa County), the total estimated value of food crop and livestock sales for the Maricopa County and Gila River Indian Community regional economy is \$672 million in 2012 (Table 8). This estimate represents farm gate sales and therefore excludes value added activities such as livestock processing, value added fruit and vegetable products, and any other prepared or processed agricultural products.

Much of this agricultural production for food is exported to other regions of the country. For example, leafy greens produced in central and western Arizona represent a large share of national supply in winter months, as the state produces far more than it consumes.

Providing an estimate of local foods activity is a challenge due to lack of data and inconsistency in the definition of “local.” Some define local foods as food products produced and consumed within the same state, while others within a certain radius, such as 100 miles. Furthermore, local foods can reach final consumers through a variety of sales channels, including direct-to-consumer sales (farm stands, farmers markets, community

supported agriculture, etc.), or through intermediated sales channels (retailers, food hubs, local distributors) (Low and Vogel, 2011). Definitions of local food can also vary by which commodities are included, whether raw agricultural products, prepared or processed foods, or crops and livestock versus dairy. For example, the Farm to School Census separates milk from other local foods because milk is already typically sourced from locations near major population centers and by many definitions would be considered a local food.

Limited information exists quantifying local foods activity, especially at a regional level. Given this limited availability of data, a reliable estimate of local foods activity would require primary data collection and a carefully defined set of criteria for what should be considered as local foods and what should not. This section presents data that is currently available both regionally and nationally, and discusses what insight it can provide in estimating local foods activity.

Direct Sales Data from the 2012 Census of Agriculture

Direct sales represent the value of agricultural products sold directly to individuals for human consumption. This includes sales through farmers markets, roadside stands, and other direct-to-consumer channels. The 2012 Census of Agriculture provides information on farm sales that are direct to consumers. In 2012, direct sales in Maricopa County totaled \$2,041,000, representing 218 operations (USDA, 2012). This is an increase from the previous 2007 Census of Agriculture where 129 operations had a total of \$1,549,000 in direct sales. Direct sales, however, only represent a portion of local foods activity as many local foods are marketed through intermediaries such as retailers or food hubs.

Table 9. Average Sales per Direct Marketing Channel for Southwest Region, 2015

Direct Marketing Channel	Number of Operations with Sales in SW Region	Total Sales in SW Region	Average Sales Per Operation
Direct to Consumer			
CSA	613	\$24,547,087	\$40,044
Farmers Markets	4,838	\$159,871,827	\$33,045
Onsite	5,161	\$276,557,471	\$53,586
Other Markets	2,848	\$21,036,534	\$7,386
Offsite Store or Roadside Stand	793	\$10,316,918	\$13,010
Intermediated			
Institutions & Intermediated	10,783	\$1,182,913,708	\$109,702
Retail	3,789	\$1,330,929,555	\$351,261
Total			
Total—Excluding Value Added	15,264	\$1,997,908,572	\$130,890
Total—Including Value Added	23,629	\$3,068,295,822	\$129,853

Source: 2015 Local Food Marketing Practices Survey; Author calculations.

2015 Local Foods Marketing Practices Survey Data

In 2017 the USDA released the 2015 Local Foods Marketing Practices Survey which provides information on local foods activity around the country. Data were available at the state level for selected states; however, Arizona is not among those states. Therefore, the most representative data available through that survey for Arizona or its counties is the data available at the regional level for the Southwest Region which includes California, Nevada, Arizona, Utah, New Mexico, and Colorado. The survey captures information on local marketing channels used by farms and of the farms that use each channel, the sales they make through each of them. On average, direct-to-consumer sales ranged between \$13,000 per year for offsite stores or roadside stands and \$53,000 for onsite markets and stands (Table 9). Operations selling locally to retail and institutional or intermediated channels had higher sales per channel on average, ranging from around \$110,000 per year for institutional and intermediated channels to over \$350,000 for retail channels. Overall, across all marketing channels, operations

engaged in local marketing sold on average around \$130,000 per year in 2015.

According to a 2015 ERS report (Low, 2015), there are over 100 farms in Maricopa County with direct sales to retail or restaurants (in 2012) and food hubs (in 2014). Applying national averages of per-channel sales for institutional and intermediate channels and retail channels to the rough number of farms in Maricopa County with direct or intermediated local food sales would lead to an estimate in the tens of millions of dollars for local food sales. It is important to emphasize that this rough estimate is not necessarily representative of local food practices in Maricopa County as it is based on regional averages.

ERS Report: Direct and Intermediated Marketing of Local Foods in the United States

Based upon the 2011 study *Direct and Intermediated Marketing of Local Foods in the United States* (Low and Vogel, 2011) relying on the 2008 USDA ARMS survey, the authors estimate that nationally, “[g]ross sales of locally marketed food (to consumer and local intermediaries) [...] [represent] 1.9 percent of total gross farms sales [...]” Assuming this national estimate holds at the

local level for Maricopa County, 2015 ERS figures for cash receipts for marketings of \$1 billion would once again correspond to an estimate in the tens of millions of dollars for local food sales.

The report goes on to explain that the majority of local food sales are through intermediated marketing channels as opposed to direct-to-consumer channels, with 50–66% of local food sales through intermediated channels. For the West Coast, this figure rises to 85%. Assuming the West Coast share of intermediated sales and national percent of total gross farm sales, the estimate of direct sales for human consumption in Maricopa County is roughly in line with the 2012 Census of Agriculture estimate in terms of magnitude, between \$2 million and \$3 million.

Finally, the study found that local food sales are heavily dominated by sales of fruits, vegetables, and nut crops. Areas with the most local food sales are regions with higher concentrations of these crops, as well as areas with close proximity to large urban areas. According to these characteristics, Maricopa County is potentially well positioned to generate local food activity by virtue of its crop portfolio and population concentration.

2015 USDA Farm to School Census

The USDA Farm to School Census (USDA, 2015) provides information on local food sourcing practices at school districts nationwide. 24 of 91 responding school districts in Maricopa County and the Gila River Indian Community reported

currently being involved in farm to school programs, and 5 reported being in the process of starting one. Most school districts indicated that they define “local” as a food commodity produced within the state. 14 respondents reported obtaining local foods directly from a food manufacturer or processor and one district reported obtaining local foods directly from a CSA. 16 respondents reported obtaining local food indirectly from a distributor, 5 indirectly from a food-buying cooperative, 2 indirectly through a food service management company, 15 indirectly from a Department of Defense Fresh Program vendor, and 11 indirectly through USDA foods. Of schools reporting the value of total food and local food purchases (n=14), on average 17.8% of school food purchases were local foods, including milk. Not including milk, that figure falls to 8.34% on average. Milk is typically sourced from dairies near population centers due to its weight and perishable nature.

Summary

Each information source listed above provides some insight and possible estimates of the magnitude of local foods activity in Maricopa County. However, given inconsistent definitions of what constitutes local food and lack of data at the county level, these estimates are by no means reliable. They could, however, be helpful in providing a rough magnitude for understanding local foods activity within the larger context of agricultural production in the county.

Appendix B. Definition of On-Farm Agriculture and Update of Maricopa County IMPLAN Model

This analysis defines agriculture as primary production of crops, livestock, and dairy products, as well as agricultural support services, or, alternatively, as NAICS codes 111 (Crop Production), 112 (Animal Production and Aquaculture), and 115 (Support Activities for Agriculture and Forestry). This definition of agriculture differs from a recent *agribusiness* economic contribution study for Arizona by Kerna Bickel, et al (2017) in that it excludes industries categorized under NAICS codes 311 (Food Manufacturing), 312 (Beverage and Tobacco Product Manufacturing), 313 (Textile Mills), 314 (Textile Product Mills), 316 (Leather and Allied Product Manufacturing), 325 (Chemical Manufacturing), 333 (Machinery Manufacturing), 423 (Merchant Wholesalers, Durable Goods), 424 (Merchant Wholesalers, Non-durable Goods), 445 (Food and Beverage Stores), and 493 (Warehousing and Storage). According to 2015 QCEW annual average employment data by sub-sector, Maricopa County represents nearly 80% of state employment in Food Manufacturing (NAICS 311) and nearly 70% of employment in Beverage and Tobacco Product Manufacturing (NAICS 312).

County-level on-farm agricultural production data for individual commodities is only available through the agricultural census, conducted every 5 years. Additionally, within each census, often there are undisclosed data to preserve confidentiality of individual farm data. Therefore, it was necessary to estimate production by commodity for 2015 based upon 2012 commodity values and 2015 overall cash receipts (Table 10). 2015 cash receipts by commodity were calculated to match Bureau of Economic Analysis (BEA) Farm Income and Expense (BEA, 2017a) figures as broken down

between crops and livestock for Maricopa County, including other farm income split proportionally across livestock and crops. Cash receipts by commodity were similarly adjusted upward to include a margin accounting for other farm income.

The breakdown of farm income by industry was estimated using 2012 Census of Agriculture county data Table 2: Market Value of Agricultural Products Sold Including Direct Sales. All cattle farming was modeled separately from milk production to best accommodate for data non-disclosure issues within livestock industries in Census of Agriculture data. The default IMPLAN model values for the agricultural support services industry was used for this analysis due to a lack of county-level output data. County employment numbers were updated using the U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW) 2015 annual average employment figures as a measure of hired farm labor and 2012 Census of Agriculture number of operations by industry as a proxy for number of farm proprietors, the sum of which constitutes the total jobs estimate. This figure provides a near exact match to U.S. Bureau of Economic Analysis 2015 Farm Employment numbers for Maricopa County (BEA, 2017b). The 2014 Maricopa County IMPLAN model was updated because IMPLAN uses a gravity model at the county level to adjust data and address data nondisclosure issues. Therefore, there are instances when the data do not fully match existing agricultural statistics at the county level. Furthermore, industry production practices modeled in IMPLAN reflect national average production practices and therefore are not representative of specific production practices in a location such as Arizona where nearly all agriculture is irrigated. These industry production patterns were updated to match 2012 Census of Agriculture state-level input spending patterns by industry.

Table 10. BEA Cash Receipts Data and Study Estimates of Farm Income

Component	BEA 2015 Cash Receipts	BEA Cash Receipts Plus Est. Other Farm Income	Study Estimate 2015
Livestock and Products	\$555,703,000	\$584,184,027	\$584,386,339
Crops	\$446,536,000	\$469,421,973	\$469,219,661



THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES

**Agricultural &
Resource Economics**



THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES

Cooperative Extension

