UNIVERSITY OF CALIFORNIA COLLEGE OF AGRICULTURE AGRICULTURAL EXPERIMENT STATION BERKELEY, CALIFORNIA

# WILD-HAY-MANAGEMENT PRACTICES IN MODOC COUNTY

L. W. FLUHARTY and J. C. HAYS

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# WILD-HAY-MANAGEMENT PRACTICES IN MODOC COUNTY<sup>1, 2</sup>

L. W. FLUHARTY' AND J. C. HAYS'  $^{\rm 4}$ 

# INTRODUCTION

DURING THE PERIOD 1935 to 1939, inclusive, a group of progressive hay and cattle producers in Modoc County coöperated with the Agricultural Extension Service of the University of California in making a study of the management problems involved in the production of wild hay. The study was conducted primarily for the purpose of obtaining information of value to coöperators in improving their management practices and thus reducing the cost per ton of hay production. Although the study was carried on in but one county with a relatively small number of producers, the results are applicable to a considerable area of the state where cattlemen depend on the production of natural meadow hay for wintering livestock. The costs reported in this bulletin are also applicable to those tame-hay fields in this same area which yielded but one cutting per season.

Wild-hay production in California is confined almost entirely to mountainmeadow districts (see fig. 1) where livestock production has long been established. Though confined to a relatively limited area, a substantial acreage is devoted to wild hay every year. Wild-hay production during the ten years, 1931 to 1940, inclusive, is shown in table 1.

The area devoted to wild hay, as shown in table 1, has varied during the ten-year period from a low of 97,000 acres in 1931 to a high of 200,000 acres in 1935; during the period an average of almost 155,000 acres of wild hay has been produced. This area has had an average annual output of 175,600 tons with an average annual value of \$1,127,360. The average yield of 1.13 tons per acre for the ten-year period, however, was considerably below the 1.67 tons per acre (average 1935 to 1939) produced by the coöperators in this study.

On most ranches in California where wild hay is produced, hay and beef cattle are complimentary enterprises. Without hay to maintain the herds during the winter (or other feeding season), the livestock industry could not exist. On the other hand, most wild-hay-producing districts are so far from effective hay markets that producers must depend upon livestock to market their crops. There are, therefore, two main enterprises on most ranches where wild hay is grown: the production of hay, and the care and feeding of livestock. On each of the hay ranches where records were carried during 1935 to 1939 beef-cattle-production methods and costs have also been studied. In analyzing and summarizing the data, an attempt was made to allocate all ranch expenses to each enterprise in the proper amount.

Inasmuch as there was no established market for hay during much of the year, income per acre and per ton was difficult to calculate. The value of hay per ton was finally based on the average farm prices paid for loose hay in the

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<sup>&</sup>lt;sup>3</sup> Specialist in Agricultural Extension and Associate on the Giannini Foundation.

<sup>\*</sup> Specialist in Agricultural Extension.

stack during that portion of the year when there were sufficient sales to establish a market and upon estimates of cattlemen for those portions of the year when there was no hay market. The average value placed on wild hay for the



Fig. 1.---A typical wild-hay meadow in Modoc County, California.

#### TABLE 1

ACREAGE, YIELD, PRODUCTION, AND VALUE OF CALIFORNIA WILD HAY, 1931-1940

Year	Acreage	Production	Yield per acre	Total farm value	Farm value per unit
	acres	tons	tons	dollars	dollars per ton
1931	97,000	82,000	0.85	656,000	8.00
1932	136,000	170,000	1.25	901,000	5.30
1933	122,000	122,000	1.00	707,600	5.80
1934	123,000	105,000	0.85	735,000	7.00
1935	200,000	270,000	1.35	1,593,000	5.90
1936	170,000	196,000	1.15	1,234,800	6.30
1937	170,000	170,000	1.00	1,377,000	8.10
1938	187,000	243,000	1.30	1,482,300	6.10
1939	159,000	159,000	1.00	1,081,200	6.80
1940	184,000	258,000	1.40	1,471,000	5.70
Average 1931-1940	154,800	177, 500	1.15	1,123,890	6.33

Source of data: California Coöperative Crop Reporting Service, Sacramento.

five-year period was \$5.38 per ton (see table 5), which was somewhat below the average price of \$6.33 per ton shown for the same period in table 1. In addition to the income from hay, most of the meadows had an aftermath and cleanup value. Thus, the income accredited to hay land was derived from the farm value of hay and pasture produced.

In working out the cost of producing beef on these same ranches, the income accredited to the hay enterprise became a feed charge against the beef enterprise. By this method of procedure it was possible to determine whether the

operator's profits or losses were due to the production of hay and pasture, or resulted from the feeding of these products to beef cattle. Even simple farm accounts will show whether a net profit or loss is resulting from the operation of an entire farm business. But it is difficult for the operator to determine which of the farm enterprises is producing an annual profit or loss without departmentalizing his farm accounts.

# METHOD OF CONDUCTING STUDY

This study was carried on under the supervision of the county farm advisor in coöperation with a group of producers who volunteered to provide accurate information on standard forms which were sent to each coöperator by the county office of the Agricultural Extension Service. These coöperators furnished detailed records of man, horse, and tractor hours involved in each cultural operation, together with the wage rates per hour. They also provided data on kind, quantities, and cost of materials used, acreage involved, quantity of hay produced, value of hay per ton, and such other figures as were needed to make a complete analysis of hay-management practices. Before final tabulations were made, each record was carefully checked for errors, omissions, or other discrepancies. At some time during each year inventories of land, improvements, and equipment were taken by the farm advisor. At the close of every record year, each individual coöperator's record was analyzed and summarized by the extension specialist, who then averaged the annual records of all coöperators participating in the study. As each year of the study was completed, each coöperator received a detailed summary of his own record, together with a mimeographed summary of all records.

Since the coöperators who furnished the data for this bulletin did so on a voluntary basis, these records may not represent a cross section of the entire wild-hay industry. Probably most producers who participated are above average in efficiency, for those who participate in such an undertaking would be expected to have above-average managerial ability. On the other hand, most of the implements used and cultural methods practiced are well standardized; thus a fairly typical sample may be obtained from a relatively small number of records. Any conclusions drawn from this bulletin should take these facts into consideration.

# KINDS OF HAY PRODUCED, ACREAGE, AND YIELD

Some of the coöperators who provided wild-hay records for this study also produced a small quantity of alfalfa, timothy and clover, grain, or other types of tame hay. In making the final summary no attempt was made to allocate expenses to each kind of hay produced except in the case of alfalfa acreage, where two or more crops were produced during the year instead of one. For this acreage, adjustments were made for certain production operations, such as cutting, raking, and stacking, in order to make the figures comparable with those fields where only one crop was harvested. Hence all figures shown in the following tables with reference to production operations will represent amounts required in producing one crop of hay per season.

Table 2 shows that of the 12,635 acres in the study, 10,461 acres, or 83 per cent of the total, was native meadow hay. Most of the acreage was irrigated

from regularly constructed irrigation works or was subirrigated from near-by streams or springs. The 1,860 acres of alfalfa hay was all given one or more irrigations annually. The grain hay, which made up a very small portion of the total acreage, was grown without benefit of irrigation.

Year	Wild meadow hay		Alfalfa hay		Grain hay		Total	
	Acreage	Yield per acre	Acreage	Yield per acre	Acreage	Yield per acre	Acreage	Yield per acre
	acres	tons	acres	tons	acres	tons	acres	tons
1935	2,584	1.78	387	2.06	90	1.33	3,061	1.86
1936	2,225	1.67	489	1.89	65	1.00	2,779	1.69
1937	1,705	1.42	243	2.42	0	0.00	1,948	1.55
1938	2,225	1.84	324	1.72	70	1.60	2,619	1.82
1939	1,722	1.64	417	2.26	89	0.69	2,228	1.72
5-year total	10,461		1,860		314*		12,635	
5-year average		1.67		2.07		1.16†		1.74

TABLE 2

Acreage and Yield per Acre of Hay by Kinds Found in the Modoc County Hay-Production Study, 1935-1939

\* Four-year total.

# INVESTMENT, INTEREST, AND DEPRECIATION

Like all commercial undertakings, hay production requires the investment of capital. Part of this capital must be invested in land on which hay is grown and part of it in facilities, such as buildings, fences, irrigation works, tillage and harvesting equipment, and field-power facilities. The operator may own the capital invested in land and facilities or he may rent all or part of this capital from someone else. Because the operator must pay for the use of rented land or other facilities, he recognizes that this charge is a production cost. The amount of money received by the landlord as rental must provide a depreciation reserve for replacement of worn-out fences, buildings, irrigation works, and similar items. Another portion of the landlord's rental income must provide for payment of such cash expenditures as county taxes, repairs, and assessments on irrigation works. Whatever residue remains after the above charges are met is considered returns for invested capital. Even though the operator owns his own land, improvements, and equipment free from indebtedness, the total cost of producing a commodity should include a charge sufficient to cover depreciation and cash outlay for taxes and repairs on improvements and equipment, an interest charge on capital invested in these facilities, and a fair rental on land. Therefore, in all management studies conducted by the Agricultural Extension Service, a charge is made to cover replacement reserves (depreciation), interest on invested capital at the rate of 5 per cent, and land rental.

Column 1 of table 3 gives the estimated original investment value per acre of land and facilities used in producing hay in Modoc County from 1935 to 1939, inclusive. These estimated values were worked out with each individual coöperator for his own setup. With the exception of land, they represent the

<sup>†</sup> Four-year average.

original cost values of facilities on hand during the period of this study and are not present replacement values. The land values are based on 1935–1939 sales value of similar kinds of land and also on the capitalization at 5 per cent of net cash rental values of land suitable for hay production.

Column 2 shows the amount on which interest at 5 per cent was charged for each group of items. For all groups of items except land, the interest charge was based on 50 per cent of the original value shown in column 1.

#### TABLE 3

Investment, Interest on Investment, and Depreciation per Acre, Modoc County Hay-Management Studies, 1935-1939 Average

		Original investment	Average investment	Interest at 5 per cent	Depreciation charge
		1	2	3	4
		dollars	dollars	dollars	dollars
Bui	ildings	0.48	0.24	0.01	0.02
Fer	nces	1.37	0.68	0.03	0.04
Irri	gation facilities	1.47	0.74	0.04	0.05
Til	lage equipment	0.38	0.19	0.01	0.01
Ha	rvesting equipment	3.88	1.94	0.10	0.13
	Subtotal	7.58	3.79	0.19	0.25
Tor	ad	42.08	12 00	9.90	
List	10	40.90	40.90	2.20	
Fie	ld power	4.36	2.18		
	Total	55.92	49.95	2.39	0.25

Column 3 is 5 per cent of the items which appear in column 2 of table 3. These figures represent the annual cost of capital per acre. The rate of 5 per cent has been arbitrarily used. In setting this rate it has been assumed that unless capital could earn 5 per cent, the owners over a period of years would not invest their money in hay land and facilities.

Column 4 represents the annual charge per acre for depreciation made against the hay crop. This charge is based on the original cost of each facility divided by the probable length of life of each piece of equipment or improvement. This figure represents a replacement reserve which must be expended from time to time to replace worn-out equipment or improvements. It represents the annual expenditure per acre that must be made to maintain the average capital investment at the figure shown in column 2 of table 3.

The items listed in table 3 represent the different classes of facilities on which investment, interest, and depreciation were computed. All three calculations were made on items down to the first subtotal figure. No depreciation charge is shown for land, because it is assumed that the method of cropping will maintain soil fertility and prevent erosion. It will also be noted that in this study no estimate was made of interest or depreciation on field power. All field power was charged on an hourly basis which was high enough to include all cost items including depreciation and interest.

# ANALYSIS OF YIELD, INCOME, AND COSTS

During the five-year period of this study, a uniform method of collecting and recording data was followed, which makes it possible to present year-toyear comparisons of yields, income, and costs. The very slight variation in these items from year to year is the natural result of a well-standardized method of hay production which has been developing over a period of years. Most producers follow in general the same production practices and use about the same type of mechanical equipment. During the last two years of this study some operators began replacing horse-drawn haying equipment with

County, California, 1935–1939									
	1935	1936	1937	1938	1939	5-year average			
Number of records in study	10	9	8	9	10	46*			
Total acres harvested	3,061	2,779	1,948	2,619	2,228	12,635*			
Total tons produced	5,702	4,702	3,016	4,777	3,832	22,029*			
Average yield per acre, tons	1.86	1.69	1.55	1.82	1.72	1.74			
	Costs and i	income in do	llars per acre	)					
Costs:									
Cultural man labor	0.59	0.70	0.69	0.82	0.65	0.69			
Cultural field power	0.12	0_14	0.09	0.20	0.16	0.14			
Total cultural labor cost	0.71	0.84	0.78	1.02	0.81	0.83			
Harvesting man labor	2 15	1.67	1 39	1.83	1 64	1 74			
Harvesting field power	0.62	0.49	0.32	0.55	0.54	0.50			
Total harvesting labor cost	2.77	2.16	1.71	2.38	2.18	2.24			
Total cultural and harvesting									
labor cost	3.48	3.00	2.49	3.40	2.99	3.07			
Cost of material	0.13	0.23	0.82	0.44	0.38	0.40			
Total labor and material	3.61	3.23	3.31	3.84	3.37	3.47			
Cash-overhead costs	0.93	0.75	0.82	0.95	1.28	0.95			
Total cash costs	4.54	3.98	4.13	4.79	4.65	4.42			
Depreciation	0.23	0.25	0.26	0.22	0.30	0.25			
Net land rental	2.40	2.12	2.06	2.09	2.26	2.20			
Interest on investment	0.21	0.26	0.15	0.13	0.19	0.19			
Total all costs	7.38	6.61	6.60	7.23	7.40	7.06			
Total income from hay and pasture	10.74	10.14	10.65	10.21	10.82	10.51			
Management income	3.36	3.53	4.05	2.98	3.42	3.45			
Capital and management incomet	5.97	5.91	6.26	5.20	5.87	5.84			
Farm incomet	6.41	6.13	6.47	5.47	6.15	6.13			

TABLE 4

Comparison of Average Costs and Income for Producing Hay in Modoc County, California, 1935–1939

\* Five-year total, not five-year average.

(Continued on next page.)

† These items do not agree with previous releases because, in this case, the renter records have been converted to an ownership basis to facilitate comparisons.

## WILD-HAY-MANAGEMENT PRACTICES

	1935	1936	1937	1938	1939	5-year average
	Costs and	income in do	llars per ton			
Costs:						
Cultural man labor	0.32	0.42	0.44	0.45	0.38	0.40
Cultural field power	0.06	0.08	0.06	0.11	0.09	0.08
Total cultural labor cost	0.38	0.50	0.50	0.56	0.47	0.48
Harvesting man labor	1.16	1.00	0.90	1.01	0.96	1.00
Harvesting field power	0.33	0.28	0.21	0.30	0.31	0.28
Total harvesting labor cost	1.49	1.28	1.11	1.31	1.27	1.28
Total cultural and barvesting						-
labor cost	1.87	1.78	1.61	1.87	1.74	1.76
Cost of material	0.07	0.14	0.53	0.24	0.22	0.23
Total labor and material	1.94	1.92	2.14	2.11	1.96	1.99
Cash-overhead costs	0.50	0.44	0.53	0.52	0.74	0.55
Total cash costs	2.44	2.36	2.67	2.63	2.70	2.54
Depreciation	0.12	0.14	0.17	0.12	0.18	0.14
Net land rental	1.29	1.25	1.33	1.15	1.31	1.27
Interest on investment	0.11	0.16	0.10	0.07	0.12	0.11
Total all costs	3.96	3.91	4.27	3.97	4.31	4.06
Total income from hay and pasture	5.76	5.99	6.88	5.60	6.29	6.04
Management income	1.80	2.08	2.61	1.63	1.98	1.98
Capital and management incomet.	3.20	3.49	4.04	2.85	3.41	3.36
Farm incomet	3.43	3.62	4.18	3.00	3.57	3.52

TABLE 4—(Continued)

† These items do not agree with previous releases because, in this case, the renter records have been converted to an ownership basis to facilitate comparisons.

power-driven machinery. For the most part, however, this trend is such a recent development that these records do not reflect the results of this mechanization process.

The purpose of presenting table 4 is to give the reader a general summary per acre and per ton of the average yields, costs, and returns for the five-year period during which hay records were carried in Modoc County. A total of 46 records was carried during this period with an average of 275 acres of hay harvested per record per year. Although the number of coöperators who kept records was relatively few as compared with the total number of wild-hay producers in the state, the production methods of these coöperators were typical of those followed in other natural meadow areas.

# DEFINITION OF TERMS USED

The meaning of most terms used in this bulletin is explained in those sections which discuss various production practices. There are certain measures of income and costs used in various sections which might not be understood by persons unfamiliar with enterprise-management studies. For this reason, brief definitions of certain terms are listed below.

Total Income from Hay and Pasture.—Total income is the value of all hay and pasture produced whether sold to others or used by the producer. The value is based on farm price which is market price less cost of marketing times yield less production costs.

Total All Costs.—Total all costs represents the value of items which were used in the production process. These items included all man labor, field power, materials, overhead charges, depreciation, land use, and interest at 5 per cent on total investment.

Management Income.—The amount by which the total income from hay and pasture exceeds the total cost is management income. Management income is the net amount available to reimburse the operator for his managerial skill after all cost items have been met.

Capital and Management Income.—This item is the management income plus net land rental and interest on investment at 5 per cent per year. This figure represents the combined income of the operator which may be attributed to his managerial skill and to earnings from money invested in land, improvements, equipment, and other facilities used in wild-hay production.

*Farm Income.*—The amount by which income exceeds all costs except rental on land, interest on investment, and value of operator's own labor is farm income. It is the amount available to reimburse the operator for his managerial ability, labor, land rental, and invested capital after all other expenses are deducted from gross income. This figure is one of the best measures for making comparisons of earning power, since it shows the amount available from the enterprise for living expenses and for making interest and principal payments on borrowed capital.

#### HAY YIELDS

The average yields reported during the five years ranged from a low of 1.55 tons per acre in 1937 to a high of 1.86 tons per acre in 1935. The five-year average was 1.74 tons per acre. However, the yield figures shown in table 4 are for all kinds of hay produced. If only the acreage of wild hay is considered, these averages range from 1.42 tons per acre in 1937 to 1.84 tons in 1938, with a five-year average of 1.67 tons per acre (see table 2). An inspection of the individual records shows a variation in yields of wild hay from a low of 0.64 ton to a high of 3.4 tons per acre. Of the 46 records, 28 (or 60.8 per cent) produced from a low of 1.25 tons to a high of 2.00 tons per acre. The average for this group was 1.67 tons per acre. Ten of the 46 records showed production of less than 1.25 tons, while 8 produced more than 2.00 tons per acre. The low group had an average production of 1.00 ton and the high group an average of 2.66 tons per acre.

The average wild-hay yield for the state during the ten years 1931–1940 was 1.13 tons per acre according to the reports of the California Coöperative Crop Reporting Service (see table 1). When the coöperators' average yield of 1.67 tons per acre is compared with this average, it is evident that they were better-than-average producers, at least from the standpoint of ability to produce yields. This may indicate that the coöperators had better-thanaverage natural conditions or that their production practices with reference to maintaining yields were more effective than average. A general survey of the situation indicates, however, that yields from a large percentage of the low-producing natural grass meadows could be materially increased by better cultural practices or by supplemental seeding with improved varieties of grasses.

#### INCOME

The net income from hay land is dependent upon the yield of hay per acre times the farm price minus the cost of production. In addition to the net income from hay, wild-hay meadows all have an aftermath pasture value. To establish a satisfactory value for wild hay, however, is difficult, because much of the natural-meadow-hay area has such high transportation charges

Year	Value	per acre	Value per ton		
1 ear	Hay	Pasture	Hay	Pasture	
	dollars	dollars	dollars	dollars	
935	9.67	1.07	5.19	0.57	
936	8.66	1.48	5.12	.87	
937	9.60	1.05	6.20	. 68	
938	9.13	1.08	5.01	.59	
939	9.75	1.07	5.67	. 62	
5-year average	9.36	1.15	5.43	0.66	

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Hay and Pasture Values per Acre and per Ton for Modoc County as Reported by Coöperators, 1935-1939

to the regularly established hay markets that none is marketed outside the local areas. If it were not for the local livestock industry, wild hay would have little value. This is just another way of saying that livestock production is a method of selling hay for which there would otherwise be no market.

There is, however, some buying and selling of hay among the livestock men of the district. These local transactions furnish a fairly reliable guide to hay values. During normal crop years these values have ranged from \$5.00 to \$8.00 per ton in the stack. During years of severe hay shortage, stockmen sometimes pay as high as \$15.00 to \$20.00 per ton for small quantities. In estimating the value per ton for wild hay, a figure has been used which represents as nearly as possible, a fair farm selling price throughout the record year. The value of aftermath pasture has been based on its sale price to stockmen.

The value of aftermath pasture from wild-hay meadows is often underestimated. This is especially true where there is an abundance of irrigation water for use in producing pasture after hay harvest. Estimates of the meadow-pasture value ranged from a low of \$1.05 per acre in 1937 to a high of \$1.48 per acre in 1936. On the average the meadow aftermath produced about 11 per cent of the total income.

When the hay-replacement value of aftermath pasture is considered, this estimated value by growers appears rather low. An acre of pasture which will provide one animal unit sufficient feed to produce rapid growth for 1 month has a feed replacement value of about 800 pounds of hay. Hence, an aftermath pasture of this quality would be worth \$2.15 per acre if hay were valued

at \$5.38 per ton, the average shown in table 5. It was impossible to get the number of animal-unit months of aftermath pasture furnished by each meadow in the study. But we do have records from some small, well-watered meadows that furnished as much as  $3\frac{1}{2}$  animal-unit months of feed. This is a hayreplacement equivalent of approximately 2,800 pounds.

#### HAY-PRODUCTION COSTS

The cost of producing hay may be divided roughly into two general classes: These are *direct costs* and *indirect costs*. As far as the farm operator is concerned, he might also think of them as *cash* and *noncash costs*. The *cash costs* include all of those items of expense for which money must be expended during the current operating year. This type of expense includes such items as hired labor, taxes, materials for repairs, and many other items.

The *indirect costs*, which are often overlooked by the farmer, include such items as wages for the operator for time spent at manual labor, charges for the use of land, depreciation on improvements and equipment, and interest on investment. One reason why the farmer does not recognize some indirect costs as expenses, is that the actual cash outlay may be deferred for several years. Depreciation on buildings and equipment is an example of this type. The depreciation on a mower may contribute to the annual hay-production expense, but since the mower does not have to be replaced for another five years, the annual charge is not considered in reckoning costs.

Still another type of indirect cost even more difficult to explain to farm operators is the expense charge made for interest on investment. It might be described as an "opportunity cost," the idea being that the farm operator would have an opportunity to earn the going rate of interest on capital invested in the farming operation if he were free to invest it in some other kind of enterprise. If, in order to continue in business, the farmer were compelled to borrow the required capital, there would be no question that interest paid was an expense item. In other words, interest on capital invested in the hay business is an expense, or part of the cost of producing hay. It is also an income to the operator of such an enterprise if he owns the capital. Land rental is another item of production expense that falls into the same category. In working out these hay-cost figures both direct- and indirect-cost items have been included. The different classes of expenses have been so itemized that the individual hay producer who keeps records may compare his own expenses, item by item, with those shown in this bulletin.

#### CULTURAL COSTS

The production of wild hay includes a group of management operations prior to time of harvest which are designated as cultural operations in this bulletin. These are the production practices that may affect yields. They may also affect hay quality in so far as thickness of stand, rankness of growth, or varieties of grasses have an influence on quality. These cultural operations are of relatively minor importance when measured by cost as compared with the total costs per ton or per acre. As a matter of fact, cultural operations account for only 11.8 per cent of the total cost of hay production. They do, however, represent about 22.0 per cent of the total man labor involved.

In one section of table 4 the actual per-acre cost of man labor and field power is shown for each year of the five-year period. Five-year averages are also given. Another section of table 4 gives the same kind of information on a per-ton basis. No attempt has been made in this table to show itemized costs of the various operations classified as cultural operations. In fact, for the first two years of the study, individual summaries of coöperator's costs were not

#### TABLE 6

Percentage of Total Acreage Reporting\* Each Cultural Operation and the Average Time Consumed and Value per Acre for Man, Horse, and Tractor Labor for the Three-Year Period, 1937–1939

	Man labor			Horse labor			Tractor labor		
Cultural operations	Percentage of acreage reporting	Hours per acre	Value per acre	Percentage of acreage reporting	Hours per acre	Value per acre	Percentage of acreage reporting	Hours per acre	Value per acre
	per cent	hours	dollars	per cent	hours	dollars	per cent	hours	dollars
Slickering	87	0.13	0.04	68	0.36	0.02	19	0.09	0.06
Cultivation .	27	0.11	.04	21	0.37	.02	6	.15	. 09
Seeding	54	0.19	.06	41	0.23	.01	10	.39	.24
Fertilization	38	0.38	.11	38	0.76	.03	0	.00	.00
Dam repairs	86	0.27	.08	85	0.53	.02	3	.01	.01
Ditch repairs	100	0.40	.11	73	0.95	.05	8	.07	.08
Irrigation	100	1.34	.37	21	1.01	.05	0	0.00	0.00
Fencerepairs	71	0.31	0.08	58	0.41	0.02			
Totals		3.13	0.89		4.62	0.22		0.71	0.48
Averages	70	2.58	0.73	51	2.42	0.11	8	0.04	0.05

\* "Acreage reporting" is the per cent of total acreage of records compiled during the three-year period which reported costs for the item or operation. The hours per acre and value per acre are based on acreage reporting each item.

sufficiently detailed so that costs of different cultural operations could be compiled. During the last three years (1937 to 1939, inclusive), however, this type of information was collected and summarized.

Before discussing in detail the preharvesting cultural costs shown in table 6, certain characteristics of the data should be explained. There are three sections in this table: One of these shows certain information regarding man labor, another horse labor, and the last, tractor labor involved in preharvest operations. In each of these sections is a column headed "percentage of acreage reporting," which gives the percentage of acres on which each cultural operation was performed during the three-year period under consideration. It will be seen from this array of figures that all cultural operations were not performed on the total number of acres each year. The hours of labor per acre and the value of this labor per acre, which appears in the second and third columns of each section of table 6, were calculated for the number of acres for which each operation was reported. At the foot of the table will be found two summary lines. One is labeled "totals," the other "averages." The line labeled "totals" gives the total values if each cultural operation had been performed on all acreage each year. The line labeled "averages" gives the average values for total acres in the study.

It will also be seen from comparing the acres on which tractor work was

done with the total involved, that up to the present time the tractor has not replaced horses for field power to any extent. Furthermore, none of the farms used tractors exclusively. They used tractor power for only certain special jobs but continued the use of horses for others. On some of the farms only portions of certain jobs, such as cutting, were done by tractor power. For this reason, and also because of the relatively small amount of work done with tractors, it is impossible to draw conclusions about the relative costs per acre of horses and tractors as a source of field power.

On the average, all the operations listed in table 6 were performed each year on approximately 70 per cent of the acreage under study. An average of 2.58 man-hours per acre was expended for all the operations. If, however, each



Fig. 2.---A homemade panel "slicker."

cultural operation had been performed on all acreage, a total of 3.13 manhours of cultural labor would have been used. A study of the last two lines at the bottom of table 6 shows the same type of comparison for other items.

Slickering and Cultivation.—Some of the cultural practices followed in wild-hay production have special purposes. Many such operations have local names which designate the type and purpose of the operation to those familiar with the terms. The operation locally called "slickering" is one of these. This operation is performed for the purpose of breaking up and spreading the manure from cattle that have been pastured or fed hay on the meadow. This practice is carried out in the early spring when meadows are still wet. At this time the cattle droppings are easily mashed up and smoothed out. The implement used is called a "slicker" (fig. 2). It may be homemade from old discarded buck-rake wheels fastened together with chains. Another type is made from four 2 by 8 inch planks 16 feet long spaced 6 inches apart and fastened together by four 2 by 8 inch cross pieces. This forms a panel, or float, 50 inches wide by 16 feet long, which is usually pulled over the hay field by a team of horses. Some operators fasten two of these units together with an evener and use four horses instead of two.

As a rule slickering is about the only kind of cultivation given the wild-hay meadows. Some operators have tried to renew meadows by cultivation, but

no tool has been found effective, because of the extremely tough sod found in these fields. Table 6 shows that only 27 per cent of the acreage was reported as having been cultivated. Most of this acreage was in alfalfa. A majority of these alfalfa fields are cultivated once each season with a disk or spring-tooth harrow.

Seeding.—Much of the acreage reported as having been seeded during this study was new alfalfa plantings. Where reseeding operations were attempted on wild-hay meadows the entire acreage was not usually covered. Coöperators reported that 3,654 acres, or 54 per cent of the total acreage, was affected by the



Fig. 3.—A reseeded wild-hay meadow. Vegetation in foreground shows original condition before reseeding with tame grasses.

seeding (or reseeding) operation. Of this total, new seedings accounted for 652 acres, and reseeding operations on wild-hay meadows for the remaining 3,002 acres. This does not mean that the entire area of 3,002 acres was reseeded. It means all or some portions of the fields making up this acreage were seeded during at least one year while the records were being kept.

A large number of these wild-hay meadows have been producing continuously for from fifty to sixty years without being plowed up, renovated, or reseeded. It is safe to estimate, however, that some seeding expense must be incurred from time to time, if satisfactory yields are to be maintained. Trial seedings have shown that where moisture conditions are favorable, large increases in yields may be obtained by plowing and reseeding (fig. 3) to proper varieties of grasses or legumes. It appears from reseeding trials made during the past several years that a mixture of grasses and legumes improves quality of feed materially. On the other hand, heaviest yields were secured from reseeding with reed canary grass. *Fertilization.*—No regularly planned system of fertilization is carried on by the operators of wild-hay meadows. No commercial fertilizer is used. Fertilization practices consist for the most part in spreading barnyard manure from feed lots where cattle are fed during the winter or from the horse barns. A considerable quantity of manure is deposited on the meadows by livestock during the 2 or 3 months' period that the hay meadows are used as pasture immediately after harvest, or during the winter months when hay is sometimes fed on meadows.

Dam and Ditch Repairs.—These are cultural practices carried on to facilitate the distribution of irrigation water. Dam and ditch-repair costs include all charges for man labor and field power used in repair and upkeep of main supply ditches and of distribution laterals. Two distinct methods of water application are used. One is the lateral-spreading method where small irrigation laterals are run on grade. The other method is to enclose an area within temporary dams and dikes so that the entire surface is submerged. Sometimes these temporary dikes are made from sod. Waste hay mixed with manure from feed lots is a common material used in making such temporary dikes which must be rebuilt each spring. Thus, a considerable amount of time is spent on this operation.

Irrigation.—In most sections of the state where native meadow hay is grown, there is sufficient rainfall during the early spring months to produce normal growth. As a rule, water is applied from the time early spring rains stop until late in June or near the time to begin haying. The length of time water is applied depends upon soil type, character of vegetation, topography of meadow, water supply, and the personal opinion of the operator. Where late water is available, irrigation is sometimes continued after harvest for the purpose of producing pasture during the fall months.

Quantity and quality of hay can be altered by irrigation methods used. By using an intermittent type of irrigation, instead of a continuous water flow, the sedges and rush types of plants are reduced in comparison with the more desirable forage plants. Thus, a hay with higher feeding value is produced. Many operations have also increased the quantity, as well as the quality, of hay by improved irrigation practices on certain soil types.

The three cultural operations required to supply and spread irrigation water (dam and ditch repairs and irrigation) account for 77 per cent of the average cultural man-labor costs. These three practices also account for a substantial portion of the preharvest field-power cost. For the most part, water costs in the area are very low, for most of the meadows are watered by gravity flow directly from mountain streams. Very few ranches have to contribute to the construction and maintenance of storage facilities. No wild-hay lands are irrigated with pumped water.

Table 6 reveals that the coöperators in this study evidently achieved the rather ingenious feat of tending irrigation water "on horseback." The evidence to support this conclusion comes from the fact that on 1,450 acres a charge for horse labor was reported as part of the irrigation cost.

*Fence Repairs.*—This is one of those joint costs that is very difficult to determine. Fences which enclose wild-hay meadows are used for the joint purpose of protecting the hay crop and also to confine grazing cattle to special

areas after hay harvest has been completed. No attempt was made in this study to allocate either labor or material charges for fence repairs to the two enterprises. Total fence repair was charged as a hay-production expense.

#### HARVESTING COSTS

The harvesting practices to be discussed in the following sections are the operations required to put loose hay in the stack. No provision has been made for man, horse, or tractor labor required for baling hay in preparation for

#### TABLE 7

PERCENTAGE OF TOTAL ACREAGE REPORTING\* EACH HARVESTING OPERATION, THE AVERAGE TIME CONSUMED AND THE VALUE PER ACRE FOR MAN, HORSE, AND TRACTOR LABOR FOR THE THREE-YEAR PERIOD, 1937–1939

	Man labor			Horse labor			Tractor labor		
Operation	Percentage of acreage reporting	Hours per acre	Value per acre	Percentage of acreage reporting	Hours per acre	Value per acre	Percentage of acreage reporting	Hours per acre	Value per acre
	per cent	hours	dollars	per cent	hours	dollars	per cent	hours	dollars
Mowing	100	0.81	0.29	81	1.38	0.06	45	0.09	0.06
Raking	100	0.86	0.30	100	1.61	.07	0	.00	.00
Bunch and									
yard	100	0.97	0.35	100	1.76	.08	14	.52	.37
Spot buck	96	0.27	0.10	95	0.54	. 03	0	.00	.00
Net set	92	0.34	0.15						
Pull-up	100	0.28	0.10	88	0.63	.03	3	.30	.06
Pull-back	31	0.32	0.11	31	0.63	.03	0	.00	.00
Stack	100	0.52	0.27						
Haul	40	0.14	0.05	40	0.24	.01	0	.00	.00
Miscel-									
laneous	44	0.36	0.11	26	0.50	0.03	0	0.00	0.00
Total		4.87	1.83		7.29	0.34		0.91	0.49
Averages.	90	4.34	1.64	47	5.94	0.27	59	0.19	0.13

\* "Acreage reporting" is the per cent of total acreage or records compiled during the three-year period which reported costs for the item or operation. The hours per acre and value per acre are based on acreage reporting each item.

market. Likewise, no account has been taken of any labor involved in feeding hay to livestock or of any labor required for processing hay fed. Even without considering any of the baling or feeding expenses, harvesting costs amount to about 70 per cent of all man, horse, and tractor expenses and about 32 per cent of the total cost of producing hay. The average cost of harvesting each year and also the five-year-average cost per acre and per ton are shown in table 4. In table 7 will be found a detailed summary of the different cultural practices used in hay harvest during the three years, 1937 to 1939.

Table 7 includes the same type of information for harvesting costs as is given in table 6 for cultural costs. A comparison of the two tables shows that all harvesting practices were performed on a larger percentage of the total acreage than were the cultural practices. The reason is that a fairly well standardized set of harvesting operations is followed by all hay producers. Furthermore, each of these operations must be carried out on the total acreage if hay is to be made available for future use; whereas, many of the cultural practices are either optional or, when performed during one year, may not need repeating for several seasons. A comparison of the average value of man labor per acre (\$1.64) with the amount which would have been expended if all harvesting practices had been performed on all acreage (\$1.82) indicates that all the harvesting operations were carried out on most of the acreage.

Mowing.—Some of the harvesting practices can be mechanized easily while many others cannot. The mowing operation is one that lends itself to mechanization. Up to 1939 only a few wild-hay producers have equipped themselves with tractor mowing machines. Since 1937, the coöperators in this study harvested 1.262 acres with tractor mowers. On the average these machines cut 1.61 acres per hour. In checking on the different individual records, a variation was found of from 1.33 to 3.37 acres per hour. The average cost per acre for man labor and tractor use was 61.0 cents per acre. The individual costs ranged from a low of 22.0 to a high of 82.0 cents per acre. The average hourly wage charged was 38.6 cents for man labor and 56.4 cents for tractor use. The average man and field-power cost for all coöperators using horses was about 35.0 cents per acre. The amount of evidence collected in this study is not sufficient to prove definitely the relative cost per acre of mowing between horse-drawn and power-driven mowers. It is fairly safe to conclude that tractor mowers are not usually more economical than horse-drawn outfits. There may be other considerations, however, which would induce hav growers to change from horses to tractors for field power.

Rake, Bunch, and Shock.—Most operators followed the practice of raking and bunching with horse-drawn dump rakes. Side-delivery rakes were used very little because the surface of most wild-hay meadows is too rough. After being bunched with the dump rake the small bunches are sometimes made into large shocks with a buck rake. There was an occasional producer who reformed the bunched hay into large shocks before bucking the hay into a stackyard. This procedure was followed only where hay was to be left in the field for a considerable time as a part of the curing process. Most of the curing is usually done in the swath or windrow. The hay is left in the field only long enough to dry out sufficiently so it can be stacked. Many of the successful operators followed the practice of leaving the hay 1 day in the swath, 2 days in the windrow, and around 3 days in the bunches or shocks before stacking. The raking operation does not lend itself to mechanization. All growers in the study used horse-drawn rakes.

Yarding.—Practically all the hay raised on native meadows is fed to cattle on or near the fields where raised. It is stored in stackyards on or adjacent to the wild-hay meadows. Small amounts are sometimes hauled in wagons or trucks to the barn for use as feed for horses or dairy cows. The common practice is to transport hay from field to stackyard with buck rakes (sweep rakes), each drawn by two horses. The buck-rake loads are left near the stackyard. This operation is locally known as "yarding." Where conditions are right some growers stack small amounts directly from the buck rakes as the hay is delivered from the field. Up to 1940 most buck rakes were horse-drawn, though a few operators are equipping themselves with either tractor-operated sweep rakes, or are mounting them on old truck or on heavy automobile chassis.

Stacking Operations.—It is at this point in the hay-producing process that the actual stacking operations begin. Hay is stacked from 1 to 5 days after

mowing. All previous harvesting practices were performed for the purpose of curing and delivering hay to the stackyard. About 63 per cent of the total man-labor and field-power harvesting expense was accounted for before the start of stacking operations. The stacking process includes spot bucking, net setting, pull-up, pull-back, and stacking.

Three types of stacking rigs are in general use throughout the wild-hay areas of the state. The derrick stacker is most generally used because large amounts of hay can be stacked at one setting (fig. 4, A). The slide stacker is also used by many producers because of its simplicity and the ease with which the rig can be moved from one stackyard to another (fig. 4, B). When small amounts of hay are handled or small stacks desired, the overshot stacker (fig. 4, C) can be used advantageously.

The operation known locally as "spot bucking" consists in picking up with a sweep rake bunches or shocks that have previously been dumped in the immediate vicinity of the stackyard and delivering the cured hay to the stacker. The main reason why hay is not usually stacked at the time of delivery from the fields to the stackyard is that too many buck rakes would be required to keep the stacking crew busy. This situation exists especially when much of the hay must be carried long distances either because yields are light or because large quantities of hay are stacked in one location.

The next three stacking operations—net setting, pull-up, and pull-back are required for lifting hay from ground to stack. The spot-buck rake delivers the hay to the stacking rig. It is then hoisted onto the stack in regular hay nets. One man is required to adjust the nets. When hay is hauled directly from field to barn, the man who rides the wagon or truck attends to setting the hay nets. The hay is then elevated from ground to stack by either horse or tractor power. This particular operation must be performed for all hay except a very small amount which may be stacked by hand or placed in permanent feed racks directly from the field. With certain types of stacking rigs the hay nets must be returned to the loading position by horse power. This operation is known locally as "pull-back." Only about 31 per cent of the total acreage in the study reported this item of expense, for this particular operation is not required with some types of stackers.

From the standpoint of maintaining quality and avoiding wastage until such time as the hay is fed, the actual stacking operation is of greatest importance. Owing to the heavy fall rains and wet snows during the winter months, it is necessary to put good tops on stacks to prevent spoilage. The building of a stack which will preserve hay quality is largely a matter of skill on the part of the men who are employed in the stacking operation. The importance of a well-made stack is reflected in a comparison of the hourly wages paid to stackers as compared with other harvest labor. During the five-year period under consideration, stackers received an average of about 53 cents per hour as compared with about 33 cents per hour for other types of haying labor.

Hauling and Miscellaneous Harvesting Operations.—Forty per cent of the acreage in the study reported hauling a portion of the crop from the field on horse-drawn wagons or on trucks equipped for hauling loose hay. An inspection of the individual records shows that only a very small amount of the total production was handled in this manner. On practically all of the hay



Fig. 4.—A, A derrick stacker in operation. In right foreground is a buck rake delivering hay to the stacker. B, A homemade slide stacker ready for moving. Note apron folded up at the bottom of the stacker. When ready for operation, lower end of the apron rests on the ground. C, An overshot stacker in operation.

ranches there were certain items of miscellaneous man labor and field power used during harvest. These miscellaneous items of labor include moving stacker, setting derrick, cleaning up stackyards, and other activities which would not be classified as regular harvesting practices.

#### MATERIAL COSTS

Table 8 shows that, on the average for all acreage reporting, the annual material costs of hav production was 40 cents per acre. Irrigation water and reseeding materials were the only material expenses reported for all five years. It should also be explained, however, that materials purchased may not have

	1935	1936	1937	1938	1939	5-year average
	dollars	dollars	dollars	dollars	dollars	dollars
Irrigation water	0.16	0.20	0.44	0.54	0.28	0.32
Fertilizer	.00	.08	.00	.00	2.50	.52
Seed	.19	.07	. 29	.19	0.20	.19
Other harvesting materials	.00	.57	.04	.00	0.00	.12
Miscellaneous	.00	.04	.09	.10	0.08	.06
Average total material costs*	0.13	0.23	0.82	0.44	0.38	0.40

TABLE 8						
ANNUAL AVERAGE	MATERIAL COSTS	S PER ACRI	OF PRODUCING	HAY IN	MODOC COUNTY,	

California, 1935-1939

\* Average total material costs are based on total acreage in the study. Individual items are based on the acreage involved in each particular expenditure.

been used on the entire acreage reporting. For example, material for reseeding may have been used to improve the stand on but 5 or 6 acres out of a 100 acres or more of meadow. The rather low average annual cost per acre of irrigation water was due to this same situation.

The last line in table 8 giving average of all material costs for each year is not the sum of the items appearing in the same columns above it. The average total material cost is for all acreage reporting, whereas the individual figures represent costs for particular acreage for which a particular expenditure was made.

#### CASH-OVERHEAD COSTS

All hay producers have certain cash-overhead expenses that cannot be allocated to any particular cultural or harvesting practice. In table 4, a total was shown for this type of expenditures. In table 9, however, the annual cost for each item of cash overhead is given.

The general-expense item is an arbitrary charge amounting to 5 per cent of the labor and material costs. It is a safety-factor charge to cover small expense items such as use of telephone, family car, interest on borrowed operating capital, and other small charges not usually reported. Most of the other items making up the cash-overhead expenses are self-explanatory. All other charges except county taxes were taken directly from the coöperator's monthly report. In most cases county taxes were paid for the entire farm. The portion of county taxes charged to the hay enterprise was found by allocating charges to this enterprise in proportion to the invested capital.

ANNUAL AVERAGE CASH-OVERHEAD COSTS PER A CRE OF PRODUCING HAY IN MODOC COUNTY, CALIFORNIA, 1935-1939

	1935	1936	1937	1938	1939	5-year average
	dollars	dollars	dollars	dollars	dollars	dollars
General expense	0.18	0.16	0.17	0.19	0.17	0.17
County taxes	.48	.37	.39	.44	. 69	.47
Machinery repairs	.21	.17	.17	. 16	.26	. 19
Compensation insurance	.06	.08	.09	.18	.17	.12
Miscellaneous	.00	.00	.12	.00	.00	.02
Average total cash-overhead costs*.	0.93	0.75	0.82	0.95	1.28	0.95

\* Average cash-overhead costs are based on total acreage in the study. Individual items are based on the acreage involved in each particular expenditure.

#### DEPRECIATION, NET LAND RENTAL, AND INTEREST ON INVESTMENT

These three charges complete the total cost of producing hay. The annual charges per acre and per ton during the five years of the study will be found in tables 3 and 4. The depreciation charge is that part of the original cost of improvements and equipment chargeable to the year's operation. For example, a mower that will last for fifteen years and costs \$90 would have an annual depreciation charge of \$6 per year. The item of net land rental used in this bulletin is a charge of 5 per cent on the estimated land value per acre. It represents the net return to land after taxes and all other charges usually borne by the landlord have been taken care of. An examination of the average of individual records indicates that this charge is equivalent to about 24 per cent of the hay crop at the average estimated sale value per ton. An interest charge on investment at the rate of 5 per cent annually is made on capital invested in all hay-producing facilities other than land. The average investment on which this interest is charged is treated more fully on page 7 in the discussion of table 3.

#### FACTORS AFFECTING INCOME

The gross income per acre from wild-hay land depends upon the yield times the value of hay produced and fluctuates with the value per ton or the yield; no other factors have any influence. But with other measures of income (see definitions, p. 10), costs are also a very important element. Income is improved when yields are increased, prices raised, or costs lowered. On the other hand, income is decreased when yields decline, prices go down, or costs increase. For the producer of wild hay to improve his income, he must favorably influence yields, prices, or costs.

Relation of  $\overline{Y}$  ield and Prices to Income.—There is almost a direct relation between all measures of income and yield and prices. This is because costs per acre are influenced but little by changes in yield (see table 10) and not at all by changes in prices. The most effective means of increasing income per acre within the grower's control, is to improve yields. Much can be accomplished along this line by improved irrigation practices, which usually mean a larger quantity of water at the proper time or a better distribution of water already available. Yields could be improved on many meadows by more adequate drainage. The use of improved varieties of grass to reseed old meadows is still another method by which yields may be increased materially.

Relation of Costs to Net Income.-Gross income, by definition, is the only measure of returns not directly affected by costs. Management income, farm income (see definitions, p. 10), and all other measures are the result of subtracting certain costs from the gross income. The kind of costs taken from gross income will depend upon the measure to be used. Since most measures of income are found by deducting certain cost items from gross income, it is evident that costs have a very direct relation to most measures of income. The producer who is in a position to influence his costs favorably, is the one who is most likely to produce the highest net income. In this connection it should be borne in mind that reduction of costs may or may not be the best method of increasing net income. For example, on many meadows increases in cost of water, labor for irrigation, or materials for fertilization might decrease the cost per ton of producing hay by increasing the yield per acre while at the same time total costs or costs per acre might be increased. On the other hand, reduction in harvesting costs by efficient handling of harvesting crews and equipment is a very direct method of increasing income by reducing costs. A study of the hay records collected during the five years 1935 to 1939 indicates clearly that the most effective means of reducing costs is by increasing yields.

# EFFECT OF YIELD ON COSTS

In discussing the effect of yield on costs, either the cost per acre or the cost per ton may be used as the unit of calculation. The operator of a hay farm is undoubtedly most interested in the relation of yield to cost per ton, for costs can then be compared directly with market value. In order to explain more clearly just what happens to the cost per ton with varying yields, the relation of yields to costs per acre should also be understood.

Costs are segregated into different categories in table 10. These include: (1) cultural or preharvesting costs, (2) harvesting costs, (3) material costs, (4) overhead costs, (5) depreciation charges, (6) land-use charge, and (7) interest on investment. These data show that all types of per-acre costs increased as yields increased. These increases were very moderate in every type of cost, however, except harvesting. For example, the cultural costs increased from 76 cents to only 82 cents per acre, a difference of but 6 cents, while the yield increased from 0.25 ton per acre to 3.25. This situation existed because about the same cultural operations were performed whether yields were light or heavy. Furthermore, the cost of cultural operations depended upon area covered and not upon amount of hay produced per acre. Harvesting was the only group of expenses that showed any marked degree of correlation with yields per acre. Even here the rate of increase in cost per acre was not proportionate to the rate of increase in yield. As the yield increased from 0.25 ton per acre to 3.25, the harvesting costs increased from \$1.15 per acre to \$3.35. The last column in table 10 shows that an increase in yields of hay is accompanied by an increase in total costs per acre. But the increase in total costs is not proportional to the increase in yields.

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Relation of Yield to Cost per Acre of Producing Wild Hay in Modoc County, California, 1935-1939

Total all costs	$\begin{array}{c} dollars \\ 5,25 \\ 5,26 \\ 5,78 \\ 6,07 \\ 6,37 \\ 7,29 \\ 7,29 \\ 8,19 \\ 8,19 \\ 8,49 \\$
Interest on investment	$\begin{array}{c} dollars\\ 0,16\\ 0,16\\ 0,17\\ 0,17\\ 0,17\\ 0,18\\ 0,18\\ 0,18\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,19\\ 0,10\\ 0,$
Net land rental	dollars 1.77 1.77 1.76 1.77 1.86 2.09 2.19 2.23 2.35 2.52 2.69 2.69
Total cash and depreci- ation costs	dollars 33,40 33,55 33,55 33,55 33,55 33,55 4,4 4,11 7,55 4,60 7,55 4,8 1,17 7,55 8,57 8,57 8,57 8,57 8,57 8,57 8,5
Depreciation	dollars 0.222 0.223 0.234 0.235 0.25
Total cash costs	dollars 3 318 3 318 3 318 318 318 318 318 318 318 318 31
Overhead costs	$\begin{array}{c} dollars\\ 0.89\\ 0.90\\ 0.91\\ 0.92\\ 0.93\\ 0.95\\ 0.95\\ 0.95\\ 0.95\\ 0.95\\ 0.95\\ 0.95\\ 1.01\\ 1.01\\ \end{array}$
Material costs	dollars 0 38 0 38 0 38 0 39 0 39 0 39 0 40 0 41 0 41 0 41 0 42 0 42 0 42 0 42
Harvesting costs	<i>dollars</i> 1.15 1.15 1.45 1.45 1.45 1.45 2.02 2.21 2.21 2.21 2.27 2.27 2.27 2.39 3.35 3.35
Cultural costs	dollars 0.76 0.77 0.77 0.77 0.78 0.79 0.79 0.80 0.80 0.81 0.81 0.82 0.82 0.82 0.82
Yield per acre	6078 0.25 0.25 0.25 0.25 2.25 2.25 2.25 2.25

TABLE 11

Relation of Yield to Cost per Ton of Producing Wild Hay in Modoc County, California, 1935-1939

Total all costs	dollars 21,000 7.71 5.09 5.09 5.09 5.09 5.09 5.09 5.03 3.37 2.33 2.33 2.33 2.33 2.33 2.33 2.71
Interest on investment	$\begin{array}{c} dollars\\ 0.64\\ 0.32\\ 0.32\\ 0.17\\ 0.11\\ 0.12\\ 0.12\\ 0.12\\ 0.12\\ 0.12\\ 0.12\\ 0.12\\ 0.08\\ 0.07\\ 0.$
Net land rental	dollars 3.54 3.54 2.48 2.48 1.62 1.162 1.125 1.13 1.13 0.98 0.98 0.98 0.87 0.83
Total cash and depreci- ation costs	dollars 13.66 5.006 5.006 5.006 5.006 5.006 2.233 2.236 2.232 2.23
Depreciation	dollars 0.88 0.88 0.31 0.23 0.16 0.119 0.119 0.119 0.110 0.110 0.10 0.10
Total cash costs	dollars 12.72 12.72 12.72 12.72 2.73 1.73 2.73 1.73 2.73 1.73 2.74 1.73 2.248 2.248 2.248 2.248 2.217 1.73 2.217 1.73 2.217 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.73 2.74 1.74 2.74 2.74 2.74 2.74 2.74 2.74 2.74 2
Overhead costs	$\begin{array}{c} dollars\\ 3.56\\ 3.56\\ 1.28\\ 1.28\\ 0.74\\ 0.54\\ 0.54\\ 0.54\\ 0.54\\ 0.33\\ 0.$
Material costs	dollars 1.52 0.776 0.776 0.33 0.33 0.33 0.33 0.33 0.33 0.33 0.3
Harvesting costs	dollars 24.60 24.60 2.52 2.52 1.93 1.46 1.146 1.135 1.135 1.15 1.03 1.03 1.03
Cultural costs	dollars 3.04 3.04 1.53 1.53 1.53 0.52 0.52 0.45 0.33 0.33 0.33 0.38 0.38 0.38 0.25
Yield per acre	6078 0.25 0.25 0.25 0.25 0.75 0.75 0.75 0.75 0.75 0.75 0.75 0.7

A somewhat different picture is found when the relation of yield to cost per ton is studied. Types of cost per acre which remained most nearly constant with varying yields show the most marked change when cost per ton is considered. For example, material costs per acre showed a variation of only 4 cents per acre, while yield was being increased from 0.25 ton per acre to 3.25. When material costs per ton were figured (see table 11), the same increase in tonnage resulted in a decrease in cost from \$1.52 to \$0.13. In this column of figures, costs per ton declined as yields per acre increased. This same situation did not exist, however, with harvesting costs. The sharp increase in per-acre harvesting costs with heavier yields resulted in a lower rate of decrease per ton than in the case of material costs (see tables 10 and 11).

The net effect of yield on total costs per ton is shown in the last column of table 11. The change in total costs range from a high of \$21.00 per ton for a yield of 0.25 ton per acre to a low of \$2.71 per ton for a yield of 3.25 tons per acre. The point of most interest to hay producers in this array of figures is the relative effect on cost per ton of an increase of one unit with low yields as compared with an increase of one unit where yields are high. For example, an increase from 0.25 ton per acre to 1.25 is accompanied by a reduction of \$15.91 in total costs per ton. On the other hand, an increase in yield from 2.25 tons per acre to 3.25 is accompanied by a decrease of but \$0.66 in total costs per ton.

This characteristic of total costs to decrease at a decreasing rate as yields increase is of particular interest to the individual producer. An examination of this array of figures gives him a fairly good idea of how much costs per ton might be reduced by increasing yield at his average production level. The grower with an average production level of 1.00 ton per acre, by increasing yields 0.25 ton per acre, should be able to reduce total costs by about \$0.98 per ton. The same amount of unit increase in tonnage for the 2.00-ton-per-acre grower only reduced costs by about \$0.26 per ton. From this it follows that there should be more incentive to increase yields among the low than the high-tonnage producers.

A study of table 11 also shows that there is a point where it does not pay to harvest hay as the yield per acre declines. The low-tonnage producer must decide whether it is more profitable for him to harvest the grass crop as cured hay or to pasture the meadow. From a study of all evidence gathered in this investigation, it appears that the hay grower cannot afford to harvest grass for hay that yields less than about 1.00 ton per acre. Nevertheless in order to have sufficient feed to carry livestock through the winter months, it may be necessary for some growers to harvest meadows yielding less than 1 ton per acre. Before doing so, however, other alternative hay sources should be investigated, if the meadow can be grazed to advantage.

Producers who own natural hay meadows that produce from 1.00 to 1.50 tons per acre annually should consider the possibilities of growing a heavier tonnage on a reduced acreage and using part of their hay land for pasture. Let us consider the case of an operator who is now producing 225 tons of hay on 225 acres of meadow. By increasing yields to 1.50 tons, which is not beyond the realm of possibility on most low-producing meadows, the same quantity of hay could be produced on 150 acres at much less cost per ton, and 75 acres of the original meadow would be released for pasture. If such an improvement can be made, the carrying capacity of the 225-acre meadow has been increased from 562 to 750 animal-unit months.<sup>5</sup> Such an improvement also means a reduction of feed cost of from \$2.43 to \$1.75 per animal-unit month.

# STANDARD COSTS

The standard inputs and costs shown in table 12 are not intended to be average for the wild-hay areas of the state. These figures are based on material gathered in Modoc County during the five years 1935 to 1939. They represent costs as they would occur under certain specified conditions where a fairly high standard of efficiency in management is maintained. These data are presented as a standard with which the individual hay producer may compare his own costs or which he may use as a guide in computing his own costs. Quantities and prices are shown so that costs may be adjusted to meet changing conditions or conditions on individual farms where yields, wage rates, or other inputs do not agree with the standard.

These standard costs are based on a well-managed, owner-operated meadow of sufficient size to justify the overhead involved in the ownership of modern hay-making equipment and other facilities. A yield of 1.75 tons per acre has been assumed. This yield is higher than average. It is attainable, however, on most meadows where irrigation water is available and where proper attention is given to yield-maintaining cultural practices. The man-labor cost is based on a preharvesting wage rate of 30 cents an hour and on a harvest labor rate of 33 cents an hour except for the two operations of net setting and stacking. The wage rate for net setting was fixed at 40 cents and for stacking, 50 cents an hour. All wage rates are without board and room being furnished by operator. The rate used for horses in all computations was 6 cents an hour. This figure was based on the assumption that actual costs to the operator of providing field power with horses is about 6 cents an hour on the average. Overhead, depreciation, and interest costs were based on the average figures reported by coöperators in Modoc County during the five years.

In table 12 all cultural and harvesting costs are based on the use of horses for field power even though this is one farm enterprise where mechanical power might easily be substituted for horses. Very few growers in the wildhay-producing areas of the state have made this change up to the present time. Although some coöperators were beginning to experiment with mechanized haying equipment, not enough information was collected to justify any speculation on costs as compared with horse-drawn equipment.

Where meadows are smooth enough to permit the operation of such machinery, power equipment is gradually replacing horse-drawn implements for some haying operations. Power-driven mowers and buck rakes are most common. The reason for this change is that about twice as many horses are required during haying as at any other time of the year on most hay ranches. These surplus horses require a considerable amount of feed and care during idle months and thus makes horse-labor costs rather high for the time they are used. Another reason for switching from horse to power-driven equipment is the scarcity of harvest hands. Power haying implements require fewer men

<sup>&</sup>lt;sup>5</sup> One animal-unit month of feed is equivalent to 800 pounds meadow hay.

as well as horses to put up the same amount of hay. Some operators who have recently changed over estimate that one power buck rake will replace from six to ten horses and at least three men.

The production practices used in setting up these standards are the ones usually performed by wild-hay producers who stack hay in regular stackyards. The cost of each operation is based on the average annual expense which

#### TABLE 12

#### STANDARD INPUTS AND COSTS FOR PRODUCING NATURAL MEADOW HAY IN CALIFORNIA\*

	Man labor per acre	Cost of man labor per acre†	Horse labor per acre	Cost of horse labor per acre†	Cost per per acre†	Cost per per ton‡					
Labor costs											
	hours	dollars	hours	dollars	dollars	dollars					
Slicker and cultivate	0.3	0.09	1 2	0.07	0.16	4011475					
Haul manure	0.4	0.12	0.8	0.05	0.10						
Dam and ditch repairs	0.6	0.18	1.2	0.07	0.25	••••					
Irrigation	1.3	0.39		0.01	0.39						
Fence renair	0.3	0.09	0.6	0.04	0.13						
Miscellaneous	0.2	0.06	0.4	0.02	0.08						
Total preharvest labor	3.1	0.93	4.2	0.25	1.18	0.67					
Cut	1.0	0.33	2.0	0.12	0.45						
Rake and bunch	0.8	0.26	1.6	0.09	0.35						
Yard	1.0	0.33	2.0	0.12	0.45						
Spot buck	0.4	0.13	0.8	0.05	0.18						
Net set	0.4	0.16			0.16						
Pull-up	0.4	0.13	0.8	0.05	0.18						
Pull-back	0.4	0.13	0.8	0.05	0.18						
Stack	0.6	0.30			0.30						
Miscellaneous	0.3	0.10	0.6	0.04	0.14						
Total harvest labor	5.3	1.87	8.6	0.52	2.39	1.37					
		Material cos	ts								
			······		dollars	dollars					
Irrigation water					0.50	uotrar o					
Repair materials					0.11						
Miscellaneous.					0.06						
Total material costs				•••••	0.67	0.38					
	Ca	sh-overhead	costs		<u>.</u>						
					dollars	dollara					
General expanses estimated at 5 per	ant of abo	to acata			0.21	aonars					
County taxes	cont of abov				0.45						
Machinery repairs					0.15						
Compensation insurance.					0.10						
Miscellaneous	•••••••••••				0.05						
Total cash-overhead costs					0.96	0.55					
Total man labor, field power, materi	ial, and overh	ead costs			5.20	2.97					

(Continued on next page.)

\* The standard costs shown in this table are for a well-managed, owner-operated, wild-hay meadow. Invest-ment, depreciation, and rates for field power are based on a 320-ace unit. † Labor costs per acre are computed at the following rates per hour: preharvest man labor \$0.30, all harvest labor except net setting and stacking \$0.325, net setting \$0.60, stacking \$0.50, horse labor \$0.06. ‡ All costs per ton are based on a yield of 1.75 tons per acre of loose hay in the stack.

#### TABLE 12--(Continued)

	Cost per acreț	Cost per ton‡
Depreciation costs		
	dollars	dollars
Buildings.	0.02	
Fences	0.04	
Irrigation facilities	0.05	
Tillage and harvesting equipment	0.14	
Total depreciation	0.25	0.14
Total cash and depreciation costs	5.45	3.11
Interest and net land-rental costs		
	dollars	dollars
Buildings.	0.02	
Fences.	0.03	
Irrigation facilities	0.04	
Tillage and harvesting equipment	0.10	
Net land rental	2.20	
Total interest and land-rental cost	2.39	1.37
Total all costs	7.84	4.48
Less income for pasture	1.00	0.57

† Labor costs per acre are computed at the following rates per hour: preharvest man labor \$0.30, all harvest labor except net setting and stacking \$0.325, net setting \$0.40, stacking \$0.50, horse labor \$0.06. ‡ All costs per ton are based on a yield of 1.75 tons per acre of toose hay in the stack.

6.84

3.91

might be expected, although all operations may not be performed every year. For example, fences might not need extensive repairs every year but the amounts shown in these standards are about the average annual requirements for fence repair. It will also be seen that stacking operations are based on the use of a stacker which requires man and horse power to return nets from stack to loading station. Some types of stackers are so constructed that the "pullback" operation does not have to be performed.

Relation of Stacking Methods to Stacking Costs.—As pointed out in the section "Effect of Yield on Costs," per-ton production costs are more closely related to yields per acre than any other single factor. In seeking ways of reducing costs, the hay grower should not overlook the possibilities of performing production operations more efficiently. On most hay ranches, production operations are already reduced to a minimum for best results. As a matter of fact many growers, by increasing certain preharvesting costs per acre, could, in the long run, decrease per-ton costs through heavier yields. Furthermore, on most hay ranches such harvesting operations as cutting, raking, bunching, and bucking are already performed very efficiently. There is, however, some possibility of reducing per-ton costs by more efficient organization of the stacking methods as will be seen from data shown in table 13.

The stacking operations summarized in table 13 included spot bucking, net setting, pulling hay onto stack, pulling back of empty nets where such opera-

Net total cost

tion is performed, and stacking. Although only 9 individual coöperators are involved in this tabulation, 36 annual hay-production records are included. While these records show a wide variation in the individual costs of stacking per ton, no definite clue was found for the reason. It was at first thought that the type of stacker might be a contributing factor. Only in so far as the type of stacker enabled the use of fewer men and less field power per ton stacked, would the type of stacker affect costs. Apparently hay-stacking costs depend more upon the organization of the stacking crew so that it will function as a unit than upon any one item, such as type of stacker or size of crew.

TABLE 1	3
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Amount of Hay Stacked per Hour, Man Labor, and Other Data Relating to Stacking Methods

Serial no.*	Yield per acre	Man labor per ton	Man labor, cost per ton	! Field power, cost per ton	Total cost per ton	Type of stacker used	Men in stacking crew	Amount of hay stacked per man-hour
	tons	hours	dollars	dollars	dollars		number	pounds
125	2.18	0.52	0.21	0.03	0.24	Overshot	4	3,850
124	3.24	0.64	0.28	0.03	0.31	Slide	5	3,120
129	1.55	0.81	0.41	0.03	0.44	Derrick	5	2,470
133	1.72	0.86	0.34	0.03	0.37	Derrick	6	2,320
122	1.51	0.99	0.42	0.03	0.45	Derrick	6	2,020
123	0.84	1.10	0.44	0.06	0.50	Derrick	4	1,820
130	1.54	1.10	0.49	0.04	0.53	Derrick	5	1,820
126	1.73	1.13	0.53	0.05	0.58	Slide	5	1,770
132	1.38	1.50	0.59	0.07	0.66	Slide	7	1,330

\* Serial nos. of records in study for five-year period were 122, 123, 124, 125, and 126; for four years, 130; for three years, 129; and for two years, 132 and 133.

# SUMMARY

The data presented in this bulletin are based on 46 annual wild-hay records obtained from producers in Modoc County, California. The study covered a five-year period from 1935 to 1939, inclusive. The conclusions reached are applicable to natural wild-hay meadows or tame-hay meadows where but one erop a year can be produced.

During 1931–1940 an average of 154,800 acres of wild hay with an average total production of 175,600 tons has been produced in the state. This is an average annual yield of 1.13 tons per acre. The total annual farm value of hay grown was \$1,127,360.00, which was \$6.42 per ton over the ten-year period.

Hay producers in the study had an average of \$49.95 per acre invested in hay land, improvements, implements, and other facilities. About 88 per cent of the total investment was in land. The gross income was \$10.51 per acre, of which \$9.36 represented value of hay and \$1.15 represented pasture value after the hay had been harvested. The average total cost for the five-year period 1935–1939 was \$7.06 per acre, leaving a management income of \$3.45 per acre.

The preharvesting expenses of \$0.83 per acre accounted for about 12 per cent of the total cost of wild-hay production. Harvesting costs, which amounted to \$2.24 per acre, or almost 32 per cent of the total, were the largest single group of costs, followed closely by a land charge of \$2.20 per acre, which

represented a little over 31 per cent of all costs. All other items of cost, such as depreciation, interest on investment in facilities, and material and cashoverhead costs, amounted to \$1.79 per acre and represented about 25 per cent of the total expense. Man labor accounted for \$2.43 per acre, or approximately 34 per cent, and field power \$0.64 per acre, or about 9 per cent of the total cost.

The farm income for the five-year period was \$6.13 per acre, or \$3.52 per ton of hay produced. When based on costs as shown in this study, the farm income per acre was made up of \$3.45 for management income, \$2.20 net land rental, \$0.19 for interest on investment, and \$0.29 for labor of operator.

The producer's net income is dependent upon yield, price, and cost of production. Of these three income-determining factors the producer can favorably influence only yield and cost of production. Some reduction in costs might be made by more efficient management of harvesting crews. The big reduction in costs per ton, however, can be made through those management practices which will increase yields.

It is apparent from this study that it may not pay to cut hay from wild-hay meadows having a yield of less than 1.00 ton per acre if the meadow can be grazed advantageously and also if alternative sources of winter hay supply can be found at a reasonable price.

# APPENDIX OF TABLES

## RECORDS OF INDIVIDUAL COÖPERATORS

The tables appearing in the Appendix give a complete record of costs for the individual coöperators who were in the Modoc County hay study. There were a total of 14 individual coöperators who furnished 46 annual-production records. Of these 14 individuals, 5 of them (serial nos. 122, 123, 124, 125, and 126) were in the study all five years, 1 (serial no. 130) was in four years, 2 (serial nos. 127 and 129) were in three years, 4 (serial nos. 120, 128, 132, and 133) were in two years, and 2 (serial nos. 121 and 134) were in one year only.

Serial no.*	Total acreage involved	Average yield	Value of hay	Value of pasture	Total income	Total cost	Manage- ment income	Capital and manage- ment income	Farm income
	acres	tons	dollars	dollars	dollars	dollars	dollars	dollars	dollars
124	1,425	3.18	17.10	1.33	18.43	8.32	10.11	13.18	13.53
125	915	2.07	10.87	1.28	12.15	6.15	6.00	8.01	8.28
128	1,119	1.90	9.63	1.43	11.06	7.61	3.45	6.74	7.10
121	480	1.84	9.20	0.51	9.71	5.62	4.09	6.14	6.30
130	648.	1.43	7.93	2.20	10.13	6.77	3.36	5.92	6.21
126	666	1.62	9.05	1.10	10.15	7.23	2.92	5.53	5.93
133	974	1.77	8.66	0.62	9.28	5.62	3.66	5.73	5.92
127	1,500	1.40	7.37	1.27	8.64	5.59	3.05	4.61	4.93
132	650	1.29	6.98	1.26	8.24	5.68	2.56	4.35	4.58
120	620	1.54	7.70	0.47	8.17	5.90	2.27	3.86	4.14
134	183	1.38	7.62	2.32	9.94	8.59	1.35	3.55	3.89
122	1,620	1.48	8.61	1.07	9.68	8.81	0.87	3.50	3.78
129	745	1.55	8.79	0.81	9.60	9.83	-0.23	2.47	2.73
123	941	0.85	5.05	1.05	6.10	6.19	0.09	2.17	2.44
Average:									
1935	3,061	1.86	9.67	1.07	10.74	7.38	3.36	5.97	6.41
1936	2,779	1.69	8.66	1.48	10.14	6.61	3.53	5.91	6.13
1937	1,948	1.55	9.60	1.05	10.65	6.60	4.05	6.26	6.47
1938	2,619	1.82	9.13	1.08	10.21	7.23	2.98	5.20	5.47
1939	2,228	1.72	9.75	1.07	10.82	7.40	3.42	5.87	6.15
All records	12,635	1.74	9.36	1.15	10.51	7.06	3.45	5.84	6.13

TABLE 14

GENERAL SUMMARY OF AVERAGE COSTS AND INCOME PER ACRE FOR THE INDIVIDUAL COÖPERATORS IN THE MODOC COUNTY HAY-PRODUCTION STUDY, 1935 TO 1939

\* These records are arranged in descending order of farm income per acre.

### GENERAL SUMMARY OF THE AVERAGE COST AND INCOME PER TON FOR THE INDIVIDUAL Coöperators in the Modoc County Hay-Production Study, 1935 to 1939

Serial no.†	Total tonnage involved	Yield per acre	Value of hay	Income from seed and pasture*	Total income	Total cost	Manage- ment income	Capital and manage- ment income	Farm income
	tons	tons	dollars	dollars	dollars	dollars	dollars	dollars	dollars
124	4,526	3.18	5.38	0.42	5.80	2.61	3.19	4.16	4.27
125	1,897	2.07	5.24	0.62	5.86	2.96	2.90	3.87	4.00
128	2,123	1.90	5.08	0.75	5.83	4.01	1.82	3.55	3.74
121	883	1.84	5.00	0.28	5.28	3.06	2.22	3.34	3.42
130	924	1.43	5.56	1.54	7.10	4.75	2.35	4.15	4.35
		_							
126	1,081	1.62	5.58	0.67	6.25	4.45	1.80	3.41	3.65
133	1,721	1.77	4.90	0.35	5.25	3.18	2.07	3.24	3.35
127	2,100	1.40	5.26	0.91	6.17	3.99	2.18	3.29	3.52
132	837	1.29	5.42	0.98	6.40	4.41	1.99	3.37	3.56
120	955	1.54	5.00	0.30	5.30	3.83	1.47	2.50	2.68
134	253	1.38	5.50	1.68	7.18	6.21	0.97	2.56	2.81
122	2,398	1.48	5.81	0.73	6.54	5.95	0.59	2.37	2.56
129	1,153	1.55	5.68	0.52	6.20	6.36	-0.16	1.59	1.76
123	800	0.85	5.94	1.23	7.17	7.28	-0.11	2.55	2.87
Average:									
1935	5,702	1.86	5.19	0.57	5.76	3.96	1.80	3.20	3.43
1936	4,702	1.69	5.12	0.87	5.99	3.91	2.08	3.49	3.62
1937	3,016	1.55	6.20	0.68	6.88	4.27	2.61	4.04	4.18
1938	4,777	1.82	5.01	0.59	5.60	3.97	1.63	2.85	3.00
1939	3,832	1.72	5.67	0.62	6.29	4.31	1.98	3.41	3.57
All records	22,029	1.74	5.38	0.66	6.04	4.06	1.98	3.36	3.52

\* Based on per ton of hay. † These records are arranged in descending order of farm income per acre.

#### BREAKDOWN OF THE AVERAGE TOTAL COST PER ACRE FOR THE INDIVIDUAL COÖPERATORS IN THE MODOC COUNTY HAY-PRODUCTION STUDY, 1935 TO 1939

				and the second se					
Serial no.¶	Yield	Labor	costs*	Matorial Cash-		Doprosi	Net	Interest	Total
	per acre	Cultural	Harvest- ing	costs	overhead costs†	ation	land rental‡	invest- ment	all costs
	tons	dollars	dollars	dollars	dollars	dollars	dollars	dollars	dollars
124	3.18	0.80	3.02	0.24	0.90	0.29	2.96	0.11	8.32
125	2.07	0.60	2.09	0.34	0.94	0.17	1.92	0.09	6.15
128	1.90	0.70	2.23	0.12	0.93	0.34	2.50	0.79	7.61
121	1.84	0.63	2.05	0.00	0.68	0.21	2.00	0.05	5.62
130	1.43	0.58	1.89	0.38	1.02	0.34	2.13	0.43	6.77
126	1.62	1.21	1.88	0.39	0.91	0.23	2.50	0.11	7.23
133	1.77	0.44	2.06	0.08	0.88	0.09	2.00	0.07	5.62
127	1.40	0.65	2.22	0.25	0.75	0.16	1.50	0.06	5.59
132	1.29	0.97	1.79	0.18	0.71	0.25	1.68	0.10	5.68
120	1.54	0.50	2.33	0.33	0.92	0.23	1.50	0.09	5.90
134	1.38	1.52	2.97	0.27	1.40	0.23	2.00	0.20	8.59
122	1.48	1.29	2.86	0.53	1.20	0.30	2.48	0.15	8.81
129	1.55	1.41	2.65	1.40	1.36	0.31	2.50	0.20	9.83
123	0.85	0.72	1.39	0.64	0.87	0.31	2.07	0.19	6.19
Average:									
1935	1.86	0.71	2.77	0.13	0.93	0.23	2.40	0.21	7.38
1936	1.69	0.84	2.16	0.23	0.75	0.25	2.12	0.26	6.61
1937	1.55	0.78	1.71	0.82	0.82	0.26	2.06	0.15	6.60
1938	1.82	1.02	2.38	0.44	0.95	0.22	2.09	0.13	7.23
1939	1.72	0.81	2.18	0.38	1.28	0.30	2.26	0.19	7.40
All records	1.74	0.83	2.24	0.40	0.95	0.25	2.20	0.19	7.06

\* Labor costs include man labor, horse labor, and other field power. † Cash-overhead costs include general expenses, taxes, machinery repairs, insurance, and other miscellaneous

Cash over near costs include gottern appendix appendix to the hay crop for use of land after land taxes and depreciation on improvements have been taken care of.
¶ Records arranged in descending order of farm income per acre.

#### BREAKDOWN OF THE AVERAGE TOTAL COSTS PER TON FOR THE INDIVIDUAL COÖPERATORS IN THE MODOC COUNTY HAY-PRODUCTION STUDY, 1935 TO 1939

and the second s								and the second s	
a	Yield	Labor costs*		Material Cash-		Depresi	Net	Interest	Total
Serial no.¶	per acre	Cultural	Harvest- ing	costs	overhead costs†	ation	land rental‡	invest- ment	all costs
	tons	dollars	dollars	dollars	dollars	dollars	dollars	dollars	dollars
124	3.18	0.25	0.95	0.07	0.28	0.09	0.93	0.04	2.61
125	2.07	0.29	1.01	0.16	0.45	0.08	0.93	0.04	2.96
128	1.90	0.37	1.18	0.06	0.49	0.18	1.32	0.41	4.01
121	1.84	0.34	1.12	0.00	0.37	0.11	1.08	0.04	3.06
130	1.43	0.41	1.33	0.26	0.71	0.24	1.49	0.31	4.75
126	1.69	0.75	1 15	0.94	0.56	0.14	1.54	0.07	4 45
133	1.02	0.75	1.10	0.05	0.50	0.14	1.0%	0.07	9 10
127	1 40	0.25	1.10	0.05	0.50	0.00	1.13	0.04	3.10
132	1 29	0.10	1.38	0.13	0.55	0.20	1.30	0.09	0.55 A A1
120	1.54	0.32	1.51	0.22	0.60	0.15	0.97	0.06	3.83
134	1.38	1.10	2.15	0.19	1.02	0.16	1.45	0.14	6.21
122	1.48	0.87	1.93	0.36	0.81	0.20	1.68	0.10	5.95
129	1.55	0.91	1.71	0.91	0.88	0.20	1.62	0.13	6.36
123	0.85	0.85	1.63	0.75	1.02	0.37	2.44	0.22	7.28
Average:									
1935	1.86	0.38	1.49	0.07	0.50	0.12	1.29	0.11	3.96
1936	1.69	0.50	1.28	0.14	0.44	0.14	1.25	0.16	3.91
1937	1.55	0.50	1.11	0.53	0.53	0.17	1.33	0.10	4.27
1938	1.82	0.56	1.31	0.24	0.52	0.12	1.15	0.07	3.97
1939	1.72	0.47	1.27	0.22	0.74	0.18	1.31	0.12	4.31
All records	1.74	0.48	1.28	0.23	0.55	0.14	1.27	0.11	4.06

\* Labor costs include man labor, horse labor, and other field power.

† Cash-overhead costs include general expenses, taxes, machinery repairs, insurance, and other miscellaneous expenses.

t Net land rental is the net amount charged against the hay crop for use of land after land taxes and depreciation on improvements have been taken care of. ¶ Records arranged in descending order of farm income per acre.