

Appendix I. Estimating California's Agricultural Acreage

How much agricultural land is there in California? Of course, the answer depends on how “agricultural land” is defined. But even when one is working with a clear definition, it is still difficult to get a precise answer. In this appendix we separate agricultural land into public and private ownership and attempt to find totals for each. In addition, we explain why our estimate for total agricultural land in 1997—43 million acres—is much larger than frequently cited statistics.

We define agricultural land as all land that is used for agriculture, regardless of whether it is cropped or grazed, public or private. Unfortunately, none of the government agencies that track acres of agricultural land report an estimate for California that matches our definition. For example, the National Agricultural Statistics Service *Census of Agriculture* “Land in Farms” statistic (about 28 million acres) is probably the most widely used figure. It measures privately owned crop and grazing land, as well as federal grazing land leased by ranchers; but it excludes public grazing land that is used by permit. Another federal source, the Natural Resources Conservation Service, *Natural Resources Inventory* does not measure any public grazing land. The California Department of Conservation Farmland Mapping and Monitoring Program (FMMP), maps only a small portion of the public land and does not map 10% of California's private land.

To develop an acreage estimate to match our definition of agricultural land we combine published data from the Census and FMMP with unpublished data and anecdotal information from federal agency sources.

Public Grazing Land

In 1997, California had roughly 16.4 million acres in federal grazing allotments. This includes 8.8 million acres administered by the Forest Service, 6.4 million by the Bureau of Land Management (BLM), and 1.3 million by the National Park Service. Of the 16.4 million acre total, only 3.1 million were leased by ranchers, all on BLM land; the remaining 13.3 million acres were available for use by permit. Table A1 shows our estimates for public grazing land by agency. We developed these estimates largely from unpublished data made available to us by the Bureau of Land Management (BLM) and US Forest Service. We do not claim that our figures are precise, but we believe they are accurate as rough estimates.

Like privately-owned grazing land, the federal allotments have a wide variety of vegetative cover and geography, and for this reason only part of the total acreage of each federal allotment is actually grazed and there are large variations in grazing intensity. For example, according to agency sources, in any given year roughly 30% to 50% of the total land in Forest Service allotments is actually grazed, in the sense that livestock actually use a specific unit of land. Given tree and brush cover, steep slopes, rocky patches, and creek beds, a significant share of most pasture parcels in mountain terrain is not actually used for production of usable grass.

Private Crop and Grazing Land

Our estimate for private crop and grazing land is largely derived from published estimates by the Census and FMMP. We begin with the estimate of “Land in Farms” that is found in the main tables of the Census: 27.7 million acres. We add 1.1 million acres to this total, in accordance with Census Appendix C which raises the estimate to 28.8 million acres to account for farms not on its mailing list, and other factors. (We assume that this additional 1.1 million acres is distributed between crop and grazing land in the same proportion as the other 27.7 million acres.) As described above, the Census estimate of “Land in Farms” measures private farmland and public grazing land that is leased. Thus, to get an estimate for privately owned farmland we simply subtract the 3.1 million acres of grazing land leased by BLM from the 28.8 million acres of “Land in Farms” to arrive at a total of 25.7 million acres.

To complicate matters, the 25.7 million acre Census-based estimate does not seem to agree with the total for private farmland implied by FMMP reports. In its *1996-98 Farmland Conversion Report*, FMMP reported about 26.7 million acres of crop and grazing land. But this figure is an undercount because it excludes large tracts of agricultural land in Fresno and Stanislaus counties that lack soil surveys, and other smaller agricultural parcels in unmapped counties in the far north and eastern parts of the state. In total, the excluded areas probably contain about two million acres of private farmland. This assertion is supported by data on agricultural land from the county agricultural commissioners in the unmapped counties. Thus, we expect that if FMMP mapped these areas, the figure it reports as total agricultural land would increase to roughly 28.7 million acres.

Now we have two different estimates for private agricultural land—25.7 million acres using the Census data and 28.7 million acres using FMMP data. We can begin to bridge the 3 million acre gap when we recognize that the FMMP figure includes small amounts of (1) public grazing land; (2) land that is not actually being used for agriculture; and (3) land that has been idled, but not yet recorded as a conversion out of agriculture. Footnotes to the FMMP reports and personal communication indicate that its figures exclude federal grazing land in the mountain and desert regions, where it is mostly located, but include some public grazing land in coastal counties. In addition, the FMMP figures include a category of land called “farmland of local importance” which is land that is deemed important to each county’s agricultural economy by its board of supervisors and a local advisory committee. This category includes some land with prime soils that is not in agriculture. Finally, it may take up to four years for agricultural land that has been permanently idled to be recorded by FMMP as a conversion from agricultural to “other” land. Through communication with FMMP, we have determined that the total impact of these three factors is probably small—we estimate about a million acres in the FMMP total are not private agricultural land. Thus we decrease the FMMP-based figure to about 27.7 million acres.

Surprisingly, the amount of private agricultural land remains an unsettled question. Even

after making many adjustments to our two data sources we do not arrive at a single figure, but are left with a range—25.7 million acres based on our adjustments to Census data, and 27.7 million acres based on our adjustments to FMMP data. We take the median of this range, 26.7 million acres, and use it as our estimate of private agricultural land in California, acknowledging that further work needs to be done in this area. We assume that the 26.7 million acres are distributed between crop and grazing land in proportion to the Census-based estimate for privately owned agricultural land.

Table A1 shows our final estimates for California’s public and private agricultural land according to land use and ownership. Our estimate for total agricultural land is about 50% larger than the commonly cited figure—28 million acres—because we added public grazing land used by permit. But note that our estimate for privately owned agricultural land, 26.7 million acres, is about a million acres smaller than the conventional figure.

Table A1: California Agricultural Land, 1997*

Land Use	Million Acres
Cropland (privately-owned)	11.7
Grazing Land (privately-owned)	15.0
Grazing Land (Forest Service land used by permit)	8.8
Grazing Land (BLM land used by permit)	3.3
Grazing Land (BLM land used by lease)	3.1
Grazing Land (Park Service land used by permit)	1.3
Total Agricultural Land	43.1

* AIC estimates for agricultural land based on data from the Census, FMMP, BLM and the Forest Service.

Different measures of California’s farmland are helpful in addressing different questions. If we are interested in the amount of privately owned land used for agricultural purposes, which is the total agricultural land base that could potentially be sold for development, then all government land should be excluded from our estimate and the figure to use would be roughly 27 million acres. Alternatively, if we want to assess total land productivity, for example, or land available for agricultural production, then the use of the land, not its ownership, is key and we would want our measure to include all public and private crop and grazing land (about 43 million acres). Or, if we were studying federal grazing policy on public land we might want to know the amount of federal grazing land in the state—16 million acres. It is harder to imagine a situation where we would specifically want to track the sum of public grazing lease land plus private farmland, which is what the commonly cited 28 million acre figure measures.

Appendix II. Adjusting FMMP Data to Estimate Total California Farmland Conversion from 1988 to 1998

The Farmland Mapping and Monitoring Program (FMMP) reported that about 420,240 acres of California’s agricultural and “other” land were converted to urban and built-up uses between 1988 and 1998. However, we believe that this figure is an underestimate for three reasons: (A) FMMP’s conversion total does not include a small amount of “island” development; (B) conversion from farmland to low-density residential development¹ is recorded as a conversion to “other” land, rather than to urban and built-up development; and (C) FMMP does not map all of the state’s farmland. In this appendix we use footnoted data from FMMP reports and anecdotal information to attempt to correct for each of these factors. Our adjusted estimates are shown in AIC Issues Brief #16.

(A) FMMP’s conversion total does not include a small amount of “island” development. Small parcels of land used for housing or other non-farm development that are less than 10 acres and surrounded by farmland (hence the term “island”) are assimilated into the surrounding areas and classified as farmland for mapping purposes. Personal communication with FMMP indicated that islands were a minute share of total development. For estimation purposes we pick a one percent share to reflect the fact that the true number is not zero, and we use that figure to adjust total farmland conversion as shown in equation 1. We assume that island development was distributed between cropland, grazing land, and “other” land in proportion to the total conversion recorded in those categories by FMMP.

(1) FMMP farmland conversion + island development

$$= 420,240 + (0.01) * 420,240 = 424,442 \text{ acres}$$

(B) Conversion from farmland to low-density residential (LDR) development is recorded as “other” land, rather than as urban development. Some large homesites may have enough land to be capable of limited agricultural production, but not on the scale that we associate with the California agricultural industry. Thus, we prefer to classify this land as a conversion from agriculture to urban uses.

It is difficult to pinpoint the extent of agricultural land converted to LDR development because FMMP does report this type of development directly. However, it does add footnotes to its tables in cases of such development over 50 acres. Some land conversion footnotes clearly indicate that conversion was due solely or primarily to LDR

¹ FMMP uses the terms “rural residential development,” “low-density residential development,” and “ranchettes”. We use the term “low-density residential development,” which we shorten to “LDR development.” All these terms refer to new residential developments that are at least 10 acres, but with fewer than 6 structures per 10-acre parcel.

development, while other footnotes attribute conversion to LDR development and other factors, without identifying the importance of each factor. The footnotes do indicate whether each conversion came from cropland or grazing land. Using the data provided in the footnotes, we estimated a likely lower bound for LDR development of 35,600 acres by summing acreage for all footnotes that attribute land use changes solely or primarily to LDR development. To construct a likely upper bound we add all acreage data from footnotes that aggregate LDR development with other land use changes. This gives us a range of 35,600 to 71,543 acres. We use the middle value of this range, 53,572 acres, to make an upward adjustment to the overall farmland conversion statistic shown in equation (2).

$$(2) \text{ FMMP farmland conversion (from (1)) + low-density residential development} \\ = 424,442 + 53,572 = 478,014 \text{ acres}$$

(C) FMMP does not map all of the state's farmland. In 1988, FMMP estimated that it mapped about 76% of the private land in California, and by 1998 this percentage had increased to 89%. Most of this increase came from newly mapped areas in the San Joaquin Valley during 1990 and 1992. The areas that were still not mapped in 1998 are relatively rural, and anecdotal information suggests that farmland conversion rates there have been much lower than in the rest of the state.

Part or all of Merced, San Joaquin, and San Mateo counties were mapped in 1998, but not in the earlier years of our study. For each of these counties, we use population data from the California Department of Finance and FMMP conversion data, for all years where it is available, to calculate the average conversion per capita. Then, for years where all or parts of these counties were not mapped we multiply the average conversion per capita by the population increase. These calculations (shown in table A2) result in an estimate of 6,484 acres converted. We distribute the total conversion for each county between cropland, grazing land, and "other" land in proportion to the total conversion in each category for the years in which that county was mapped by FMMP.

Table A2: Conversion Estimates for Counties First Mapped Between 1988 and 1998

Population	Merced	San Joaquin	San Mateo
1988	167,800	461,400	633,700
1989	172,000	471,500	642,600
1990	180,200	483,800	651,400
1991	186,200	495,400	659,400
1992	190,300	505,500	670,400
1993	194,100	510,400	676,100
1994	197,600	515,600	681,700
1995	198,500	524,600	689,700
1996	198,400	533,200	698,000
1997	202,000	542,200	711,700
1998	204,400	551,500	721,400
Farmland Conversion (acres in mapped years)	2,224	7,836	1,357
Population Change (mapped years)	14,100	67,700	70,000
Conversion per Capita	0.158	0.116	0.019
Population Change (unmapped years)	22,500	22,400	17,700
Estimated Farmland Conversion (acres in unmapped years)	3,549	2,593	343

years not mapped
years mapped

Finally, to correct for the 10% of private land that was still not mapped in 1998, we assume that this rural acreage had a conversion rate of 25% as much as the rest of the state between 1988 and 1998. So, multiplying 484,498 (the sum of the farmland conversion from equation (2) and 6,484) by 2.5% results in an additional 12,112 acres of conversion. Equation (3) shows our final estimate of total California farmland converted to urban uses from 1988 to 1998. Here, we again assume that conversion from cropland, grazing land, and “other” land was in proportion to total conversion in those categories for the area mapped by FMMP.

(3) FMMP farmland conversion from (2) + conversion estimates for counties first mapped between 1988 and 1998 + conversion estimates for areas still not mapped in 1998

$$= 478,014 + 6,484 + 12,112 = 496,610 \text{ acres.}$$

Thus, we estimate that total California farmland converted to urban uses between 1988 and 1998 was roughly 496,610 acres, about 18% higher than the FMMP-based figure we started with.