H O P I

O R C H A R D S U R V E Y

1939 Season

Submitted by:

Lyman W. Gleason
Assistant Agronomist

Approved by:

_____
Area Conservationist

_____
Head, Section of Agronomy

HP858

HOPI ORCHARD SURVEY

In the early fall of 1939, it was deemed advisable to make a survey of the orchards on Hopi lands. The 1939 season having been so extremely dry and unfavorable, in all probability the condition and yield of the orchards would be about as poor as could be expected, and greatly below normal. Follow-up surveys should give an average yield which could be expected on an average year.

Objects:

The human demands for fruit in the diet make it necessary that the Hopi fruit supply adequately furnish the need at all times. This survey, carried on over a few years, will determine what change or increase (if any) is necessary. In order to determine the present status, it was necessary to get:

1. Average yield of fruit per tree.
2. Average number of trees per acre.
3. Approximate number of acres in fruit trees.
4. Condition of orchard as to erosion, disease, care of trees, et cetera.
5. Population dependent upon orchards.

Manner of Survey:

Fruit was graded according to size, large to small, as: 0-1-2-3-4 and the average number of each necessary to fill a bushel box. The actual number of fruit per tree was counted until it was possible to estimate more or less correctly. Then orchards

were taken at random and estimates made, however, check-up counts being made occasionally. The number of trees per acre was determined by pacing half-acre plots on these random orchards, and counting the trees.

All this information was then worked out into averages.

Results:

1. Average yield per tree in bushels: (Numbers 0-1-2-3-4 averaging 100-140-240-380-500 units per bushel respectively.)

Grade	0	1	2	3	4
Peaches		.79	.66	.53	.17
Apples	.01	.68	.95	.32	.14
Pears		.80	.25	.45	
Plums					.34

2. Average number of trees per acre:

Keams Canyon Orchard	50 trees
First and Second Mesas	69 trees
Third Mesa	50 trees
Mean	59 trees

3. Percent of trees:

Apples	11%
Early Peaches	8%
Apricots	20%
Peaches	59%
Others	2%
	100%

HP860

4. Number of Acres

Land Management Survey of 1937 shows about 800 acres of fruit trees on the Reservation which would yield this year approximately.

5. Number of trees and acreage.

59 trees per acre or 47,200 trees of which-

11 %	or	5,192	are apple trees	88 acres
8 %	or	3,776	are early peaches	64 acres
20%	or	9,440	are apricots	160 acres
59 %	or	27,848	are peaches	472 acres
2 %	or	944	are others	16 acres
			Total	800 acres

6. Number of trees and size of each.

	0	1	2	3	4	None Production
Peach Trees		534	5,149	10,340	6,012	5,813 ~~or 18.66 bu per acre.~~
Apple Trees	237	1,090	1,232	1,009	69	1,555

7. Approximate yield in bushels.

Peaches (late)		421	3,398	5,480	1,022	9,810 or 20.78 bu. per acre
Apples	2.37	741	1,170	322	9.66	2,249 " 25.55 bu. per acre
					Total	12,059 bushels*

* Excluding 50% of No. 4's which failed to ripen.

8. There are 2900 people dependent on the orchards and according to Home Economics food rations, they should have 200# of fruit per year per capita for a well balanced diet.

HP861

Diseases, Insects, and Birds.

The drouth effects on the orchards have made it somewhat difficult to diagnose disease. There appears to be considerable peach mosaic, very little bacterial gumosis on peaches, and some die back in apple trees, due either to winter killing or fire blight--probably the latter.

Insect damage was very small and confined to coddling moth and web worms. The coddling moth injury probably will not account for over 2% loss in the apples, and no spraying has been done.

The birds have done considerable damage to all fruits, especially grapes and cherries.

Hail on Third Mesa has damaged all the fruit by probably 15 to 20%.

Erosion:

Most of the orchards show the effects of active wind erosion. Those orchards on the top of Second Mesa are being blown out of the ground, many roots having been exposed, and, in one place, the underlying rock structure having been bared. Many other orchards are also having roots exposed. On the Third Mesa there is either exposing of roots or burying of trees by shifting sand.

The action of water is less marked, mainly on account of the bulk of orchards being on sandy land or sandy sidehills. Some of the orchards on overflow land show effects of water action.

HP862

Care of Trees:

Many of the peach trees are no more than peach brush, not true trees, caused by die back or cutting of the parent tree and sprouts emerging from the roots. The peach trees are not of ideal conformation, however, they are not in bad shape either. There is much dead wood in peach trees and poor pruning methods are evident. Most apple trees have too many main branches.

Conclusions:

Considering the great number of trees there is sufficient fruit available at all times regardless of the small yield per tree evident this year.

Observations indicate that the ordhards on the sandy soils are better than those on the heavier lands as the sandy land has a high factor of moisture absorption and retention.

The classes of fruit grown vary from seedlings to the best nursery stock obtainable. A much greater percent of the peaches are from seed; therefore, the bulk of the fruit is small and inferior. The improved peaches showed up very well this year, indicating that they stand up under the climatical adversities about as well as the so-called "Natives." Some of the "Natives" are very juicy and of good flavor, however, many lack these properties.

The improved peaches, color and form up very well, are juicy, and have a truely superior flavor.

HP863

Apples are probably all nursery stock; however, the Delicious are by far the outstanding variety. Without exception, the Delicious apples observed would average as fine in color, conformation, size and flavor as any of the Washington State Delicious apples, and the yield per tree was commercially satisfactory.

What few grapes were found were bearing heavily.

The fruit on Third Mesa was probably a third better than elsewhere--the average yield and size considered.

Neither diseases or insects seem to be of much importance; however, the ordinary precautions should be taken to guard against any spread of disease or insects which might become of economic importance.

On many fields sand catchers of rabbit brush have been erected at right angles to the wind at intervals of thirty to fifty feet. These "catchers" are holding the soil in place, thereby no roots being exposed, and also assist in retention or spreading of water.

The younger generation of Hopi have desires for morethan a bare subsistance. Improved fruit from the same number of acres now in orchard will give them something readily salable so as to better satisfy their desires for some of the niceties of life.

Recommendations:

In order to make the Hopi orchards a greater asset in the economic life of these people, the following recommendations are offered.

1. The erection of sand catchers at right angles to the prevailing wind, at intervals of from 30 to 50 feet.

HP864

2. Put in water spreaders, dikes, etc., in overflow orchards.

3. Subsequent plantings should be of improved varieties such as; Delicious, Stamen, Winesap, and Rome Beauty apples; Hale, Elberta and Halberta peaches and American variety of grapes.

4. Head out plenty low so ground will be shaded and protected from the wind.

5. Leave plenty of foliage on the southwest of all trees as protection against the prevailing wind.

6. Dead wood cut out and correct pruning methods used.

7. Use control methods on webworms.

8. Follow-up surveys to strike an average yield over a period of years.

9. Topwork thrifty trees, using improved variety of cion or bud.

HP865

Field No. 1 East Slope of Mesa, North of Highway

	Peaches					Apples				
Grade	1	2	3	4	none	1	2	3	4	None
Bushels		1.00	2.90	2.59		12.67	4.00	11.99	3.10	
Trees		1	9	11	17	8	1	10	2	7
% of Trees		2.77	25	30.5	47.22	28.57	3.57	35.71	7.14	25

.52 Acre @ 38 trees .40 Acre @ 28 trees

Field No. 2 Q14 F81, West Side of Mesa

Bushels	.25	18.65	12.10	4.40	
Trees	1	46	27	23	11
% of Trees	.9	42.60	25	21.30	10.18

1.56 Acre @ 108 trees

Field No. 3 West Side of Mesa, East of Road on Hillside

Bushels	.95	1.22	.12		Apricot
Trees	5	5	1	6	5
% of Trees	22.72	22.72	4.54	27.27	22.72

.33 Acre @ 22 trees

Field No. 4 Wepo Gardens (Two Trees of Naughts)

Bushels	4.75	5.08	87.11	62.38	2.62	
Trees	4	7	17	15	4	14
% of Trees	36.36	63.63	34	30	8	30

.16 Acre @ 11 trees .73 Acre @ 50 trees

Field No. 4 -- Pears

Bushels	11.00	19.00
Trees	1	2

HP866

Field No. 5 In Sand Dunes above Wepo Gardens

	Peaches					Apples				
Grade	1	2	3	4	~~Noughts~~ one	1	2	3	4	~~Noughts~~ one
Bushels		33.25	9.47	3.01		7.05	18.45	2.25	.25	
Trees		26	13	14	6	5	8	3	1	9
% of trees		44.06	22.03	23.72	10.16	14.28	22.85	8.57	2.85	25.71

.85 Acre @ 59 trees .50 Acre @ 35 trees

Field No. 6 South of Q14 F81 In a Wash

Bushels	6.69	7.62	1.14	
Trees	18	24	5	9
% of trees	32.14	42.85	8.9	16.07

.81 Acre @ 56 trees

Field No. 7 Q14 F152

Bushels	.25	4.30	.21		Few young ones
Trees	1	15	4	8	8
% of trees	3.57	53.57	14.28	28.57	

28 trees .40 Acres @ 90 trees per acre

Field No. 8

Bushels	.22	2.00	.20	
Trees	2	5	2	10
% of trees	10.52	26.31	10.52	52.63

19 trees .25 Acres @ 76 trees per acre

Field No. 9

Bushels	7.43	1.42	
Trees	19	7	5
% of trees	61.29	22.58	16.13

31 trees .76 Acres @ 40 trees per acre

HP867

Field No. 10

	Peaches					Apples				
Grade	1	2	3	4	~~Naughts~~ one	1	2	3	4	~~Naughts~~ one
Bushels			5.84	1.01						
Trees			19	16	17					
% of trees			36.53	30.76	32.69					

52 trees .66 Acres @ 79 trees per acre

Field No. 11

						Apricots			Early Peaches	Early
Bushels	5.61	13.17	72.00	17.10			3.37	3.00		
Trees	8	20	102	54	51	49	5	3	21	5
% of trees	3.4	8.5	43.40	22.97	21.70	15.40	38.46	23.07	8.2	38.46

235 trees 5 Acres @ 63 trees per acre 13 trees

4% of all trees in orchard are apples. Average of 69 trees per acre. 8.2% of all peaches in the orchard were earlys. 15.40% of all trees in orchard were apricots

Field No. 12 Upper Orchard, Kearns Canyon

					Apples		Naughts	None
Bushels	3.00	5.00	1.00	4.35	7.46	2.65	.59	
Trees	1	3	3	11	12	12	7	20
% of trees	14.28	42.85	42.85	20	21.81	21.81	12.72	36.36

3.00 Acres 91 trees, or 28 trees per acre

	Pears			None		Plums
Bushels	2.40	1.00	1.79			2.77 not sized
Trees	3	4	4	3	8	
% of trees	21.42	28.57	28.57	21.42		

14 trees

HP868

Field No. 13 Lower Orchard, Keams Canyon

	Peaches					Apples				
Grade	1	2	3	4	None	1	2	3	Naughts	None
Bushels	4.50	.08	.90	1.17		4.92	11.08	6.77	.45	
Trees	1	1	3	6	1	13	20	18	5	19
% of trees	7.14	7.14	21.42	42.85	7.14	7.33	26.66	24.00	6.66	25.33

2 early peaches 3.5 Acres 89 trees or 25 trees per acre

TOTALS

Grade	1	2	3	4	None	1	2	3	4	Naughts
Bushels	12.76	82.01	64.58	33.37		116.10	106.74	29.28	3.35	1.04
Trees	13	125	251	146	141	54	61	50	3	12
Yield per tree (actual)	.98	.66	.25	.23		2.15	1.74	.58	1.11	.08

Total trees - 676 Total trees 257

Naughts total trees 192.72 bushels

											None
% of trees	1.92	18.49	37.13	21.59	20.85	21.00	23.73	19.45	1.16	4.66	29.96

HP869

AVERAGE ESTIMATED YIELDS PER TREE IN BUSHELS

	Peaches				Apples				
Grade Field Nos.	1	2	3	4	1	2	3	4	Naughts
1		1.00	.322	.235	1.584	4.00	1.20	1.55	
2	.25	.40	.448	.191					
3		.19	.24	.12					
4		1.18	.73		5.12	4.16	.65		
5		1.27	.73	.21	1.41	2.30	.75	.25	
6		.37	.32	.23					
7		.25	.29	.05					
8		.11	.40	.10					
9			.39	.20					
10			.31	.06					
11	5.61	.68	.71	.32		.67	1.00		
12		3.00	1.66	.33	.40	.62	.22		.08
13	4.50	.08	.30	.19	.38	.55	.38		.09
Average bushels	.79	.66	.53	.17	.68	.95	.32	.14	.01

Average .54 bushels

Average .65 bushels

PERCENTAGES OF TREES

Grading According to Sizes

	Peaches					Apples				
Grade	1	2	3	4	None	1	2	3	4	None
Field No.										
1		2.77	25	30.5	47.2	28.5	3.57	35.71	7.14	25
2	.9	42.6	25	21.3	10.2					
3		22.7	22.7	4.54	27.27	22.7				
4		36.36	63.63			34.0	30.0	8.0		30
5		44.0	22.0	23.7	10.1	14.2	22.8	8.6	3.0	25.7
6		32.1	42.8	8.9	16.0					
7		3.5	53.5	14.3	28.5					
8		10.5	26.3	10.5	52.6					
9			61.3	22.6	16.1					
10			36.5	30.7	32.7					
11	3.4	8.5	43.4	22.9	21.7		38.4	23.0		38.4 (Early)
12		14.2	42.8	42.8		20.0	21.8	21.8	12.7	36.36
13	11.1	11.1	33.3	66.6	11.1	17.3	26.6	24.0	6.6	25.3

HP871