ESTIMATING CALIFORNIA ALFALFA HAY PRODUCTION

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A) Overview

The California Crop and Livestock Reporting Service is part of a network of 44 field offices, serving the 50 States, through cooperative agreements between USDA and State departments of agriculture or State universities. These State Statistical Offices (SSO's) regularly survey thousands of operators of farms, ranches, and agribusinesses who voluntarily provide information on a confidential basis. Statisticians consolidate these reports with field observations, objective yield measurements, and other data to produce State estimates. These estimates are forwarded to the USDA's Statistical Reporting Service (SRS) headquarters in Washington D.C., where they are combined and released at the national level. States, in turn, publish and release information at the State level.

This report is intended to provide the reader with an introduction to the statistical concepts that sample surveys employ and the techniques used to translate facts gleaned from surveys into crop and livestock estimates , in specific alfalfa hay production estimates. The data collection section describes in practical terms how SRS personnel conduct surveys and process information into published reports.

Statistical Reporting Service reports provide broad coverage of agriculture, including about 120 crops and 45 livestock items. The annual cycle of crop reports begins with estimates of the acreages that farmers intend to plant, and continues with estimates of planted acreages, acreages intended for harvest, probable yields, and potential production. Estimates of acreages harvested, actual yields, and production are made at the end of the season. Livestock inventory numbers are published annually. Seasonal details on hog production, cattle on feed, and production of eggs, milk, and meat are issued during the year in monthly and quarterly reports. Estimates of manufactured dairy products and cold storage holdings of agricultural commodities are also published regularly.

The Agency statistics apply to a variety of additional subjects vital to agriculture. These include fertilizer, number and size of farms, farm labor and wages, prices received and paid by farmers and associated indexes, grain stocks, mink, catfish processed, and weekly weather and crop bulletins.

B) Publication:

State estimates of both alfalfa and other hay are published concurrently and begin the season with the February intended acreage for harvest. This is followed by the June acreage report of harvest acres. The first production estimate is released in August, followed by a second forecast of production in October. The end of season production is issued in February of the Following year in addition to the first hay stocks report. The second stocks estimate (old crop) is released in May.

The following table displays the data that will be published by month for the calendar year 1986:

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[1]Cooperative Agreement between USDA Statistical Reporting Service and California Department of Food and Agriculture.

1986 ALFALFA AND OTHER HAY RELEASE DATES

1986 Release Dates	Alfalfa	Other Hay
Feb. 10	Hay Stocks and Harv. acres, yield, prod., (1985)	Harv. acres, yield, prod., (1985)
Feb. 18	Intentions (Harv. acres)	Intentions (Harv. acres)
May 9	Hay Stocks (old crop)	
June (26)	Acres for harvest.	Acres for harvest.
Aug. 12	Harv. acres, yield, production	Harv. acres, yield, production
Oct. 10	Harv. acres, yield, production	Harv. acres, yield, production

C) Sampling and Estimating Methods

Most of the information published is based on data gathered through a system of sample surveys. The Agency regularly surveys sample farms and agricultural businesses in order to make statistical inferences (estimates) for a total population.

The alternative to using a sample survey would be to make a complete enumeration, or count, of the entire population. Both cost and timely results favor the sample survey. Information must be gathered quickly to provide timely data fordecision making purposes. Many estimates are published only a few weeks after a survey begins. This kind of timeliness would be impossible to achieve if complete enumeration of a population was necessary. A well-designed sample survey is much more cost-efficient than a complete census, and may even be more accurate.

Nonprobability surveys rely on responses to questionnaires sent to lists of crop reporters or other respondents. This traditional survey method still provides some of the basic data used by California Crop and Livestock Reporting Service. The more recent probability surveys usually employ enumerators who gather data from a small sample that is randomly selected from an entire population.

Sampling Frames

Sample surveys use two kinds of frames, the area frame and the list frame. The concept of area-frame sampling is simple. The land area to be surveyed (California) is divided into small blocks, called segments, with unique and identifiable boundaries that can be delineated on aerial photographs or maps. The segments must cover the land area completely. No segment will have more than one chance of being selected. The sample is then a random selection of these small segments. The primary advantage of area-frame sampling is that it provides a complete frame; that is, every segment of land, and thus all land, has a known chance to be selected, so all items being surveyed have a chance of being selected by their association with a unique segment. An area frame does not grow out of date in terms of coverage of the population, but it can become inefficient as the characteristics of the population change. California utilizes 911 sample land areas (segments) in the State. The average segment is approximately 640 acres in size. All farm operators are interviewed to collect basic data regarding crops and livestock being produced within the segment boundaries.

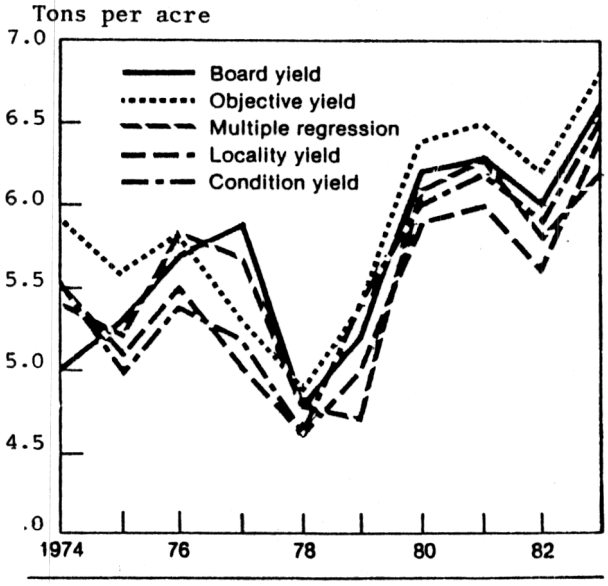
Data Interpretation

The assumptions that must be made to prepare estimates from nonprobability survey indications are factors that limit survey reliability. Several methods most frequently used for minimizing or interpreting the inherent biases should be mentioned.

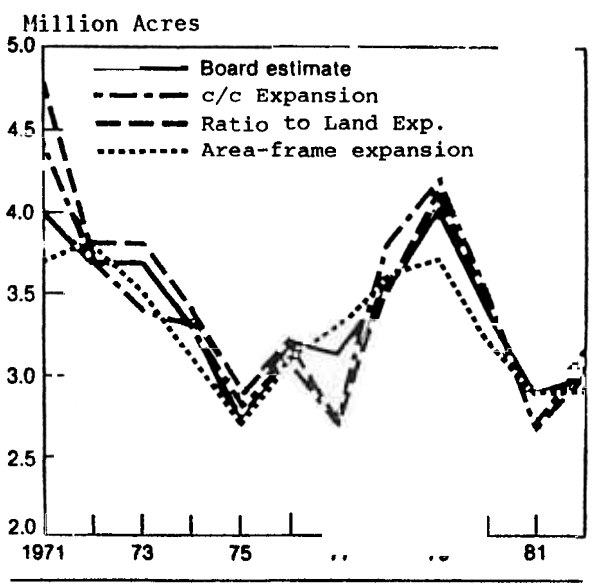
Weighted Averages. One procedure for minimizing response bias is to summarize the data by geographic or size group strata. Known or estimated weights are used to weight stratum averages to State estimates. The effect of a poor distribution in sample response is minimized, providing respondents have characteristics similar to others in the same stratum. For example, crop yields would normally be expected to be more alike within a crop reporting district (for example - San Joaquin Valley) than within the entire State. Average yields from the survey are computed at the level of the crop reporting district and weighted to a State average yield using district estimates of crop acreages for weights. Size group stratification is used similarly.

Charts. Most nonprobability survey data are interpreted through time-series charts which pictorially describe past relationships of survey indications to final estimates. The horizontal axis is used to sequently plot time. The levels of indications and values of the board estimates are indicated on the vertical axis. Indications are the corresponding estimates are distinguished by different types of points and lines drawn to show respective year-to-year changes. The chart enables statisticians to evaluate all indications simultaneously. More reliable indications can be given more weight in the evaluation process. The figures below shows time-series charts used to estimate yields and acreage.

Example of a Time-Series Chart for a State's Yield



Example of a Time-Series Chart for a State's Acreage



Trend is an important consideration for some estimates, particularly in developing crop yield forecasts. Time is often used as a second variable for developing a multiple-regression indication. In this way, an allowance for trend (due to improved variables, cultural practices, or fertilization) is incorporated into the indication. Additional variables, such as precipitation, are occasionally used in developing the multiple-regression indication.

A list of farm operators or agribusinesses can also constitute a sampling frame. This list sampling frame contains names and addresses along with control data that identify the relative size of the items being surveyed. The list frame has several advantages. It permits the use of data collection by mail and telephone, which is a more efficient sampling methods, especially for items grown on a small percentage of farms or where there is extreme variability in size of operation. California currently maintains approximately 55,000 names of farm operators for use in list sample selection. A basic disadvantage of a list sampling frame is that it is nearly impossible to maintain a list that covers the entire population of interest or is completely up to date. In addition, maintaining a list frame with current names, addresses, and control data for sampling purposes is costly.

Multiple-frame sampling is a survey technique that uses list and area frames in combination to gain the advantages of both. The list frame is extremely efficient for large operations and operations that produce rare items. The area frame ensures complete coverage and can be used to estimate the incompleteness of the list frame.

All three of these survey techniques (list, area, and multiframe) are use to produce separate indications for California's alfalfa acreage and production.

The list sample is still the primary method use for estimating alfalfa production. Some 6,000 farm responses are summarized from the June Acreage Survey where information is collected on all crop acreages grown on the farm including alfalfa and other hay.

Estimation Methods

Nonprobability Surveys:

Nonprobability surveys are voluntary mail surveys based on incomplete frames. Nonprobability surveys tend to be selective, employing operators known to have had the commodities of interest. Operators who are willing to cooperate are asked to supply data relating to their own farms as well as data relating to agricultural conditions in their locality.

It is not possible to obtain accurate direct estimates of population totals with nonprobability surveys because of incompleteness of the list frame used to collect the data plus we have no control over who responds and whether they are representative of the population of interest. Therefore, most survey indications are relationships estimated from the survey data which can be applied to some assumed known base. Brief descriptions of some of the commonly used nonprobability survey indications follow.

Matched Reports. Estimates of survey-to-survey changes are made by matching reports from the same farm for two successive surveys (current to previous year). This indication is commonly called the "current/current" (C/C) ratio. Indications are developed by applying survey changes to the previous estimates. Care must be taken in the matching process to assure that the reporting units are comparable between surveys. The procedure does not permit new operating units to be included in the tabulations.

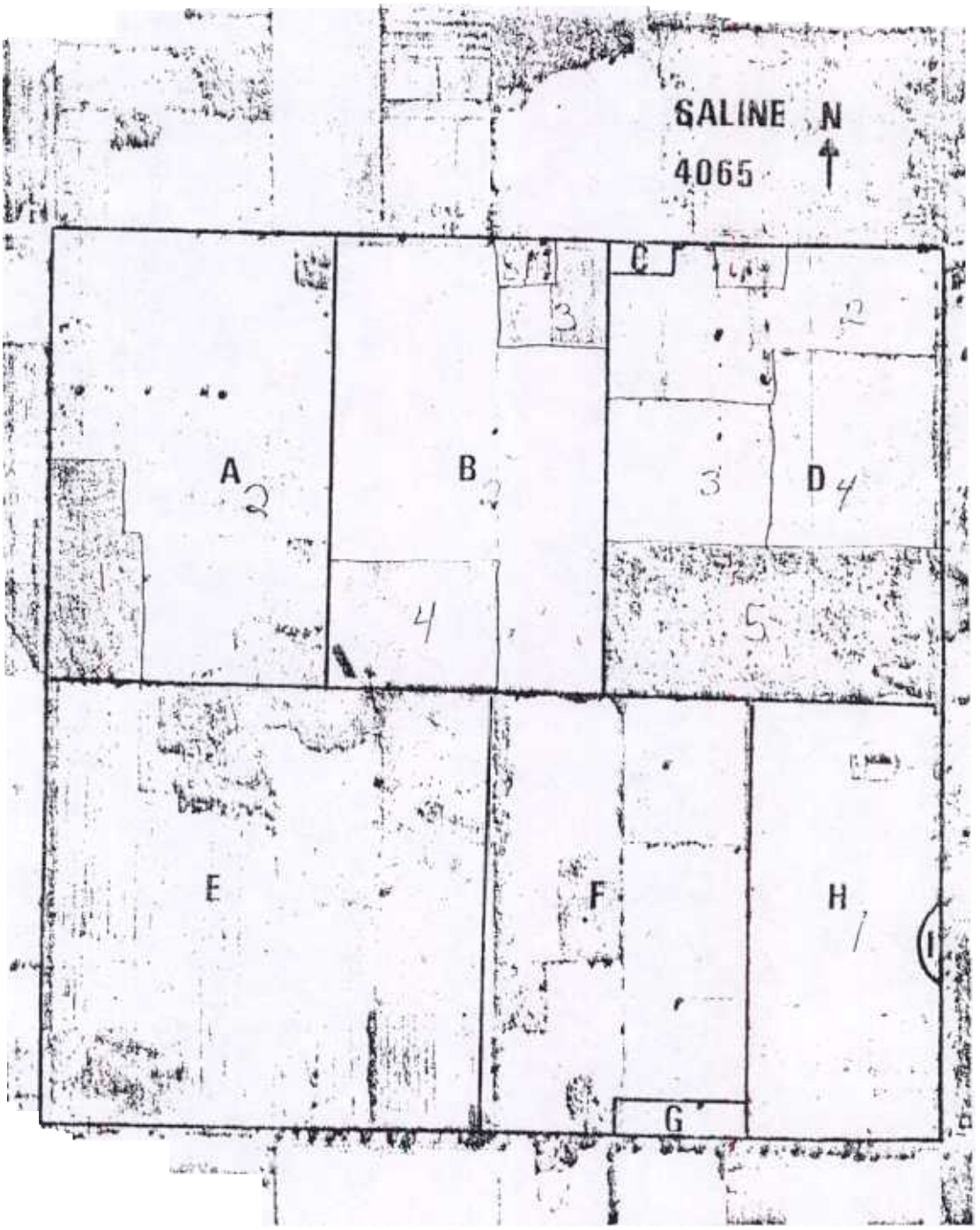
Ratio to Land. The sample total acreage for a specified crop is divided by the sample total farmland acreage or total cropland acreage. This provides a measure of the proportion of farmland acreage used for that crop. The relationship of any two items on the questionnaire can be estimated in this manner.

Yield Indications. Mail surveys have retained much of their usefulness for estimating and forecasting crop yields. Indications for forecasting yields are based on reports of condition or probable yield. Reported condition consists of evaluations by growers and crop reporters of the size of the current crop expressed as a percentage of a hypothetical full or normal crop. Expected or probable yield is likewise a subjective judgment of crop prospects, but is expressed directly as yield per acre. At harvest, actual yields can be derived by obtaining harvested acreage and comparable production data.

ALFALFA HAY: ACREAGE, YIELD AND PRODUCTION

Year	Acreage Harvested (000)	Yield Per Acre (Tons)	Production (000 Tons)
1951	963	4.70	4,574
1952	1,002	4.70	4,709
1953	1,062	4.60	4,885
1954	1,094	4.80	5,251
1955	1,082	4.60	5,437
1956	1,206	4.50	5,427
1957	1,170	4.85	5,674
1958	1,135	5.00	5,675
1959	1,146	5.20	5,959
1960	1,192	5.00	5,960
1961	1,204	5.10	6,140
1962	1,120	5.20	5,824
1963	1,131	5.60	6,334
1964	1,176	5.55	6,527
1965	1,176	5.35	6,292
1966	1,141	5.60	6,390
1967	1,164	5.30	6,169
1968	1,152	5.70	6,566
1969	1,129	5.50	6,210
1970	1,152	5.60	6,451
1971	1,210	5.70	6,897
1972	1,198	6.00	7,188
1973	1,190	5.80	6,902
1974	1,150	5.90	6,785
1975	1,120	5.90	6,608
1976	1,100	6.00	6,600
1977	1,140	5.85	6,669
1978	1,090	5.45	5,941
1979	1,050	6.00	6,300
1980	1,030	6.40	6,592
1981	1,050	6.30	6,615
1982	960	6.70	6,432
1983	950	6.40	6,080
1984	1,020	6.50	6,630
1985	1,030	6.40	6,592

EXAMPLE OF AN AREA SEGMENT



CALIFORNIA
CROP AND LIVESTOCK
REPORTING SERVICE
U S DEPT OF AGRICULTURE and
CALIF DEPT OF FOOD & AGRICULTURE
P O Box 1258, Sacramento, California 95806

CALIFORNIA ACREAGE SURVEY

1985

Form Approved
OMB Number 535-0033
Expiration Date 8/31/86

C.E. 02-9774

CALIFORNIA

002	1-M 2-TEL 3-INT 6-MR 7-TR 8-IR 9-INAC
325	

Please correct any errors in label information.

Dear Reporter:

The information asked for in this survey is used in preparing estimates of crops, acreages, and livestock numbers for 1985. Response to this survey is voluntary and not required by law. However, your report will be very helpful in representing your locality.

Please return promptly in the enclosed envelope, which does not require a stamp. If exact acreage is not known, please give your best estimate. Your report will be kept confidential.

Respectfully,

L. ODELL LARSON
Agricultural Statistician in Charge

FARM GRAIN STORAGE CAPACITY

What is the total whole grain storage capacity located on the land you operate? (Do not include storage only used for mixed feeds or silage) 326 Tons

LIVESTOCK ON THIS FARM OR RANCH

Please report below livestock numbers currently on all California land operated by the above first line label name in 1985.

Total Cattle and Calves . . . Number	320	
Milk Cows . . . . . Number	319	
Beef Cows . . . . . Number	318	
Total Hogs and Pigs . . . . . Number	321	
Total Sheep and Lambs . . . . Number	322	

Reported by _____

County _____
(In which farm is located)

PLEASE SEE OTHER SIDE

Please report for all land operated under the above label name in 1985

Fall and Winter Seeded Crops	All Acres Seeded for 1985	Acres for Grain Harvest in 1985
WHEAT: a. Durum Wheat	003	007
b. Other Wheat	021	025
OATS	057	061
BARLEY	039	043

SPRING AND SUMMER SEEDED CROPS	Acres Planted and to be Planted in 1985
CORN for all purposes (not sweet corn)	075
SORGHUM for all purposes (exclude crosses with sudan)	
SUGAR BEETS for sugar	
COTTON	
DRY EDIBLE BEANS: a. Large Lima	
b. Baby Lima	155
c. Other than Lima	173
RICE	187
SAFFLOWER	181
SOYBEANS	
POTATOES, "Irish"	117
VEGETABLES and MELONS	114
OTHER CROPS (_____) Name of Crop	254

HAY CROPS	Acres for Harvest in 1985
ALFALFA and alfalfa mixtures for HAY	218
ALFALFA and alfalfa mixtures for PASTURE or GREENCHOP only . . .	219
ALFALFA for SEED	236
OATS for HAY	300
WHEAT, BARLEY, and RYE for HAY . . .	293
ALL OTHER HAY (wild and range grasses, clover, timothy, sudans, etc.) cut for HAY	200

TREE AND VINE CROPS, PASTURE, RANGE, AND TOTAL LAND	Acres in 1985
TREE AND VINE CROPS	315
RANGE, PASTURE, WASTE, and all non-cropland	316
ASCS Diversion Land and Other Idle or Fallow Land not cropped in 1985 . .	254
ACRES of ALL LAND IN THIS FARM OR RANCH (exclude land rented to others)	307

If you would like to receive a report of the results of this survey, please check here . . ☐ 998