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Volume VI,	No.1	Ninth annual report of the Agricultural Department.
" "	No.2	Catalogue & announcement of courses, 1927-1928.
" "	No.2 Suppl.	Summer session announcement, July 5 - August 2, 1927.
" "	No.2 Suppl.	Bibliographical list of the Publications, by Members of the Faculty, 1925-1926-1927.
" "	No.3	Directory of Officers and students, 1927-1928.
" "	No.4	Financial statement of the Treasurer, 1926-1927.
Bound in at end of Volume.		Circular of information for students, 1927-1928.
" " " "		Circular of information for faculty members, 1927-1928.
" " " "		Announcement of Afternoon and Evening courses, Second Semester, 1927-1928.
" " " "		Preliminary Announcement of the Summer session, July 2 to August 10, 1928.

UNIVERSITY OF HAWAII
QUARTERLY BULLETIN

VOLUME VI NUMBER 1

Ninth Annual Report

OF THE

Agricultural Department

of the University of Hawaii for the Fiscal Year
July 1, 1925, to June 30, 1926

JANUARY, 1927

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Honolulu

PART I

ANIMAL HUSBANDRY DIVISION

By L. A. HENKE, *Professor of Agriculture.*

INTRODUCTION

This report covers the experimental work carried out on the University of Hawaii Farm from July 1, 1925, to June 30, 1926, and such occasional data from other years as seem necessary to make for continuity. The first report was published in 1917.

The University of Hawaii Farm is not an experimental station in the commonly accepted meaning of the term. It has no funds for research work or men detailed thereto. The farm is necessary primarily as an agricultural laboratory for students, since the University of Hawaii does not have the advantages resulting from the usual arrangement whereby the university and the experiment station are combined. A reasonable amount of experimental work on the University Farm is done each year, but only as a by-product of the men engaged in teaching in the department of agriculture of the university.

An agricultural experiment station at Waiakea, Hilo, Hawaii, under the direction of the university was established by act of the Territorial Legislature and began operations July 1, 1921.

UNIVERSITY OF HAWAII

DEPARTMENT OF AGRICULTURE

INVENTORY JUNE 30, 1926

BUILDINGS:		
Laborers' cottages (4)	$ 2,371.00	
Milk house and dairy laboratory	3,420.00	
Dairy and calf and bull barn (2)	13,458.00	
Old feeding barn	2,400.00	
Farm superintendent's houses (2)	4,734.00	
Piggery	3,133.00	
Poultry house, commercial	1,500.00	
Poultry house, divided in pens	2,672.00	
Poultry houses, portable (23)	1,265.00	
Poultry houses, small (7)	288.00	
Brooder houses (5)	710.67	
Implement shed	500.00	
Horse stable	470.00	
Slat house	175.00	$37,096.67
FARM FENCING		1,000.00
FARM IRRIGATION SYSTEM		3,680.00
FARM ROADS		1,500.00
SWINE:		
Berkshires (9)	$ 875.00	
Tamworths (5)	500.00	
Market hogs (18)	360.00	1,735.00
DAIRY:		
Holsteins (32) includes 1 bull	$ 6,925.00	
Guernseys (12) includes 1 bull	3,225.00	
Dairy equipment	3,706.99	13,856.99
POULTRY:		
S. C. W. Leghorns (1478)	$ 3,957.50	
Rhode Island Reds (63)	146.00	
Barred Plymouth Rocks (2)	8.00	
Light Brahma (1)	3.00	
Poultry equipment	797.58	4,912.08
AGRONOMY		4,005.60
Total farm inventory		$67,786.34
APPARATUS IN LABORATORIES:		
Soils	$ 655.64	
Animal and dairy husbandry	265.80	
Miscellaneous	278.40	1,199.84
Grand total		$68,986.18

DAIRY CATTLE

Every one of the forty-four dairy animals in the University Farm dairy is purebred and registered. The herd consists of 32 Holsteins and 12 Guernseys. The Holstein herd is headed by King Pontiac Segis Prilly De Kol, whose sire, King Segis Alcartra Prilly, is one of the outstanding bulls of the Holstein breed at the present time. The dam of King Pontiac Segis Prilly De Kol has an A. R. S. O. record of 17,404.30 pounds milk testing 4.07 per cent butter fat and yielding 886.91 pounds butter produced in 358 days. The Guernsey sire, Islander's Floss Boy, was purchased in Wisconsin in 1925. His two nearest dams average 14,672.73 pounds milk and 732.02 pounds of butter fat.

All of the present Holstein females and all but three of the Guernsey females were born and raised on the University Farm. The better bull calves are sold to dairymen throughout the Territory. During the past nine years 31 Holstein and 5 Guernsey bulls have been sold at very reasonable prices, and these have been a big influence in improving the type and increasing the production of the dairy cattle in the Islands.

The failure of the old irrigation system and the unavoidable delay in the installation of the new system left most of the forage fields without sufficient water, and the resultant decrease in the amount of green forage produced greatly decreased milk production records for the year. Dried roughages were purchased as substitutes but they did not prove nearly as satisfactory as green alfalfa for milk production.

The herd has been tested annually for bovine tuberculosis by the territorial veterinarian and no reactors have been found since 1916. One animal that gave a suspicious reaction proved non-tubercular upon post-mortem examination.

The details of milk and butter fat production as well as feed costs and milk production costs are shown in the following tables:

YEARLY PRODUCTION RECORDS OF COWS IN THE UNIVERSITY OF HAWAII HERD, JULY 1—JUNE 30

NAME	Born	Date First Calf	1913-1914	1914-1915	1915-1916	1916 1917	1917-1918	1918-1919	1919-1920	1920-1921	1921-1922	1922-1923	1923-1924	1924-1925	1925-1926
Holsteins:															
Luku	Oct. 3, 1912	May 28, 1914	762.4	5,933.8	6,032.8	7,553.6	6,840.2	10,023.5	4,064.1	9,903.2	11,024.3	8,081.0	7,714.1	7,439.0	1,115.6[1]
Manca Creamcup	Oct. 3, 1915	July 4, 1917	....	.....	.....	.....	3,108.7	6,493.7	7,645.9	10,714.5	11,169.3	10,867.5	9,043.3	10,768.2	9,095.0
Manca Korndyke	Oct. 10, 1916	Dec. 7, 1918	....	.....	.....	.....	.....	6,165.4	12,233.8	13,177.5	13,951.6	12,987.4	10,763.5	11,101.9	9,880.5
Joletta Camino Korndyke	Oct. 3, 1918	Oct. 18, 1920	....	.....	.....	.....	.....	.....	.....	7,876.2	6,385.6	6,406.6	9,466.1	7,502.2	8,276.1
Natoma Hawaii Creamcup	July 23, 1920	July 22, 1922	....	.....	.....	.....	.....	.....	.....	.....	.....	4,766.6	7,862.0	7,829.4	8,560.9
Joletta University Girl	Dec. 1, 1920	Oct. 4, 1922	....	.....	.....	.....	.....	.....	.....	.....	.....	3,691.8	7,215.4	8,873.2	3,262.1
Baby Korndyke Joletta	May 21, 1921	May 6, 1923	....	.....	.....	.....	.....	.....	.....	.....	.....	989.4	5,240.6	3,165.3	7,887.6
Lady Mead Manca	Oct. 20, 1921	May 24, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,060.5	9,558.3	8,535.8
Joletta Girl	Dec. 16, 1921	Apr. 12, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,147.7	7,848.5	4,300.5
Lady Natoma Mead	Mar. 13, 1922	Aug. 11, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7,443.8	8,377.1
Korndyke Mead Manca	Apr. 26, 1922	Nov. 29, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,702.8	6,420.9
Madam Luku Mead	May 14, 1922	Oct. 15, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,879.0	1,902.5
Baby Tela Gem Mead	June 4, 1922	Oct. 27, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6,919.3	9,611.4
Princess Manca Creamcup	Sept. 30, 1922	Sept. 7, 1925	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8,191.3
Lady Joletta El Prado	Oct. 4, 1922	Feb. 8, 1925	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,838.8	5,502.8
Korndyke El Prado Manca	Dec. 6, 1922	Feb. 1, 1925	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,673.5	7,700.1
Manca Hawaii Korndyke Mead	Jan. 30, 1923	Sept. 5, 1925	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6,794.4
Natoma Hawaii Creamcup 2d	July 3, 1923	Feb. 23, 1926	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,275.1
Manca Creamcup El Prado	July 20, 1923	Sept. 25, 1925	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,557.5
Guernseys:															
Alberta of Hidden Valley	Feb. 1, 1917	July 28, 1919	....	.....	.....	.....	.....	.....	4,625.3	4,305.4	5,359.6	2,680.4	6,097.5	5,495.4	4,102.2
Clementina of Hidden Valley	Nov. 16, 1918	June 16, 1920	....	.....	.....	.....	.....	.....	224.5	4,765.9	3,915.8	3,267.8	4,339.7	5,545.8	2,927.2
Alberta of Manoa	July 28, 1919	Oct. 18, 1921	....	.....	.....	.....	.....	.....	.....	.....	4,817.9	5,774.0	6,955.1	7,567.6	3,641.4
Mysie's Manoa Lady	Feb. 16, 1921	Oct. 1, 1923	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,118.7	5,822.8	3,501.7
Alberta of Hawaii	June 8, 1921	Jan. 11, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,480.4	6,371.2	2,684.5[3]
Corona Boy's Alberta of Hawaii	June 2, 1922	Aug. 21, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6,010.1	6,192.8
Corona Queen of Hawaii	June 11, 1922	May 8, 1924	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	881.6	4,752.2	3,020.5
Lulu of Hawaii	June 16, 1923	Sept. 30, 1925	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6,293.2
Corium Elizabeth's Cassandra	Oct. 9, 1921	Nov. 29, 1923	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,557.7	4,005.4	980.3[4]
King's Golden Bess	Jan. 15, 1924	Dec. 24, 1925	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,644.3
Hawaii Clementina	May 19, 1921	July 3, 1923	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,358.9	2,496.0	[2]

[1] Sold Oct. 14, 1925.
[2] Sold Aug. 7, 1925.
[3] Sold May 5, 1926.
[4] Sold Oct. 14, 1925.

BUTTERFAT PRODUCTION OF UNIVERSITY OF HAWAII HERD

(Based on tests of composite samples tested once every month)

Stable No.	NAME	July 1, 1925, to June 30, 1926	
		Pounds Butterfat	Average % Fat
	Holsteins:		
4	Luku	37.78*	3.03
9	Manca Creamcup	285.72	3.21
11	Manca Korndyke	304.12	3.20
15	Joletta Camino Korndyke	260.76	3.17
30	Natoma Hawaii Creamcup	277.66	3.25
31	Joletta University Girl	104.72	3.39
35	Baby Korndyke Joletta	264.60	3.38
38	Lady Mead Manca	252.65	3.03
39	Joletta Girl	145.72	3.54
41	Lady Natoma Mead	291.50	3.57
42	Korndyke Mead Manca	210.23	3.06
43	Madam Luku Mead	55.82*	3.15
45	Baby Tela Gem Mead	317.63	3.35
47	Princess Manca Creamcup	272.55	3.31
48	Lady Joletta El Prado	214.10	3.47
49	Korndyke El Prado Manca	265.49	3.56
50	Manca Hawaii Korndyke Mead	215.46	3.16
52	Natoma Hawaii Creamcup 2d	97.05*	3.20
53	Manca Creamcup El Prado	178.80	3.20
	Average†	241.36	3.31
	Guernseys:		
18	Alberta of Hidden Valley	180.80	4.16
20	Clementina of Hidden Valley	133.11	4.59
21	Alberta of Manoa	176.29	4.91
32	Mysie's Manoa Lady	126.01	4.17
34	Hawaii Clementina	.....	....
37	Alberta of Hawaii	115.01*	4.74
44	Corona Boy's Alberta of Hawaii	253.20	4.17
46	Corona Queen of Hawaii	134.22	4.38
51	Lulu of Hawaii	258.77	4.26
54	Corium Elizabeth's Cassandra	48.64*	5.02
63	King's Golden Bess	155.00*	4.48
	Average†	180.34	4.38

* In milk during only part of year.
† For animals in milk during full year.

ANIMALS IN UNIVERSITY DAIRY JULY 1, 1925—JUNE 30, 1926

Stable No.	NAME	Date of Birth	Value of Feed for Year	Value of Feed for Day	Feed Cost per Quart of Milk
1	Sunny Girl's Daughter	.....	$ 36.22*	0.6354	0.0887
2	Gypsy Queen of Valley Gem	.....	26.51*	0.4651	0.0575
3	Jenora Goldie	.....	35.47*	0.6224	0.0846
4	Luku	Oct. 3, 1912	45.71	0.4312	0.0881
9	Manca Creamcup	Oct. 3, 1915	202.48	0.5547	0.0478
11	Manca Korndyke	Oct. 10, 1916	196.43	0.5354	0.0429
15	Joletta Camino Korndyke	Oct. 3, 1918	174.47	0.4780	0.0453
18	Alberta of Hidden Valley	Feb. 1, 1917	144.07	0.3947	0.0755
20	Clementina of Hidden Valley	Nov. 16, 1918	130.35	0.3571	0.0958
21	Alberta of Manoa	July 28, 1919	148.57	0.4070	0.0877
30	Natoma Hawaii Creamcup	July 23, 1920	161.76	0.4432	0.0406
31	Joletta University Girl	Dec. 1, 1920	150.52	0.4124	0.0992
32	Mysie's Manoa Lady	Feb. 16, 1921	162.11	0.4442	0.0995
34	Hawaii Clementina	May 19, 1921	7.18	0.1158	.....
35	Baby Korndyke Joletta	May 21, 1921	168.19	0.4608	0.0458
37	Alberta of Hawaii	June 8, 1921	113.01	0.3096	0.0905
38	Lady Mead Manca	Oct. 20, 1921	173.35	0.4749	0.0438
39	Joletta Girl	Dec. 16, 1921	166.73	0.4568	0.0834
41	Lady Natoma Mead	Mar. 13, 1922	168.04	0.4604	0.0431
42	Korndyke Mead Manca	Apr. 26, 1922	158.74	0.4330	0.0531
43	Madam Luku Mead	May 14, 1922	140.22	0.3842	0.1584
44	Corona Boy's Alberta of Hawaii	June 2, 1922	168.61	0.4619	0.0585
45	Baby Tela Gem Mead	June 4, 1922	186.61	0.5112	0.0417
46	Corona Queen of Hawaii	June 11, 1922	139.41	0.3808	0.0992
47	Princess Manca Creamcup	Sept. 30, 1922	164.90	0.4517	0.0433
48	Lady Joletta El Prado	Oct. 4, 1922	157.89	0.4326	0.0617
49	Korndyke El Prado Manca	Dec. 6, 1922	160.93	0.4409	0.0449
50	Manca Hawaii Korndyke Mead	Jan. 30, 1923	139.86	0.3832	0.0442
51	Lulu of Hawaii	June 16, 1923	170.81	0.4689	0.0583
52	Natoma Hawaii Creamcup 2d	July 3, 1923	127.79	0.3501	0.0838
53	Manca Creamcup El Prado	July 20, 1923	132.90	0.3641	0.0514
54	Corium Elizabeth's Cassandra	Oct. 9, 1921	38.55	0.3637	0.0845
56	Hawaii Ladock Cassandra	Nov. 29, 1923	114.92	0.3148	.....
57	Mysie Alberta	May 5, 1924	121.86	0.3339	.....
58	Luku Gem	June 20, 1924	96.05	0.2635	.....
59	Luku Mead	June 20, 1924	109.95	0.3012	.....
60	Segis Joletta Girl	Aug. 30, 1924	83.38	0.2285	.....
61	Lady Manca Mead	Sept. 19, 1924	83.50	0.2288	.....
62	Korndyke Segis Prilly Dekol	Nov. 29, 1924	96.58	0.2646	.....
63	King's Golden Bess	Jan. 15, 1924	137.64	0.3771	0.0812
64	Prilly Manca	Sept. 7, 1925	60.23	0.2035	.....
65	Dekol Prilly Segis Pontiac	Sept. 25, 1925	49.64	0.1786	.....
66	Segis Dekol Gem	Oct. 25, 1925	47.25	0.1905	.....
67	Sterling's Golden Bess	Dec. 24, 1925	38.33	0.2039	.....
68	Uniwai Prilly Manca	Jan. 14, 1926	26.36	0.1598	.....
69	Uniwai Manca El Prado Prilly	Feb. 3, 1926	25.91	0.1762	.....
70	Uniwai El Prado Joletta Prilly	Feb. 19, 1926	22.31	0.1703	.....
71	Uniwai Natoma Mead Prilly	Feb. 23, 1926	15.94	0.1177	.....
72	Uniwai Dekol Segis	May 8, 1926	19.76	0.3659	.....
	King Pontiac Segis Prilly Dekol	June 26, 1922	190.66	0.5223	.....
	Islander's Floss Boy	July 15, 1924	178.04	0.4877	.....
	13 calves	.....	239.66	0.2484	
			6056.36		

* Cows belonging to Mr. Carter in herd for 57 days.

COMPARISONS OF MILK PRODUCTION COSTS OF UNIVERSITY FARM

(Interest and Depreciation or Appreciation Not Included in These Figures)

Year	Quarts Produced	Cost per Quart for: Feed	Man Labor	Miscellaneous	Refrigeration	Sterilization	Operation Delivery Truck	Total Cost per Quart
1916-17	25,151	$ .0618	$.0392	$.0210	$.0106	$.0088	$.....	$.1414
1917-18	22,940	.0811	.0549	.0177	.0061	.0086	.....	.1684
1918-19	41,305	.1114	.0401	.0151	.0043	.0040	.....	.1749
1919-20	57,625	.1256	.0448	.0104	.0036	.0014	.0055	.1913
1920-21	69,099	.1032	.0592	.0195	.0032	.0005	.0105	.1961
1921-22	76,723	.0637	.0509	.0132	.0058	.0021	.0068	.1425
1922-23	74,471	.0788	.0554	.0148	.0087	.0017	.0099	.1693
1923-24	71,032	.0887	.0564	.0234	.0101	.0019	.0103	.1908
1924-25	73,432	.0809	.0622	.0190	.0039	.0032	.0096	.1788
1925-26	74,970	.0808	.0615	.0317	.0058	.0016	.0101	.1915
10-year average	58,675	$0.0876	$.0525	$.0186	$.0062	$.0034	$.0063	$.1745

TUBERCULIN TESTS ON UNIVERSITY HERD

The University dairy herd was tuberculin tested on March 17, 1918, August 12, 1919, June 30, 1921, March 6, 1922, January 22, 1924, November 10, 1924, and December 11, 1925, by the Territorial Veterinarian or his deputy and no reactors were found.

INFLUENCE OF HERD SIRES ON UNIVERSITY OF HAWAII FARM

A bull's value is determined largely by the production records of his daughters. If the daughters are better producers than their dams the credit, assuming the same system of management and feeding is continued, goes to the sire. If the daughters average 1000 pounds more milk annually than their dams and if there are thirty daughters of such a sire in a herd the increased milk production at Honolulu retail prices for milk would be worth about $3000 per year. This explains why dairymen who have studied the problem are willing, if necessary, to pay big prices for a proven sire. They cannot afford to gamble on a bull of questionable value, for his calves might prove inferior to their dams, which would make the bull a liability rather than an asset. King Segis Alcartra Prilly, the sire of the present University of Hawaii Holstein bull, was sold for $35,000.00 largely because of the excellent type and production records of sons and daughters. He is a proven sire.

To determine the influence of the sires that have been used on University Farm an examination of the records dating back ten or more years was made, largely by students in dairy husbandry, and the following data were secured, production in most cases being computed up to February 28, 1926. Comparisons between daughters and dams are for corresponding periods; that is, if the daughters had been producing only three years to date, only the first three years of the dam's producing period were included in the average in order to get comparable figures.

Sire	Daughters			Dams		
	No.	Name	Avge. Lbs. Milk per Year	No.	Name	Avge. Lbs. per Year During Corresponding Period
Holstein						
Tela Gem	3	Baby Joletta	7,428	2	Joletta	8,855
(1910-1913)	5	Joletta 2d	7,082	2	Joletta	7,343
		AVERAGE	7,255			8,099
		Gain over Dam	—844			
Holstein						
Creamcup	9	Manca Creamcup	8,857	1	Kauic Manca	10,401
Korndyke	11	Manca Korndyke	12,219	1	Kauic Manca	9,607
Cornucopia	8	Joletta Korndyke	8,665	2	Joletta	7,101
(1913-1916)	10	Luku Korndyke	8,801	4	Luku	6,857
		AVERAGE	9,635			8,491
		Gain over Dam	+1,144			
Holstein						
Natoma	15	Joletta Camino Korndyke	8,008	5	Joletta 2d	6,353
Camino	16	Manca Hawaii Korndyke	8,276	11	Manca Korndyke	9,143
Korndyke	23	Manca Hawaii Creamcup	7,688	9	Manca Creamcup	5,812
(1917-1920)	30	Natoma Hawaii Creamcup	6,948	9	Manca Creamcup	5,865
	31	Joletta University Girl	7,219	2	Joletta	7,601
	35	Baby Korndyke Joletta	4,369	3	Baby Joletta	6,676
		AVERAGE	7,085			6,908
		Gain over Dam	+ 77			
Holstein						
King El	33	Manca Hawaii Mead	6,080	16	Manca Hawaii Korndyke	9,756
Prado	38	Lady Mead Manca	9,653	23	Manca Hawaii Creamcup	9,216
Mead	39	Joletta Girl	8,272	2	Joletta	7,524
(1920-1924)	43	Madam Luku Mead	5,474	4	Luku	6,264
	45	Baby Tela Gem Mead	10,221	3	Baby Joletta	5,724
	47	Princess Manca Creamcup	11,217	23	Manca Hawaii Creamcup	9,648
	48	Lady Joletta El Prado	9,140	31	Joletta University Girl	6,192
	49	Korndyke El Prado Manca	11,263	11	Manca Korndyke	8,892
	50	Manca Hawaii Korndyke Mead	12,096	16	Manca Hawaii Korndyke	10,908
	52	Natoma Hawaii Creamcup 2d	8,784	30	Natoma Hawaii Creamcup	9,709
	53	Manca Creamcup El Prado	10,332	9	Manoa Creamcup	5,688
		AVERAGE	9,321			8,138
		Gain over Dam	+1,183			
Guernsey						
Lord	32	Mysie's Manoa Lady	5,388	6	Lady of Manoa	5,442
Mysic's	34	Hawaii Clementina	3,760	20	Clementina of Hidden Valley	4,495
Corona	37	Alberta of Hawaii	5,639	18	Alberta of Hidden Valley	5,041
Boy	44	Corona Boy's Alberta of Hawaii	7,037	18	Alberta of Hidden Valley	5,438
(1918-1924)	46	Corona Queen of Hawaii	4,712	20	Clementina of Hidden Valley	4,653
	51	Lulu of Hawaii	9,845	18	Alberta of Hidden Valley	6,823
		AVERAGE	6,064			5,315
		Gain over Dam	+ 749			

It appears from the above analysis of the production records of dams and daughters that Creamcup Korndyke Cornucopia and King El Prado Mead were excellent Holstein sires, raising the average production of daughters over dams 1,144 pounds and 1,183 pounds milk per year respectively. Natoma Camino Korndyke increased the production averaged only 77 pounds over that of the dams of his calves, while the daughters of Tela Gem actually averaged 844 pounds milk less than their dam. However, since records of only two of his daughters are available, and both of them from the same outstanding dam, the figures are not complete or conclusive.

The daughters of the one Guernsey sire, Lord Mysie's Corona Boy, averaged 749 pounds more milk than their dams.

Since a cow's production tends to vary from year to year, another analysis a year or more later in the case of cows still producing would not give exactly the same figures, but in the case of cows where three or more years' production was available for this analysis the average for later analyses should be approximately the same.

FEEDING CANE MOLASSES TO DAIRY COWS

Cane molasses has been fed to all cows in the University of Hawaii Dairy except for a few cows on other feeding tests, since July, 1924. After some preliminary tests a concentrate mixture containing 25 per cent molasses was made August 18, 1924, and this has been the standard concentrate mixture since that time to June 30, 1926, the closing date of this report. The production of all molasses fed cows in the herd during the three years, in 1923-24 when on a non-molasses ration which serves as a check, and in 1924-1925 and 1925-1926 when on the 25 per cent molasses concentrate mixture follows:

MILK PRODUCTION

Cow No.	Breed	Age July, 1923	On Non-Molasses Mixture	On 25 Per Cent Molasses Cane Mixture		
			1923-24	1924-25	1925-26	Average
		Yrs.	Lbs.	Lbs.	Lbs.	Lbs.
4	Holstein	11	7,714.1	7,439.0	1,115.6†	
11	Holstein	7	10,763.5	11,101.9	9,830.5	10,466.2
15	Holstein	5	9,466.1	7,502.3	8,276.1	7,889.2
31	Holstein	2½	7,215.4	8,873.2	3,262.1	6,067.6
35	Holstein*	2	5,240.6	3,165.3	7,887.6	5,526.4
21	Guernsey	4	6,955.1	7,567.6	3,641.4	5,604.5
34	Guernsey*	2	5,358.9	2,496.0	(‡)	
	Average of full year cows		7,530.5	6,877.9	6,579.5	7,110.8
	Average excluding cows 4-34		7,928.1	7,642.1	6,579.5	7,110.8

* Cows 35 and 34 lost their calves early in 1924, so their low production in 1924-25 can not be wholly or even partly attributed to change of feed.

† Sold October 14, 1925—old age—13 years old.

(‡) Sold August 7, 1925—could not get her bred following abortion April 28, 1924.

The average production on the 25 per cent molasses concentrate mixture was less in both years than in 1923-1924 when no molasses was fed, and less the second year of molasses feeding than the first, although individual cows in the group react differently from the average. While these results suggest that 25 per cent cane molasses in the concentrate mixture may be in excess of what is desirable for best results, the writer feels that no definite conclusions can be drawn. Perhaps the decreased available green roughage was a factor in the decreased yields of milk, particularly in the year 1925-1926, and many other factors which can not well be controlled when working with dairy cows may have played a part in the milk production. It is not at all unusual for a cow to drop from high production one year to low production the next when no change in feed has been made. Delayed calving or abortions are probably the most common causes of this. In theory cows should be bred to produce a calf at twelve months intervals; every practical dairyman knows how difficult is the accomplishment of this seemingly simple schedule.

While the above table lists only the seven cows that had records preceding the time when molasses feeding was started so that comparisons could be made, actually twenty-four of the twenty-nine cows in the herd received the 25 per cent molasses grain mixture. While no comparisons with previous records can be made in the case of these recently matured cows their production records can be seen on page 6 of this report.

This 25 per cent molasses grain mixture has the following ingredients:

3 pounds molasses,
3 " wheat bran,
1 " soy bean oil cake meal,
¾ " coconut oil cake meal,
¼ " linseed oil cake meal,
4 " cracked corn.

The cost in Honolulu of this mixture at June, 1926, feed prices was $0.0198 per pound or $39.60 per ton. In this calculation molasses was valued at $15.50 per ton, the cost to the University at that time. Much lower prices for molasses would obtain in many places in the Territory.

PINEAPPLE BRAN FOR DAIRY COWS

Experiments with pineapple bran as a feed for dairy cows were started as early as August, 1922, at the University of Hawaii Farm.* The present experiment was started in July, 1924, and is still in progress. Results to June 30, 1925 were reported in a previous publication.† This report is a continuation and progress report to June 30, 1926, but does not complete the experiment.

The general plan of the present experiment consists in selecting typical cows in the University herd with at least one or more previous lactation periods during which they were fed the regular herd mixture and putting them on the pineapple bran feed three months preceding their calving date and continuing them on same until such time as it may seem desirable to discontinue the test. One cow, No. 32, has now had two full lactation periods on pineapple bran feed. Nine cows were started on this test but for various reasons only five of them could be continued for a long enough period to get comparable results. Two of them died, one was suspected of having contracted a contagious disease, and another developed a bad case of garget and breeding troubles. Since the remaining five cows are in good health and apparently normal in all respects, there is nothing to indicate that the feeding of pineapple bran was the cause of any of the troubles with the above mentioned four cows.

Two pineapple bran mixtures are being used, one containing 33⅓ per cent and the other 66⅔ per cent pineapple bran, supplemented in each case with protein feeds to satisfy the requirements of the Henry-Morrison feeding standard. These mixtures as well as the regular herd mixture previously fed are as follows:

Previous Herd Mixture Feed X	One-Third Pineapple Bran Mixture Feed A	Two-Thirds Pineapple Bran Mixture Feed B
75 lbs. cracked corn.	60 lbs. pineapple bran.	133 lbs. pineapple bran.
100 " wheat bran.	60 " rolled barley.	27 " rolled barley.
50 " coconut oil cake meal.	20 " rolled oats.	20 " linseed oil cake meal.
10 " linseed oil cake meal.	20 " wheat bran.	20 " soybean oil cake meal.
5 " raw rock phosphate.	20 " soybean oil cake meal.	2 " raw rock phosphate.
5 " salt.	2 " raw rock phosphate.	2 " salt.
	2 " salt.	

* 6th (1924) Annual Report, Dept. of Agri., Univ. of Hawaii, p. 20.
† 7th (1925) Annual Report, Dept. of Agri., Univ. of Hawaii, p. 24.

The production records, feed costs, etc., of the cows on the regular herd mixture and later on pineapple bran feed are shown in the following tabulation:

Cow No.	On Feed	Beginning of Lactation	Length of Lactation Days	Total Milk Produced Lbs.	Average Milk Daily Lbs.	Total Concentrates (Dry Basis)—Lbs.	Total Roughages (Green Basis)—Lbs.	Total Feed Cost	Feed Cost per Lb. Milk	Lbs. Milk per Lb. Concentrate
23	X	6-16-23	302	4,879.9	16.18	2,385	24,814	$147.26	$0.0302	2.05
18	X	5- 5-24	279	4,327.0	15.51	3,018	16,942	142.51	0.0329	1.43
9	X	7-20-23	311	8,915.0	28.66	3,876	25,405	185.19	0.0208	2.30
9	X	6-26-24	293	8,421.4	28.74	4,096	18,911	176.97	0.0210	2.05
32*	X	10- 1-23	303	4,441.5	14.65	2,467	25,037	147.87	0.0333	1.80
Average			296	6,635.8	22.27	3,344	21,518	162.98	0.0262	1.96
18	A	3-31-25	332	4,456.2	13.42	3,125	17,110	148.51	0.0333	1.42
9	A	5-11-25	339	11,570.1	34.43	4,840	19,614	211.52	0.0182	2.40
32*	A	9-17-24	305	5,500.0	18.03	3,611	17,604	169.90	0.0309	1.52
32*	A	9-16-25	287	3,450.2	12.06	2,361	13,616	117.60	0.0341	1.46
Average			335	8,013.1	23.92	3,982	18.362	180.01	0.0257	1.91
20	X	6-15-23	301	3,721.5	12.36	2,262	24,688	143.79	0.0389	1.65
20	X	5-24-24	260	4,202.8	16.17	2,718	13,952	134.10	0.0319	1.55
30	X	7- 3-23	319	6,942.1	21.76	3,419	25,647	175.39	0.0253	2.03
30	X	5-30-24	284	6,278.1	22.10	3,841	17,524	169.40	0.0270	1.63
Average			291	5,286.1	18.10	3,060	20,453	155.67	0.0308	1.71
20	B	4- 6-25	374	5,153.0	13.80	3,133	18,101	142.30	0.0276	1.65
30	B	5- 3-25	409	11,032.1	26.97	5,095	22,926	210.16	0.0190	2.16
Average			391	8,092.5	20.38	4,114	20,513	176.23	0.0230	1.90

* Cow No. 32 is not included in the averages as she had two lactations with pineapple bran feed and only one preliminary lactation period. A cow's individuality is a great factor and including her in the average would destroy the balance between the pineapple and non-pineapple groups.

It will be noted that the concentrates and roughages fed to the same cows varied from year to year. For purposes of making comparisons this is unfortunate, but under practical dairy conditions, the roughages given vary somewhat with the amounts the fields will produce, and concentrates, for economical reasons, if for none other, are adjusted to the cow's ability to produce at that time. No concentrates were withheld from a cow if she demonstrated her ability to utilize more of them economically.

Conclusions: Final conclusions can not be drawn, for a dairy cow is a highly individualistic creature and not enough cows were used to overcome the effects of individuality.

Cows on the one-third pineapple bran mixture averaged 1.91 pounds of milk per pound of concentrates fed at a feed cost of 2.57 cents per pound of milk produced as compared with 1.96 pounds and 2.62 cents respectively for the same cows when on a non-pineapple bran ration. Thus the cost of production was

slightly lower, but the efficiency of the feed was also lower with the one-third pineapple bran mixture. It should be noted, however, that the cows while on the non-pineapple bran mixture received an average of over 3,000 pounds more of green roughage per year, which was undoubtedly a factor in increasing the apparent efficiency of the non-pineapple bran grain mixture.

Cows on the two-thirds pineapple bran mixture averaged 1.90 pounds of milk per pound of concentrates fed at a feed cost of 2.30 cents per pound of milk produced as compared with 1.71 pounds and 3.08 cents respectively for the same cows on the non-pineapple bran ration. On the two-thirds pineapple bran mixture the cost of production was materially lower and the efficiency of the feed somewhat higher than when on the non-pineapple mixture.

SWINE DEPARTMENT

The swine department on June 30, 1926, consisted of nine Berkshire and five Tamworth breeding hogs, all purebred and registered, and eighteen market hogs mostly on feeding tests. Four breeding hogs were imported during the year—two Tamworths from Iowa and two Berkshires from Indiana.

Three feeding tests completed during the year are described in detail in the following pages:

FATTENING OLD HOGS

Repeated tests at the University of Hawaii Farm showed that with hogs weighing from 50-175 pounds, a pound of increased weight could be produced by feeding from 3.70 pounds to 4.59 pounds of 50% pineapple bran mixture consisting of

50	pounds	pineapple bran.
30	"	wheat middlings.
10	"	coconut oil cake meal.
10	"	tankage.
1	"	salt.
1	"	raw rock phosphate.

The cost of these gains ranged from 7 to 10.4 cents per pound.

Three old hogs that were unsatisfactory as breeding animals provided an opportunity to determine the rate and economy of gains when feeding the same 50% pineapple bran mixture de-

scribed above. The concentrate mixture was provided in a self feeder and each hog was provided with one pound of green alfalfa daily. The three hogs consumed 572 pounds of the concentrate mixture in twenty days.

Breed	Sex	Age in Months	Weight Apr. 8	Weight Apr. 28	Gain	Average Daily Gain	Concentrates per Lb. Gain	Feed Cost per Lb. Gain
			Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Cents
Berkshire	M	24	561	577	16	0.80	...	....
Tamworth	F	18	502	519	17	0.85	...	....
Berkshire	F	17	379	408	29	1.45	...	....
Average		20	480.7	501.3	62	1.03	9.2	29.5

Conclusion: This short test with old hogs shows that they require twice as much feed for a pound of gain as younger hogs, and at present prices (about 12 cents per pound) for old hogs, fattening them before marketing is unprofitable unless they are in a run down condition, in which case they may put on weight more economically.

WHEAT MIDDLINGS VERSUS RICE BRAN AS SUPPLEMENTS TO PINEAPPLE BRAN WHEN FED TO FATTENING HOGS

Rice bran in Hawaii generally sells for about fifteen dollars less per ton than wheat middlings. While wheat middlings is preferred to rice bran by most animal husbandry men, rice bran must be given some consideration because of its much lower cost.

A previous experiment at the University of Hawaii Farm* showed rice bran to be inferior to wheat middlings as a supplement to pineapple bran for fattening hogs, both in the rate of gain and the cost of the gain produced. The purpose of this experiment was to gather further information on this problem.

Pigs Used

Nine pigs from two sows were used:

No. and Breed of Dam of Litter	Breed of Sire of Litter	Date Born	Pigs Used in Test
70—Berkshire	Tamworth	May 25, 1925	5
540—Berkshire	Berkshire	May 18, 1925	4

These pigs were weaned at about the same time and given the same weaning mixture till September 12, 1925, when they were divided into two lots as described below.

LOT I

No.	Sex	Breed	Dam	Weight in Lbs. Sept. 12	Nov. 14	Jan. 16	Total Gain Lbs.	Average Daily Gain Lbs.
2	M	Tamworth X Berkshire	70	51	132	204	153	1.21
79	F	Berkshire	540	46	98	152	106	.84
78	F	Berkshire	540	42	74	108	66	.52
3	M	Tamworth X Berkshire	70	47	152	216	169	1.34
	Average			46.5	114	170	123.5	.98

LOT II

No.	Sex	Breed	Dam	Weight in Lbs. Sept. 12	Nov. 14	Jan. 16	Total Gain Lbs.	Average Daily Gain Lbs.
6	F	Tamworth X Berkshire	70	69	122	164	95	.75
1	M	Tamworth X Berkshire	70	51	92	145	94	.75
4	M	Berkshire	540	42	75	116	74	.59
5	M	Berkshire	540	43	73	108	65	.51
7	F	Tamworth X Berkshire	70	36	77	123	87	.69
	Average			48.2	87.8	131.2	83	.66

The Feed Mixture

Lot I was given the pineapple bran mixture which in repeated trials at the University Farm has given such satisfactory results that we consider it the standard fattening ration when economy of production is considered. The mixture follows:

Feed A	50	pounds	pineapple bran.
Mixture	30	"	wheat middlings.
for	30	"	coconut oil cake meal.
Lot I	10	"	tankage.
	1	"	salt.
	1	"	raw rock phosphate.
Feed B	50	pounds	pineapple bran.
Mixture	30	"	rice bran.
for	10	"	coconut oil cake meal.
Lot II	10	"	tankage.
	1	"	salt.
	1	"	raw rock phosphate.

It will be noted that the feed mixtures are the same except that rice bran is substituted for wheat middlings in Lot II. The mixtures were supplied in self feeders so regulated that the pigs could eat as much and whenever they wanted. One pound of green alfalfa was given daily to each pig in both lots. Plenty of clean water was supplied. The self feeders and the pens in which Lot I and Lot II respectively were kept were exactly the same. The pigs were weighed every three weeks.

Feed Prices

During the period of the test, September 12, 1925, to January 16, 1926, the average cost of the feeds used was as follows:

Pineapple bran	$25.00 per ton.
Wheat middlings	60.00 " "
Coconut oil cake meal	50.00 " "
Tankage	90.00 " "
Salt	16.00 " "
Raw rock phosphate	30.00 " "
Rice bran	45.00 " "
Green alfalfa	10.00 " "

	Feed A	Feed B
Cost per pound feed mixture	$.0220	$.0198

Total Gains and Costs

	LOT I Wheat Middlings Mixture	LOT II Rice Bran Mixture
Duration of test	126 Days	126 Days.
No. in each lot	4	5
Final average weight	170.0 Lbs.	131.5 Lbs.
Initial average weight	46.5 "	48.5 "
Average gain per pig	123.5 "	83.0 "
Average daily gain per pig	.98 "	.66 "
Total concentrate feed consumed	2,073.00 "	1,929.00 "
Average concentrate per pig per day	4.11 "	3.06 "
Pounds concentrates per pound gain	4.19 "	4.65 "
Total green alfalfa consumed	504.00 "	630.00 "
Total feed cost	$48.13	$41.34
Feed cost per pound of gain	.097	.099

Conclusions and Summary

1. Lot I on the pineapple bran mixture containing wheat middlings required 4.19 pounds concentrates to make a pound of gain at a total feed cost of 9.7 cents per pound and averaged .98 pounds gain per day.

2. Lot II on the pineapple bran mixture containing rice bran required 4.65 pounds concentrates to make a pound of gain at a feed cost of 9.9 cents per pound and averaged .66 pounds gain per day.

3. Wheat middlings proved more palatable as indicated in the daily consumption, proved more efficient in producing larger gains per pound of the mixture consumed, and the feed cost per pound of gain was lower than with the rice bran mixture, the latter differences, however, being very slight.

4. These results while differing slightly in details are in general accord with a previous similar experiment* performed at University of Hawaii Farm.

COMPARISONS OF RATE OF GAIN BETWEEN PUREBRED BERKSHIRES AND TAMWORTH X BERKSHIRE CROSSBRED PIGS

A feeding test from September 12, 1925, to January 16, 1926, which included both purebred Berkshires and Tamworth-Berkshire crossbred pigs afforded an opportunity to gather further data as regards the rate of weight increase.

The Pigs Used

Five crossbred pigs born May 25, 1925, out of a purebred Berkshire sow and sired by a purebred Tamworth boar, and four purebred Berkshires born May 18, 1925, were available for this test. It will be noted that the purebred Berkshires were only one week older than the crossbreds. The pigs were weaned about the same time and fed the same previous to the beginning of the test on September 12, 1925. During the 18 week test they were fed from self feeders, so arranged that each pig had free access to all feed it wanted at all times. In addition to the concentrates, one pound of green alfalfa was supplied for each pig daily.

* 7th Annual Report of Department of Agriculture, University of Hawaii (1923-1924), p. 18.

RECORD OF GAINS

Tamworth X Berkshire Cross bred pigs.

No.	Sex	Feed Mixture	Weight in Lbs. Sept. 12	Nov. 14	Jan. 16	Total Gain Lbs.	Average Daily Gain Lbs.
1	M	B	51	92	145	94	.75
2	M	A	51	132	204	153	1.21
3	M	A	47	152	216	169	1.34
6	F	B	69	122	164	95	.75
7	F	B	36	77	123	87	.69
Average.....			50.8	115	170.4	119.6	.95
Purebred Berkshires.							
4	M	B	42	75	116	74	.59
5	M	B	43	73	108	65	.51
78	F	A	42	74	108	66	.52
79	F	A	46	98	152	106	.84
Average.....			43.2	80	121	77.8	.62

FEED MIXTURE A

50 lbs. pineapple bran.
30 " wheat middlings.
10 " coconut oil cake meal.
10 " tankage.
1 " salt.
1 " raw rock phosphate.

FEED MIXTURE B

50 lbs. pineapple bran.
30 " rice bran.
10 " coconut oil cake meal.
10 " tankage.
1 " salt.
1 " raw rock phosphate.

Summary and Conclusions

1. In spite of the disadvantage of three of the five crossbred pigs being on feed mixture B (which produced poorer gains) while the purebred Berkshires were equally divided as to feed, the crossbreds nevertheless made an average daily gain of .95 pound as compared to .62 pound daily gain for the purebred Berkshires.

2. This increased rate of gain of the crossbreds over the purebreds amounting to 53 per cent is in accord with previous experiments* at the University Farm.

* Fifth Annual Report (1921-1922), Department of Agriculture, University of Hawaii, p. 29.

POULTRY DIVISION

By J. O. DALE
Instructor in Poultry Husbandry

Experimental work at the poultry farm was carried on in a general way and but little conclusive data is available. The incubating and brooding equipment had been increased during the summer and the work was centered chiefly on growing stock.

Mortality of the young chicks was unusually high, due to an outbreak of sorehead during the month of February, and an outbreak of coccidiosis during the month of June. However, enough pullets were grown to keep the flock number equal to that of the previous years.

Receipts from market eggs were considerably lower than the previous year, due chiefly to a greater number of eggs being set, and sold as setting eggs. The laying flock was fewer in numbers due to close cullings. The percentage lay of the flock was higher than last year. Sales from breeding stock setting eggs, and day old chicks was higher than in previous years.

The results of the egg laying contest were quite satisfactory. A new pen record of 1245 eggs and a new hen record of 274 eggs were made in this contest. The average lay per hen was somewhat higher than in the second contest, and improvement in stock and ability on the part of contestants to select good laying stock was apparent.

The results of the pineapple bran feeding experiment were inconclusive. Pen No. 2, which was fed a mash containing 25 per cent pineapple bran, gave the most economical production. Pen No. 3, which was the check pen, gave the highest egg production, but the cost per dozen eggs was higher than in Pen No. 2. Pen No. 1, which was fed a mash containing 12½ per cent pineapple bran, was much lower in egg production than was Pen No. 3, and the cost per dozen eggs was higher than for both Pens 2 and 3. It will perhaps require further investigation to determine the value of pineapple bran in a ration for laying hens.

POULTRY DEPARTMENT

Summary of the Poultry Department July 1, 1925, to June 30, 1926

Inventories (Buildings, Stock and Equipment) as of:

	June 30, 1925	June 30, 1926
Buildings	$5,725.00	$7,435.67
Poultry	3,244.00	4,114.50
Equipment	781.85	797.58
Totals	$9,750.85	$11,347.75

EXPENDITURES

Man labor	$3,124.22	$3,011.04
Feed	3,008.31	2,675.56
Building Materials	235.07	721.89
Equipment and Supplies	700.58	411.03
Electricity	217.01	152.96
Kerosene	15.88	44.38
Stock purchased	30.00	10.00
Totals	$7,331.07	$7,026.88

RECEIPTS

	June 30, 1925	June 30, 1926
Market eggs	$4,714.43	$3,604.61
Market poultry	792.12	366.43
Setting eggs	462.60	676.20
Baby chicks	668.40	757.70
Breeding stock	128.65	370.50
Credit for Manure	36.59	34.08
Miscellaneous	138.70	112.56
	$6,941.49	$5,922.08

PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDING JUNE 30, 1926

	Dr.	Cr.
June 30, 1925 inventory	$9,750.85	
6% interest on valuation	575.05	
Expenditures	7,026.88	
June 30, 1926, inventory		$11,347.75
Receipts		5,922.08
Loss		82.95
	$17,352.78	$17,352.78

THIRD ANNUAL HAWAII EGG LAYING CONTEST NOV. 1, 1924, TO OCT. 26, 1925

Twenty pens of five pullets and one alternate were entered in this contest. There was one pen of Australian Black Orpingtons, one pen of Barred Plymouths, one pen of New Era, and one pen of S. C. Brown Leghorns entered. The other sixteen entries were S. C. W. Leghorns.

The method of handling was the same as in the First Annual contest. Each entry was given a separate 6′x10′ house with a 6′x10′ run beneath. The method of feeding and caring for the birds was the same as in previous contests.

A new pen record of 1,245 eggs was made by Pen No. 3 which belonged to L. K. Smith of Makawao, Maui. A hen in this pen made the highest individual record for Hawaii of 274 eggs.

The following table gives the feed consumed, cost of feed, number of eggs, and value of eggs per pen.

Egg prices throughout the contest period were somewhat higher than for those of the previous contest. The average monthly wholesale prices of No. 1 eggs during the period of the Third Hawaiian Egg Laying Contest were as follows:

November,	1924	$1.10
December,	1924	.83
January,	1925	.71
February,	1925	.47
March,	1925	.476
April,	1925	.550
May,	1925	.598
June,	1925	.60
July,	1925	.62
August,	1925	.788
September,	1925	.896
October,	1925	.90
Average		$0.7115

'en	Contestant	Breed and Strain	Eggs Per Hen*	Average Eggs per Hen	Value of Eggs Pen	Average Price per Doz.	Feed Cost per Pen	Feed Cost per Hen	Value of Eggs per Hen	Profit per Hen Above Feed Cost	‡ Stan. Eggs	Pullet Eggs	Per Cent Stan.
3	Haleakala Poultry Ranch, Maui...	Tancred, S. C. W. Leghorns....	1,245	249	$72.08	$.6947	$21.24	$3.54	$14.41	$10.87	827	590	58.36
2	A. J. Horswill, Kauai.....	Aus. Black Orpingtons.....	1,156	231.2	65.32	.6780	19.60	3.51	13.06	9.55	586	647	47.52
7	A. J. Campbell, Oahu.....	Hollywood, S. C. W. Leghorns..	1,084	216.8	61.57	.6816	17.29	2.88	12.31	9.43	1,134	108	91.30
5	Ting Poultry Farm, Maui.....	Tancred, S. C. W. Leghorns....	1,065	213	59.82	.6740	20.35	3.64	11.96	8.32	884	335	72.51
0	University of Hawaii, Oahu.....	U. of H., S. C. W. Leghorns...	1,060	212	60.09	.6934	20.04	3.34	12.01	8.67	982	139	87.60
0	Frank S. Lee, Oahu.....	Hanson, S. C. W. Leghorns....	986	197.2	55.18	.6716	20.81	3.47	11.03	7.56	1,043	88	92.21
4	Haleakala Poultry Ranch, Maui....	Tancred, S. C. W. Leghorns....	984	196.8	55.89	.6815	19.25	3.21	11.18	7.97	456	534	46.06
2	University of Hawaii, Oahu.....	U. of H., S. C. W. Leghorns..	955	191	53.81	.6753	20.25	3.37	10.76	7.39	603	413	59.35
6	Waialae Ranch Co., Ltd., Oahu....	Hollywood, S. C. W. Leghorns.	937	187.4	54.65	.6999	17.97	3.59	10.93	7.34	903	97	90.30
9	Y. Saiki, Oahu	U. of H., S. C. W. Leghorns..	934	186.8	52.14	.6697	17.35	2.89	10.43	7.54	582	399	59.32
1	Beatrice H. Krauss, Oahu.....	New Era	928	185.6	52.68	.6812	21.85	3.64	10.53	6.89	730	343	68.03
4	Comp. M. Schoening, Oahu.....	Tancred, S. C. W. Leghorns....	922	184.4	50.43	.6564	16.18	2.90	10.08	7.18	688	283	70.85
7	J. T. Sing, Maui.....	Hanson, S. C. W. Leghorns....	858	171.6	45.71	.6393	19.92	3.32	9.14	5.82	964	8	99.17
5	Comp. M. Schoening, Oahu.....	Tancred, S. C. W. Leghorns....	846	169.2	49.03	.6947	18.25	3.04	9.80	6.76	678	264	71.97
9	Waialae Ranch Co., Ltd., Oahu.....	Hollywood, S. C. W. Leghorns.	831	166.2	47.46	.6853	20.81	3.47	9.49	6.02	894	5	99.44
8	E. A. Mott-Smith, Oahu.....	S. C. W. Leghorns.....	801	160.2	45.14	.6762	19.81	3.30	9.03	5.73	633	244	72.17
3	Geo. W. Moore, Oahu.....	Ferris, S. C. W. Leghorns.....	791	158.2	43.15	.6546	18.24	3.04	8.63	5.59	592	300	66.36
8	Noel H. Krauss, Oahu.....	Holterman, B. P. Rocks.....	739	145.8	38.17	.6198	19.27	3.21	7.63	4.42	799	44	94.78
1	John K. Awa, Oahu.....	U. of H., S. C. Brown Leghorns	479	96.8	24.95	.6000	17.79	2.96	4.99	2.03	160	384	29.41
6†	G. E. Macfarlane, Oahu.....	Enwood, S. C. W. Leghorns....	.....	.....	.....	.....	.....	....	....	....	...	...	.....
		Average.....	926.3	185.22	$51.96	$.6698	.....	$3.07	$10.44	$ 7.11	...	...	72.45

* Five highest hens.
† All died during the first 8 months of contest.
‡ Includes alternate.

Feed Costs

Feed prices throughout the contest period fluctuated somewhat, but the average for the year was above normal prices. The average prices of feed were estimated from bills for feed purchased by the Poultry Department and are as follows:

Wheat	$70.00	per ton.
Cracked corn	55.00	" "
Egg mash	65.75	" "
Grit	1.88	per 100 lbs.
Crushed bone	2.71	" " "
Crushed oyster shell	1.93	" " "
Charcoal	5.00	" " "

Labor Performed in Caring for Contest Hens

Feeding scratch grain	78 hrs.
Filling dry mash hoppers	40 "
Filling mineral hoppers	6 "
Feeding wet mash	51 "
Feeding green feed	51 "
Cleaning and filling water cans	96 "
Trapnesting	375 "
Recording egg and reporting	189 "
Cleaning and disinfecting houses	280 "
Gathering eggs	57 "
Moving houses	36 "
Total hours	1,259 hrs.
Labor per hen	10.4 hrs.
Labor cost per hen	$ 3.90
Average profit per hen above feed cost	7.11
Average profit per hen above feed and labor cost	3.21

To determine the labor required by the contest, time was taken on each part of the work that was done and the yearly time requirement for each part was calculated. A number of time checks were made and the average of these was used in calculating the yearly labor requirement.

The labor cost per hour was estimated from the average wage of the men employed at the poultry farm. The seemingly high labor cost per hen is due to trapnesting and the colony house system under which the fowls were kept. Even with the high labor cost a very satisfactory profit per hen is shown.

A comparison of the high and low pens which emphasizes the value of high producing stock.

	High Pen	Low Pen
Feed cost per hen	$ 3.54	$ 2.96
Value of eggs per hen	14.41	4.99
Profit per hen above feed cost	10.87	2.03
Profit per hen above feed and labor cost	6.97	1.87 loss

PART II

AGRONOMY DIVISION

By F. G. KRAUSS, Professor of Agronomy

In conjunction with the teaching of the courses of study in the agricultural curriculum at the University, considerable experimental and research work has been carried on by the more advanced students and the result of this work together with the general field crop production work on University Farm, the primary object of which is to furnish feed for the livestock of the Animal Husbandry Division, forms the basis of the report.

Owing to the unprecedented drought of the past several years, with the last year the driest of all (see table and graph of rainfall), with a precipitation about half of normal, and because of the general depleted condition of the cultivated areas, the yields per unit area have been low and the amount of planting somewhat reduced.

THE AGRONOMY COURSE

In its broadest sense agronomy includes a wide range of agricultural subjects, beginning with the study of soils and their formations to the production and final utilization of all field crops. As confined to our work, however, the course in Crops treats of the history, botany and culture of the leading tropical and subtropical field crops. But our students make contributions to Hawaiian Agriculture by the introduction of new crop plants and by the improvement of cultural methods, as the introduction and dissemination of new and improved leguminous and grass crop plants, among which may be mentioned the (1) Hairy Peruvian Alfalfa, which has superseded all other varieties here; (2) the Pigeon Pea which, in its improved form, has become an im-

portant pasture and field crop; (3) the Biloxi Soy bean, which promises to enter more and more extensively in our cropping schemes; (4) Guam and Cuban corn and its hybrids; (5) Uba cane as a forage crop; (6) Kukuyu grass (Pennisetum clandestinum) and a considerable number of other field crops as yet less firmly established than the foregoing.

In soil and crop management studies, several well-defined systems of green manuring and crop rotation, including improved pasturage and pasturing schemes have been devised. Several of these have become established ranch and plantation practices, especially on the island of Maui, but have also extended far beyond our borders to other lands.

The more economical and rational utilization of island grown feeds has received much attention, with the result that cured, mixed and milled Hawaiian grown feeds, including molasses, have become a common practice on a number of ranches and plantations.

The introduction of new and improved agricultural tools and implements, covering a wide variety, has proved a material aid to the agriculturist in labor-saving and greater efficiency in field operations.

Recognizing that our graduates are to be trained for agricultural leadership, we devote much effort in directing them through original research to ascertain not only the local demand for commodities which we produce, but which the outside world may need. They are directed to inquire into conditions and methods of other agricultural regions so that not only their state may profit to the utmost thereby, but that they in turn may generously and wisely serve other lands in friendly reciprocity.

From making production secure and permanent, our problems in agriculture are shifting to better distribution and marketing, and to the maintenance of a truly American rural population. This latter problem can only be solved by real statesmanship, by an insight into what far-reaching results may come about by following certain policies in business and in government as they affect our basic industry, agriculture.

A large responsibility rests with land-grant institutions in the solution of these problems, and they demand the same degree of scientific research that is being applied to crop production. The problems include sane land policies, equalization of the tax burden, better banking facilities, world markets and world agricultural production, and the equalization, production and consumption. All these things are brought to the attention of our students with a view to inspire their thought and action to strong,

broad, far-sighted and wise leadership in things agricultural, that our rural civilization may be maintained on a high order. Thus has character building, with the building of knowledge, become an important part of our agricultural curriculum at the University.

PINEAPPLE PRODUCTION

The course in Pineapple Production is designed to give a more intimate knowledge of the principles and practices of production of a highly specialized field crop, second only to sugar in its magnitude and value, than is possible in the general crops course. Every phase of cultural methods and improvement of the crop under Hawaiian conditions is carefully studied in field and laboratory. The Experiment Station staff of the Association of Hawaiian Pineapple Canners gives ample opportunity to students for original research. Thus, during the past year have root and plant studies been made by the class in Pineapple Production, which may prove suggestive and helpful in solving some of the problems of the industry. A survey and census is made each year of the status of the pineapple and sugar industries in Hawaii, and other countries for means of comparison and to give the student a broad outlook over world agriculture. This data is used in making tables, graphs and maps, all of which have been drawn upon freely by the community, our Federal government and by the International Institute of Agriculture, Rome. This latter is a case in point where our students have rendered services of a kind that the world at large has a right to expect from our institutions of higher learning.

GENETICS AND BREEDING

The need and importance of a greater diversity and improvement in field crops is being recognized at every hand. Every experiment station and many private institutions throughout the world have well equipped departments of genetics. The University of Hawaii was a pioneer in the application of genetic principles to crop production. In the first agronomy courses offered, rice, corn and legume crop breeding was brought under a scientific regime in the agricultural curriculum. This lead has been maintained to the present day and our graduates are now filling responsible positions in our two major agricultural industries as geneticists. The University has to its credit the development and dissemination of a number of superior field crop varieties, which have enriched not only the Territory but have reached the farthermost agricultural lands.

HORTICULTURE

Possibly least has been accomplished in this relatively new and untried field in Hawaii, yet the University is said to have given great stimulus to at least the growing of fresh vegetables for home consumption. Innumerable new varieties of vegetables in great diversity have been introduced by the Agronomy Division to Hawaii. A bulletin and numerous papers on vegetable growing have been prepared and much superior seed has been disseminated. The tomato and bean breeding work in this division has been especially noteworthy, as was likewise the devising of preserving and storage methods of surplus products during the period of the Great War. Students of the University have made contributions in evolving new methods of propagating horticultural plants, of improved systems of pruning trees, shrubs, and vines and cultural methods generally. Only in the production of the tree fruits have they failed, and this because of extremely unfavorable soil conditions for such culture on the University Farm. Fortunately this important sphere of fruit culture has been well cared for by the Hawaii Agricultural Experiment Stations.

It is in the horticultural division that the most extensive Extension work has been carried out in the past. Short courses have been offered to a large number of students in the past. The public schools have been co-operated with, as has likewise the Star-Bulletin Garden Contests from their inception. Many visitors and much correspondence have resulted from this course. The various editions of the vegetable culture charts, bulletin and mimeographed lesson series have run out of print. It is safe to say that more and better gardens and vegetables have resulted.

All the experimental and cultural work on the University Farm has labored under extremely adverse conditions. The farm is splendidly adapted to animal husbandry and the production of some of the more essential forage crops for the maintenance of that division, but for agronomical, horticultural and genetical investigations, the University needs a more suitable tract of land. Field experiments of a very high order could then be undertaken, and at a minimum expense and with maximum accomplishment. *The agronomist in charge would be extremely delinquent did he not again urge at this time his previous recommendations that the University authorities seek a better field equipment for this Division.* A hundred acres of good typical agricultural land with facilities for irrigation and drainage, and fairly accessible to the University would make an ideal University Farm where field

crops, orchards, vegetable gardens, nurseries, etc., could be most creditably and profitably maintained for the student body and the community at large.

EXTENSION AND IMPROVEMENTS ON THE UNIVERSITY FARM

In addition to the general program for renovating and building up the soil of the University Farm by means of deep-tillage, green manuring, fertilization and crop rotations reported last year, there has been added to the cultivated area of the University Farm an additional two acres, which brings the total cultivated area to about 23½ acres. One of these acres, designated as Field F-2, in South Field, was in the rough, virgin state, heavily timbered and rock ridden. As this area is characteristic of the bulk of the 20-odd acres thus far brought under cultivation, a summary of the costs of preparing this land will be of interest in giving a fair idea of the great overhead expense involved in crop production on University Farm.

COST OF PREPARING AN ACRE OF ROUGH NEW LAND (FIELD F-2), WITH PLANTING AND MAINTENANCE COSTS IN ALFALFA PRODUCTION

Nature of Work	Man		Horse		Tractor		Total
	Hours	Cost	Hours	Cost	Hours	Cost	
Preparation of Land for Planting:							
Clearing land of trees, shrubs and stones	918	$275.40	...	....	...	.....	.....
Plowing and sub-soiling with heavy equipment by contract	51	34.45	...	....	78.5	$219.00	.....
Plowing, discing, grading, etc., by University Farm men and equipment	383.5	115.05	206	$51.50	64	32.00	.....
Final leveling	4	1.20	...	....	4	2.00	.....
Total cost for preparation	1356.5	$426.10	206	$51.50	146.5	$253.00	$729.88

An analysis of the table above shows that the total cost of preparing an average acre of raw, new land, ready for planting, is around $730.00 an acre, and that this cost is distributed approximately in the following proportions:

	Hours	Cost
Man labor:		
Clearing land of trees, rock, etc	53.7%	37.6%
Plowing and sub-soiling by contract	3.0	4.7
Plowing, discing, grading, by U. H	22.4	15.7
Final leveling	0.2	0.2
Horse labor	12.0	7.1
Tractor labor	8.7	34.7
	100.0%	100.0%

This is twice the outright cost of good alfalfa land in California, and is the best possible argument in favor of our recommendation that University Farm be no longer used for crops of this kind.

CROP ADAPTATION

The agronomist approaches his problems in Crop Production from two directions, first by the adaptation of crops suitable to the environments of soil and climate, and secondly, through the amelioration of the environments insofar as he may be able to control them. A third mode of approach is the breeding of crops to special order. On the University Farm all these methods have been applied to the best of our abilities. Our dry, shallow, stony soils are being sub-soiled, green-manured, fertilized and irrigated to the limit of our facilities, and at the same time every promising and available field crop of which we have knowledge is being tested out in comparative cultures. This has resulted in trials of hundreds of varieties of crop plants including practically all of the catalogued legumes, grasses, cereals, root fiber and sugar crops, together with many varieties of vegetables and some fruits. Of all these, comparatively few have proved economically adapted to our conditions. Among the leguminous crops to which we have given the greatest attention, alfalfa has been stressed the most. A half dozen or more varieties have been tested out exhaustively since 1911, when the University Farm was first established. Beginning with the Chilean or common variety, German Lucerne, two broad-leaved Australian varieties, Arabian, Turkestan and finally, the Smooth and Hairy Peruvian varieties were grown. The latter variety has superseded all other sorts not only on University Farm, but throughout the Territory. But alfalfa, while doubtless the most valuable of our forage crops, is

an expensive crop to grow on any but good, level soils, with ample water for irrigation. (See report on alfalfa in this and preceding annual reports.)

Next to alfalfa, maize (Indian corn) has received greatest attention on University Farm. More than fifty standard varieties and hybrids have been tested out. Three varieties—Funk's Yellow Dent, 90-Day and Silver Mine—have yielded over 80 bushels shelled corn per acre with fertilization and irrigation. The highest yield being 91 bushels. Most other varieties have been failures excepting the so-called Guam and Cuban varieties, of which Professor L. A. Henke produced a cross that has proved, one year with another, the most reliable variety yet grown, this strain being resistant to the corn leaf-hopper, which is mainly responsible for the undoing of some of the higher bred standard types. However, on account of the high cost of production and rather uncertain results from corn, little is now grown except for student demonstration purposes.

Of the soiling grasses, Sudan, Elephant and Merker grasses and Uba cane have given excellent results and are being grown continuously. A report covering the final results of some of the initial plantings of these grasses follows:

PERENNIAL SOILING FORAGE GRASSES

Field C-1, North Field

Planted Dec. 15, 1921, the grass crops reported below were discontinued at the end of the present fiscal year, making the stand about four and one-half years old. The total yields green forage for the four-year period and averages per annum were as follows:

Variety	Total harvests	Calculated in tons per acre Total yield 4½ years	Average yield per annum
Uba cane	12	69.24	15.38
Merker grass	24	96.20	21.37
Elephant grass	29	152.47	33.86

These crops showed a rapid decline during the past year. The Uba cane plot was discontinued at the beginning of the year. The Merker grass gave four scant cuttings, yielding only 6070 pounds. The Elephant grass was harvested ten times and yielded 49,650 pounds for the year and proved to be by far the best grass under our conditions.

The "Economic Grass Garden" reported upon in the preceding annual report, suffered severely from the protracted drought. The plants were cut back twice during the year to prevent their going to seed and possibly dying out. However, all the stands survived. The following varieties made the best showing under the adverse conditions: Guinea grass (Panicum maximum), Sudan grass (Andropogon halepensis), Kikuyu grass (Pennisetum clandestinum), Exophorus unisetum (common name unknown), Buffalo grass (Stenotaphrum americanum), Giant Bermuda grass (Capriola (Cynodon) dactylon var. giganticum), Paspalum larranagai (common name unknown), Bermuda grass, our common "manienie" (Cynodon dactylon).

Of all the above grasses, only the Kikuyu grass (Pennisetum clandestinum) received from the University of California several years ago still maintains a high place in our estimation, but needs further trial before it can be fully recommended.

The following grasses have been added to our grass garden during the past year: Paspalum compressum (carpet grass), Paspalum dilatatum (Australian water grass), Bromus inermis No. 1614 (common name unknown), Melinis minutiflora (molassas grass), Andropogon sericeus (Australian blue grass), Polytrias diversiflora (Java grass), Phalaris arundinacea No. 1630 (Canary grass), Tripsacum laxum (Guatemala grass), Chloris gayana (Rhodes grass) and Andropogon spp. (Wilder grass).

LEGUMINOUS CROPS OTHER THAN ALFALFA

The Pigeon Pea (Cajanus indicus) continues to hold first place as a drought resistant crop on University Farm. Five acres have been planted to the crop in North Field during the past year. This includes one and a half acres devoted to new varieties and hybrids. All have seeded freely; 2301 pounds seed of the old standard New Era Strain D was harvested during the latter half of the year. Most of this seed was sold locally and brought in $337.65, which about covered cost of production under the unfavorable season in which it was grown. A large amount of seed in small lots was sent out gratis. Six lots of the twenty best newly established varieties were sent out for trial to Parker Ranch, Haleakala Ranch and Harold Rice's ranch in Hawaii and the remainder to the University of California, United States Department of Agriculture, Washington, D. C., and the Botanical Gardens at Calcutta.

The demand for Pigeon Pea seed from foreign countries continues to grow, showing that the crop is becoming more and more generally known through the tropical world. It is expected that

the promising, newly developed New Era Strain X may become established and multiplied sufficiently for general distribution within another year or two. This will give the crop a still wider field of usefulness.

MISCELLANEOUS LEGUME CROPS

The following additional leguminous crop varieties were planted in the spring and harvested at the close of the school year. Considering the extreme drought, some of these varieties made a remarkably good showing:

SOY BEAN (SOJA MAX)

Variety	Remarks
Biloxi-Haiku	The best variety for Hawaiian conditions. Heavy seeding, large brown seeds, height 24-36 inches, stiff upright stems.
O-Too-Tan	A fine stemmed variety suitable for hay. In favorable seasons yields a large amount of forage. This variety introduced by us has taken the Southern states by storm.
Laredo	A promising black seeded sort, does better some seasons than O-Too-Tan which it resembles, but is much earlier.
Manchu and Mid-West	These two yellow seeded varieties proved the heaviest seeding sorts next to Biloxi-Haiku.
Mammoth Yellow, Mongol and A. K	All yellow seeded varieties yielded a fair amount of seed.
Sabel and Illinois	Black and brown seeded sorts respectively, proved to be the heaviest seeding, dark seeded varieties.

During the past dry season, the Soys have proved fairly drought resistant and exceptionally heavy seeding, all things considered. The above varieties run 2500 to 3000 seeds per pound, so that with rows spaced 30 inches apart with seed dropped six inches apart in the row about 10 pounds of seed should be sown per acre. If planted among corn, three to five pounds of soy beans should be planted per acre. We strongly urge that corn and soy beans together be tried out under widely varying Hawaiian conditions.

COWPEAS (*Vigna sinensis*)

No other legume excepting the Cajanus (pigeon pea) was able to hold its own during the past seasons' drought as was the cowpea. Most of the varieties tested matured in about 110 days from seeding.

Brabham proved to be one of the best varieties grown during the past year as in other seasons. Whippoorwill, an old standard variety, also succeeded well, as did Groit, Taylor and New Era in the order named. Black or Unknown, Two Crop Clay, Dixie Queen Brown Eye and Early Ram's Horn Black Eye, the latter extra early maturing (91 days), are all worthy of trial, especially in seasons of scant rainfall.

MUNG BEAN (*Phaseolus aureus*)

Both the red and green seeded varieties of the mung bean withstood the drought well, and are deserving of extensive trials. The seed is small (10,000 per pound). Three to five pounds will sow an acre.

A miscellaneous lot of beans was received from China, including Phaseolus aconitifolius, the moth bean and P. calcaratus, the rice bean; two Dolicus, resembling our native Lablabs, sent to us under the names of Hung Pin and Hwi Pin beans, their source said to be from Yunnan. A new mung bean called Pai Fan (white rice) was also received from the same source, as was a large speckled lima, called Hung Pao, and four large seeded beans apparently belonging to the Phaseolus multiflorus type of perennials, called Yuang Yin Tao (goat's eye knife bean), Sui Chi (four seasons), Hung Hau Tsai and Ta Pai, all of which seem promising.

The following eight varieties of vetch all failed to set seed: Purple, Sand or Winter, Pearl, Hungarian, "Wooly" Podded and "Corn More," Golden and Large Gray. The same was true of the Tangier pea (Lathyrus tingitanus), Chick pea (Cicer arietinum) and Lupines, the latter represented by a blue-gray colored lupine received from New Zealand.

In a more favorable season these legumes may give a better account of themselves and will be planted again next winter or spring.

CROP PLANT ROOT STUDIES

A series of root studies of the following field crop has been inaugurated during the past year, the results of which will be ready for publication in the next annual report: Alfalfa, pigeon peas, cowpeas, soy beans, velvet beans and mung beans, among the legumes; and in maize, the Pennisetums, Panicums and Paspalums, among grasses, and of pineapples.

SOIL FERTILITY EXPERIMENTS

The soil fertility experiments in Fields D-1 and D-2, which were planted to pigeon peas in May, 1925, have been greatly retarded due to dry weather. However, the pea plants have borne heavily of seed, two crops having been harvested during the year which yielded approximately one ton of seed from the two acres. The entire plant growth was disced down to encourage a volunteer crop from the ripe pods remaining on the plants.

OPERATING COST OF FORDSON TRACTOR

The Fordson tractor purchased in April, 1923, to supplant the work of three work horses, has now been in operation for 39 months (3¼ years). During this period it has been in active operation for 3568 hours, or an average of 137.2 eight-hour days per annum. The average rate of plowing with a 12-inch one-bottom moldboard plow on University Farm soil is approximately one acre per day. This equipment has consequently performed the equivalent of plowing 446 acres of land. It would seem reasonable to expect this tractor to plow 500 acres in its lifetime.

To determine the approximate average tractor cost per acre for plowing, the following operating costs are given:

OPERATING COSTS OF TRACTOR (Based on 39 Months Operation)

Original Cost of Tractor, April, 1923, $600.00

Items	Total cost	Cost per hour operation
Depreciation @ 25%	$ 487.50	$0.137
Interest on investment @ 5%	97.50	0.027
Gasoline and kerosene, 3403 gals. @ 0.19	651.56	0.183
Repairs	93.17	0.026
Lubrication	75.18	0.021
	$1404.91	$0.394

On the basis of the above figures, the tractor cost of plowing an acre of land on University Farm is approximately $4.00. While these costs will seem high to many, it should be stated that ours are very adverse soil conditions, and furthermore, the cost of plowing with horses has been found to be more than twice as great.

CROP BREEDING

The breeding work in Cajanus and tomatoes has been supplemented with the breeding of papaia. The Cajanus hybrids now number approximately fifty. At least ten of these are being established as readily as possible. The many tomato hybrids produced in past years have been culled to a half dozen superior types. The papaia orchard has only just been established and consists of three strains. A full report on this work will appear in the next annual report.

CLIMATE AND RAINFALL

University Farm is located at the south entrance of Manoa Valley, about two miles inland and at an elevation of 97.5 feet. Flanked by hills on two sides, the high, steep range immediately to the southeast reflects the afternoon sun, resulting in very warm summer weathers, while in winter, strong, cool winds blow in through the gap from the northeast. The rainfall has usually been considered fairly equable, ranging a little above 30 inches per annum, November to April being the wettest months. However, as has been noted elsewhere the past three years have been unusually dry as will be noted from the table below, covering the period 1918 to 1926 inclusive. In the accompanying graph, the rainfall record of another station, less than a mile distant, but at a higher elevation, shows twice the rainfall recorded at University Farm.

Agriculturists will readily appreciate the need of irrigation under these conditions and will the more readily understand why the cost of crop production is excessive under existing circumstances.

RAINFALL ON UNIVERSITY FARM *
(Lat. 21° 17', Long. 157° 49')

A rainfall gauge located on the farm at a ground elevation of 97.5 feet showed the following inches of rainfall since its installation in 1918:

	1918	1919	1920	1921	1922	1923	1924	1925	1926
January	6.67	4.75	3.89	13.59	8.13	13.27	0.08	2.17	0.32
February ...	4.77	0.98	1.24	0.83	1.65	3.20	2.53	0.20	1.44
March	7.38	2.23	5.34	0.96	4.71	2.25	0.63	5.22	1.76
April	9.17	0.99	1.30	1.41	0.07	3.88	6.92	2.26	0.00
May	1.33	2.08	1.72	0.94	0.21	0.85	0.25	1.07	0.20
June	1.98	1.83	0.37	0.37	0.42	‡	0.04	0.06	3.55
July	0.48	1.48	1.90	1.57	0.13	0.19	1.23	0.35	0.22
August	‡	2.65	1.49	1.35	2.52	0.40	0.52	0.00	0.38
September ..	1.00	2.51	1.85	2.04	1.14	1.23	0.25	1.28	0.46
October	3.31	4.74	1.28	6.07	2.63	1.53	0.08	2.70	3.80
November ..	5.34	2.14	8.95	0.51	0.62	0.37	0.96	1.43	2.03
December ..	6.33	2.00	7.50	5.67	1.05	8.27	3.76	2.03	1.19
Total.....	47.46	28.38	36.83	35.31	23.28	35.44	17.25	18.77	15.35

* At the end of this report will be found a graphic representation of the above data together with a graph representing the rainfall at the junction of Vancouver Highway and Oahu Avenue, less than a mile from the University, for comparison.

‡ Record lost.

IRRIGATION SYSTEM OF UNIVERSITY FARM

As has been noted elsewhere in this report, the originally established wood-stave pipe line gravity system for conveying irrigation water from Manoa stream to the fields of University Farm went completely out of commission at about the beginning of the fiscal year of which this report treats. As this equipment was established in 1915, the period of its service was about 10 years. The original cost of installing the equipment was about $2500.00; the cost for maintenance, however, was excessive for a gravity system of water conveyance. Troublesome leaks developed along the line within a few years of its installation. This was in part due to defective staves, although much of the trouble was doubtless due to the intermittent soaking and drying out of the staves, resulting from irregular use of the irrigation system, and the fact, that it was laid over very rough ground. The total length of the old system of mains and laterals was approximately three-fourths of a mile, which consisted of 12, 8 and 5 inch, wire-wrapped, redwood stave pipe, tar-coated. A close estimate of the costs of this irrigation covering the ten years of its existence gives us an annual cost of approximately

$300.00. And, as an average of only about 10 acres was irrigated during this period, it is conservative to state that the annual acre cost for irrigation equipments alone amounted to about $30.00 per annum.

In consequence of the collapse of the old irrigation system it became imperative to plan for a new and more efficient system. The engineering and agricultural departments of the University co-operating submitted comprehensive plans, covering a modern power pumping plant and a well distributed pipe line, to furnish a minimum of 144,000 gallons in an 8-hour day, sufficient to irrigate 2 acres to a depth of a little over 2½ inches, the minimum effective irrigation in our soils, when applied every seven to ten days during the dry seasons.

ALFALFA EXPERIMENTS

The only justification for incurring the great expense pointed out in the project just recorded lies, of course, in the necessity of maintaining a field laboratory for our students. There may possibly be some justification in that when a field is once established the production is relatively high. This point is brought out in the table below which gives the crop yields of alfalfa on an acre field.

The clearing and preparation of this area covered the period from July 1 to November 10, 1925, following which the alfalfa seed was sown and the crop yields resulted as follows:

ALFALFA EXPERIMENT, 1925-26

Planted Nov. 10, 1925, Field F-2, University Farm

Plot No.	Rows	Treatment	Yields (calculated on acre basis) pounds Feb. (1st)	March (1st)	April (2nd)	May (3rd)	June (4th)
1	1–7	Check (no fertilizer)	2638	....	2772	4158	3406
	8–17	Check (no fertilizer)	....	1813	2398	6271	8541
2	1–10	500 lbs. superphosphate per acre	2796	....	2585	4001	8213
	11–20	500 lbs. superphosphate per acre	....	1719	2655	6704	8915
3	1–10	Check (no fertilizer)	3182	....	2538	5440	8365
	11–20	Check (no fertilizer)	....	1474	2293	4984	10272
4	1–10	500 lbs. reverted phosphate per acre	3720	....	3299	3521	8892
	11–20	500 lbs. reverted phosphate per acre	....	1556	2591	5265	8131
5	1–10	Check (no fertilizer)	2880	....	3182	4902	6961
	11–20	Check (no fertilizer)	....	2644	4937	4890	11232
6	1–7	500 lbs. super-plus, 500 lbs. reverted phosphate	....	4108	6412	5193	6128
	8–17	500 lbs. super-plus, 500 lbs. reverted phosphate	....	3942	5885	6341	8271
		Average acre yield per harvest, all treatments included	3043	2465	3453	5140	8110

It will be noted that the average yields increased in rather regular progression, beginning with the first harvest in March and ending in June, by which time the crop had probably attained its optimum productivity, considering the unfavorable season. The yields at this latter period amounted to approximately 4 tons per monthly harvest, which, calculated to an annual acre basis would total around 50 tons of green forage. Such prime forage has a market value of around $10 per ton and probably a much higher value when fed to dairy cows with the price of milk at present high levels. Thus it would be reasonable to value the acre production of fields such as this at about $500 per annum, and it might seem that in a few years of cropping, the heavy initial costs would be wiped out. However, in the above no allowance has been made for the direct production costs. These for the field in question have been approximately as follows:

FIELD COSTS OF PRODUCING ALFALFA AT UNIVERSITY FARM AFTER THE CROP HAS BECOME ESTABLISHED

(Calculated to an annual acre basis)

Fertilization and manuring	$ 80.00
Cultivation and hand weeding	100.00
Irrigation (man labor and water)	100.00
Harvesting by hand, 12 cuttings	100.00
Proportional cost for establishing the crop, including the cost of clearing land	100.00
Incidentals, not including taxes and interest	20.00
Total	$ 500.00

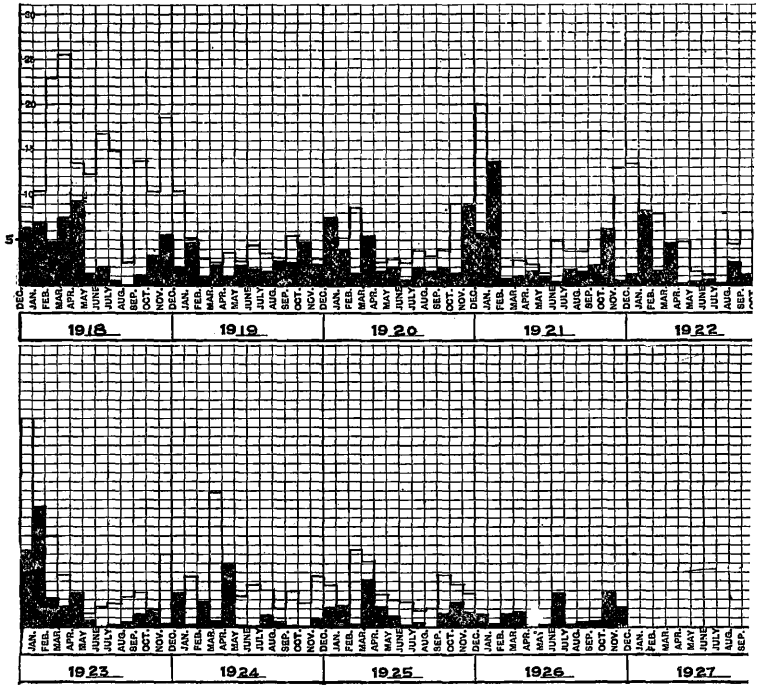
It will thus be seen, that on the basis of a cycle period of four to five years, covering the life of an alfalfa planting on University Farm, the operation costs and product values about balance. The data further show that the cost of producing green alfalfa on University Farm is approximately $10.00 per ton, probably not excessively higher than in many other regions, yet much in excess of what it would be under more favorable conditions.

YIELDS OF GREEN ALFALFA FROM VARIOUS OTHER FIELDS OF UNIVER SITY FARM FOR 1925-26

These data should be compared with those presented in the Eighth Annual Report 1924-25), pp. 33-35

Field	Acres	Variety	Planted	Yields 1925 July	August	September	October	November	December	Yields 1926 January	February	March	April	May	June	No. cutting	Total yields, lbs.	Croping period, months	Comparative yields 1925-26 with 1924-25: Yields tons per acre 1925-1926	Yields tons per acre 1924-1925
1	1	Hairy Peruvian	Nov., 1921	9255	3785	....	2220	11260	7280	3610	3291	5025	2550	....	....	9	45,026	12	22.51	18.82
2	1	Hairy Peruvian	Nov., 1921	13905	6680	4295	3685	9385	10765	3535	3299	6835	12560	6230	4015	12	85,189	12	42.59	34.32
3	0.82	Hairy Peruvian	Nov., 1921	4270	3185	4390	4025	5100	3850	6235	2610	3770	4630	1840	6360	12	50,265	12	29.66	14.38
4	0.70	Hairy Peruvian	Nov., 1921	520	1460	1685	3390	750	....	2040	2500	3000	1860	4450	5540	11	27,195	12	17.68	5.75
5, 6, 7	1.25	Hairy Peruvian	Nov., 1921	7105	9705	9610	9960	....	1650	6420	3615	7160	6970	8535	7480	11	78,210	12	31.28	2.82
1	1	Hairy Peruvian	Nov., 1922	....	2425	2725	2160	....	....	4625	4665	1900	2140	....	....	7	20,640	11	10.32	18.67
2	1	Hairy Peruvian	Nov., 1925	....	....	....	....	....	....	....	837	1370	3316	5032	8075	5	18,630	5	9.32	....
Hairy	...	.....	.....	....	....	....	....	....	....	....	....	....	....	4030	1260	2	5,290	2	....	....

It will be noted that there was a general and gradual decline i the yields of alfalfa from year to year up to the end of 1924-2 period. However, there appears to have been a very extraor dinary increase in the yields during the past year over that o the previous twelve months period. This increase is evidentl due to a number of factors; (1) Sub-soiling between the plan rows, better cultivation generally and much hand weeding; (2 to rather heavy manuring and some fertilization; (3) to mor uniform and rational irrigation, and (4) to hand cutting th crop at optimum periods of the plant development. Under ord nary conditions less attention is given to details of culture but i seasons of shortage every effort is made to get the most ou of the crop as in this case.



MONTHLY RAINFALL OF THE UNIVERSITY FARM (97.5′ Ele tion, Lat. 21° 17′, Long. 157° 49′) designated by solid bars, co pared with Rainfall at Junction of Oahu Ave. and Vancouver Hi way, (210′ Elevation, and one mile distant from the Univers Farm Rain Gauge)—designated by outlined bars. 1918-1926.