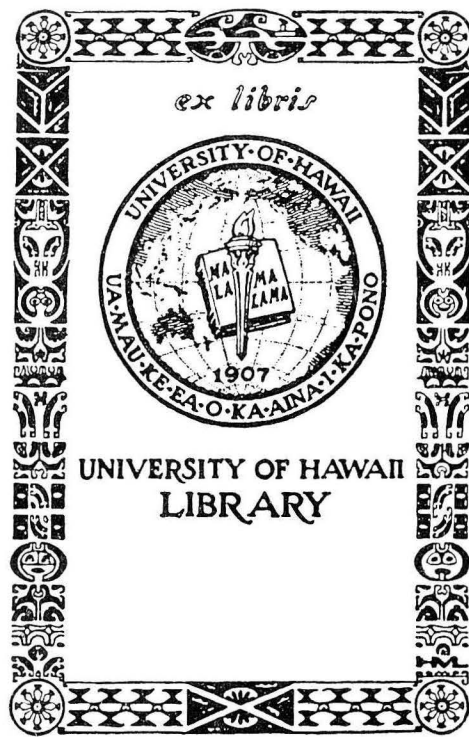


PRODUCTION PRACTICES AND COSTS
FOR GROWING WATERMELONS
ON THE ISLAND OF KAUAI



William L. Collier and Jack R. Davidson

Agricultural Economics Report No. 73
Hawaii Agricultural Experiment Station
University of Hawaii
January 1967



CONTENTS

	<u>Page</u>
INTRODUCTION	3
PRODUCTION PRACTICES	3
CALENDAR OF OPERATIONS	6
COSTS OF PRODUCING WATERMELONS	6
Direct and Indirect Costs	6
Representative Costs of Watermelon Production	11
Labor and Management Earnings	11
Note on Shipping Costs	12

TABLES

Number

1. Labor use per acre of watermelons grown, Kauai farm survey, 1966	4
2. Calendar of farm operations for a representative farm producing 32,000 pounds of watermelons per acre, island of Kauai, 1966	7
3. Machinery and buildings investment representative for farms producing watermelons on Kauai, Kauai farm survey, 1966	9
4. Average cost per acre for producing watermelons on the island of Kauai, 1966	10
5. Labor used in producing watermelons on the island of Kauai, 1966	11

FIGURES

Number

1. A watermelon that has been staked in order to indicate date of harvest	5
2. Several staked watermelons illustrating the use of sticks to indicate the date of harvest	5
3. Hours of labor use per acre per month for production of watermelons on Kauai	8

ACKNOWLEDGMENTS

This report is the first in a series of farm management studies conducted under State Project 409 "Farm Cost of Production and Efficiency Studies on Truck Crops and Field Crops in Hawaii", and Western Region Project W-54 (State Contributing Project 412) "Appraisal of Opportunities for Adjusting Farming to Prospective Markets."

AUTHORS

William L. Collier is Assistant Agricultural Economist, University of Hawaii Agricultural Experiment Station.

Jack R. Davidson is Agricultural Economist, University of Hawaii Agricultural Experiment Station, and Professor of Agricultural Economics, College of Tropical Agriculture, University of Hawaii.

COVER PHOTO

Watermelons being produced on a farm near Mana, Kauai.

PRODUCTION PRACTICES AND COSTS FOR GROWING WATERMELONS ON THE ISLAND OF KAUAI

William L. Collier and Jack R. Davidson

INTRODUCTION

A personal interview survey of vegetable farmers on the island of Kauai was made by the University of Hawaii's Department of Agricultural Economics personnel of the Hawaii Agricultural Experiment Station early in 1966 to determine costs of production for the leading vegetable crops. Only three of those interviewed grew watermelons. At least two known commercial growers could not be reached at the time the survey was taken. However, the three who did supply the detailed cost and operational information requested grew approximately 90 percent of the watermelons on the island. These farm interviews, together with published research materials and the experience of resource people in the Agricultural Experiment Station and the Hawaii Cooperative Extension Service, serve as the basis for the following analysis.

PRODUCTION PRACTICES

In order to avoid too much emphasis on a single planting, farmers were asked to comment on normal practices used if the previous season was not representative of their usual operation. The following is a summary of their replies:

Planting--Generally, the farmers plant watermelons in January and harvest during the summer months. Melons may be sown directly or planted in a seedbed, peat pots, or paper cups and then transplanted to the field about two weeks later. Both methods were used by the producers interviewed.

Fertilization--Each of the interviewed farmers applied a preplant organic fertilizer, usually chicken manure. This was followed by approximately six sidedressings with chemical fertilizers.

Irrigation--All of the growers interviewed irrigated their watermelon crop. All indicated they had adequate water available.

Weeding--Weeds were controlled both by hand-weeding and by herbicides. The farmers using herbicides said they applied these chemicals about four times during the growing and harvesting seasons.

Insect and Disease Control--The farmers interviewed sprayed insecticides and fungicides. They reported spraying an average of fifty times during the growing and harvesting seasons.

Staking--Staking the watermelons requires more labor than any of the other

production operations. Producers in the survey used an average of 360 hours or 38 percent of the total labor for this task (see Table 1). This operation enables the farmer to estimate the best harvest date for each melon.

When the watermelons are two or three inches in diameter, the growers push a stick into the ground next to the melons (see Figures 1 and 2). Sometimes the tops of the stakes are painted various colors that correspond to harvest dates. While harvesting the farmers pick all the melons marked by a certain color of stake.^{1/} On the farms where questionnaires were completed, this operation occupied one or two people continuously for two and one-half to three months during the growing season.

Other Practices--Some farmers had developed particular practices to correct certain types of problems. For example, one farmer strung wires on short pins alongside of the irrigation furrows to hold the vines above the water in order to keep them dry. This helped to prevent fungus diseases.

Table 1. Labor use per acre of watermelons grown,
Kauai farm survey, 1966

Labor-using activity	Average hours used	Percent of total labor used
Establishing the Stand ^{a/}	40.8	4.3
Cultural Operations	(603.9)	(63.7)
Fertilizing	30.0	3.2
Spraying	77.3	8.2
Irrigating	80.9	8.5
Cultivating	31.9	3.3
Staking	360.0	38.0
Other	23.8	2.5
Harvest and Handling	303.0	32.0
Average Hours of Labor Used	947.7	100.0

^{a/} Includes seedbed, field preparation, and transplanting operations.

Harvesting--Harvesting is another high labor-consuming activity. In the survey, harvesting operations used an average of 32 percent of the total labor required for production purposes. The length of harvest appears to be an important factor affecting yield. This varies from two to five months.

^{1/} Yukio Nakagawa, Watermelon Growing in Hawaii, Extension Circular No. 386, University of Hawaii, Agricultural Extension Service, 1957, p. 6.



Figure 1. A watermelon that has been staked in order to indicate date of harvest.



Figure 2. Several staked watermelons illustrating the use of sticks to indicate the date of harvest.

CALENDAR OF OPERATIONS

Farmers on the island of Kauai used an average of 947 hours of labor for growing and harvesting an acre of watermelons. Table 2 illustrates the way in which labor requirements for a representative operation are broken down by months. Normally, the farmers on Kauai plant their seed in December, January, or February. The crop's demand on the farmers' labor supply is relatively small during these first three months of the watermelon-growing period and high in the summer harvest period.

Only 14 percent of the total hours of labor was needed for the period from January to April. During the harvest period the final three months (May 1 to August 1) required 67 percent of the total hours of labor.

COSTS OF PRODUCING WATERMELONS

In developing representative costs for watermelon production, the survey provided the basis for determining the production practices used by these growers and ascertaining their level of use (see Table 2). This permitted estimation of labor requirements. These priced at the prevailing wage rates give labor costs. Materials required were estimated on the basis of these production activities and the normal practices of surveyed farmers and were combined with the appropriate prices to give an estimate of these costs to the farmer.

Cost of production as estimated in this report should be considered as representative of the level of costs being attained on the island of Kauai at the time the survey was taken. This information does not reveal the costs reported by any one of the three individual operators surveyed.

Direct and Indirect Costs

Direct costs of production are those which occur as a result of growing the crop. Indirect costs are not directly related to production and must be met each year even if the farmer does not grow this particular crop. In watermelon production, direct costs are primarily labor and materials. Indirect costs important to watermelon producers on Kauai are the costs of machinery, buildings, and the land investment.

Table 3 shows the average investment in machinery and buildings (Column 1), an estimate of depreciation (Column 2), interest on average investment (Column 3), and machinery and building costs per acre (Column 4) for the surveyed watermelon growers. For the three farmers, the percentage of use of the equipment for producing watermelons averaged 41 percent and varied from 29 to 78 percent.

A representative watermelon grower on Kauai has the following equipment and buildings:

- Irrigation Pipes
- 2 - Irrigation Pumps
- 1 - Disk Harrow
- 1 - Disk Plow

Table 2. Calendar of farm operations for a representative farm producing 32,000 pounds of watermelons per acre, island of Kauai, 1966

Date	Operation	Man-hours per acre	Number of men	Acres	Power-hours per acre	Type of power
First Month ^{a/}	Seedbed operation	6.25	1	-	-	-
	Plowing (2X)	5.2	1	3	5.2	Tractor
	Disking (4X)	4.1	1	3	4.1	Tractor
	Laying out the furrow (1X)	4.0	2	3	-	-
	Hilling (1X)	14.6	1	3	-	-
	Transplanting (1X)	8.3	2	3	-	-
	Fertilizing-preplant (1X)	4.0	1	3	-	-
Total Hours - First Month		46.45			9.3	
Second Month	Fertilizing-sidedressing (1X)	4.4	1	3	-	-
	Applying herbicide (1X)	5.0	1	3	-	-
	Irrigating (8X)	13.6	1	3	-	-
	Weeding (1X)	15.9	2	3	-	-
	Spraying (9X)	10.8	1	3	-	-
Total Hours - Second Month		49.7			-	
Third Month	Fertilizing-sidedressing (1X)	4.4	1	3	-	-
	Irrigating (8X)	13.6	1	3	-	-
	Spraying (9X)	10.8	1	3	-	-
Total Hours - Third Month		28.8			-	
Fourth Month ^{b/}	Fertilizing-sidedressing (1X)	4.4	1	3	-	-
	Irrigating (8X)	13.6	1	3	-	-
	Spraying (9X)	10.8	1	3	-	-
	Staking (30X)	90.0	2	3	-	-
	Weeding (1X)	15.9	2	3	-	-
	Harvesting (15X) 4/15 to 5/1	43.5	3	3	-	-
Total Hours - Fourth Month		178.2			-	
Fifth, Sixth, and Seventh Months	Fertilizing-sidedressing (3X)	13.2	1	3	-	-
	Irrigating (24X)	40.8	1	3	-	-
	Spraying (27X)	32.4	1	3	-	-
	Staking (90X)	270.0	2	3	-	-
	Weeding (1X)	15.9	2	3	-	-
	Harvesting (90X)	261.0	3	3	-	-
Total Hours - Fifth to Eighth Month		633.3			-	
Total Hours ^{c/}		936.45			9.3	

^{a/} Farmers on Kauai reported that they normally plant early in January.

^{b/} Harvesting usually begins by the middle of the fourth month.

^{c/} This does not include "Others" listed in Table 3.

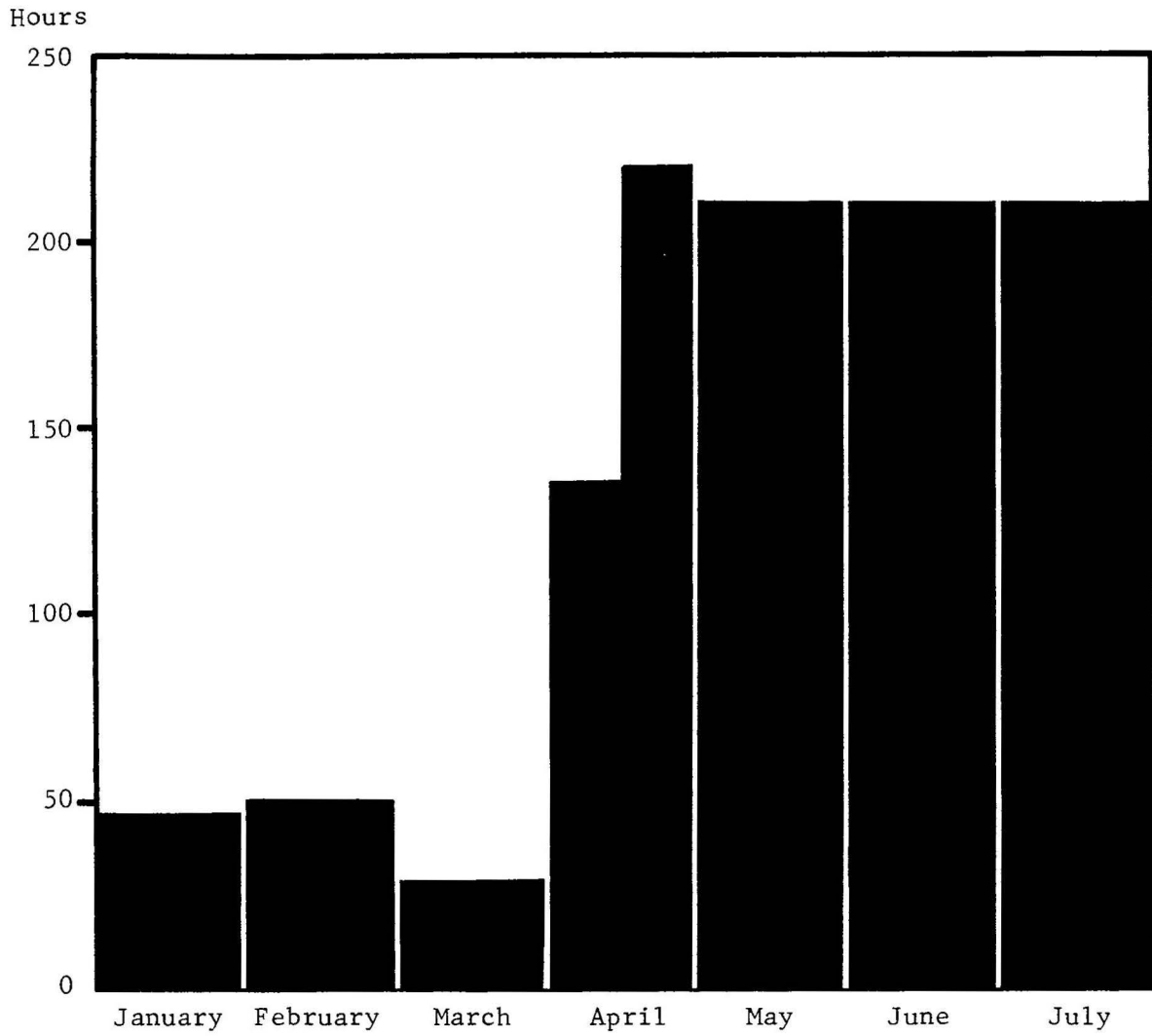


Figure 3. Hours of labor use per acre per month for production of watermelons on Kauai.

Table 3. Machinery and buildings investment representative for farms producing watermelons on Kauai, Kauai farm survey, 1966

Item	Value of investment ^{a/} (1966)	Depreciation per year ^{b/}	Interest per year ^{c/}	Per acre cost to watermelon enterprise ^{d/}
	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Irrigation Equipment	933.76	76.33	51.53	12.20
Implements	943.53	71.48	47.00	11.55
Sprayers	1,156.14	159.68	65.84	22.85
Tractors	3,379.90	268.42	180.00	43.97
Trucks and Pickups	1,637.74	340.22	105.06	47.77
Buildings	1,837.25	80.13	69.00	13.58
Total Machinery and Buildings Invest- ment - 1966 value	9,888.32			151.92

- ^{a/} Value of investment is calculated by first depreciating the original price of each piece of equipment in order to determine the 1966 value. Next these values for each category were summed up and divided by the number of interviewed farmers.
- ^{b/} Depreciation per year was determined by dividing the purchase price of each piece of equipment by the number of years it could be used (based on farmer's estimate of years of use). Then these amounts were summed up for each category and divided by the number of interviewed farmers.
- ^{c/} Interest per year was estimated by dividing the purchase price of each piece of equipment by two, then multiplying by 0.06 (interest rate of 6 percent). These amounts were summed up for each category and divided by the number of interviewed farmers.
- ^{d/} Cost to the watermelon enterprise was calculated by summing up the depreciation per year and the interest per year for each piece and reducing this to a per acre basis. This is multiplied by the percentage of use by each piece on the representative watermelon crop.

Table 4. Average cost per acre for producing watermelons on the island of Kauai, 1966

Item	Cost per acre	Cost per pound
	<u>Dollars</u>	<u>Cents</u>
Direct Costs:		
Labor (\$1.25 per hour) ^{a/}	1,211.81	3.8
Materials:		
Seed-----\$ 3.01		
Fertilizer----- 249.69		
Spray Materials--- 198.45		
Gas and Oil----- 55.75		
Irrigation Water-- 10.00		
Total Materials	516.90	1.6
Gross Income Tax ^{b/}	16.34	0.1
Total Direct Costs	1,745.05	5.5
Indirect Costs:		
Machinery and Buildings	151.92	
Rent	21.00	
Total Indirect Costs	172.92	0.5
Total Cost	1,917.97	6.0
Total Return ^{c/}	3,264.00	
Net Return to Management	1,346.03	

^{a/} The prevailing wage on Kauai was \$1.25 per hour.

^{b/} This is based on one-half percent of the farmer's gross sales.

^{c/} This is based on average sales of 27,200 pounds (32,000 pounds less 15 percent spoilage). Interviewed farmers estimated they received an average of 12 cents per pound at the farm level.

- 1 - Moldboard Plow
- 1 - Boom-type Power Sprayer
- 1 - Mist Blower
- 2 - Knapsack Sprayers
- 1 - Tractor, crawler type
- 1 - Tractor, wheel type
- 1 - Pickup, $\frac{1}{2}$ ton, 1958
- 1 - Pickup, $\frac{1}{2}$ ton, 1953
- 1 - Truck, $1\frac{1}{2}$ ton
- 1 - Farm Building, 1,400 square feet

Representative Costs of Watermelon Production

Table 4 shows cost and returns for a representative watermelon producer on the island of Kauai. For a farm producing 32,000 pounds per acre, the estimated total cost of production is \$1,917.97. This represents cost at the farm level and does not include trucking to the ports, shipping costs to Honolulu, or spoilage. Cost per pound of watermelon is estimated at 6 cents.

In this analysis direct costs comprised 91 percent of total costs. Labor costs as computed here represent 69 percent of direct costs and almost 62 percent of total costs. This does not provide accurate reflection of requirements for working versus fixed capital for watermelon production, however, since the enterprise was charged for all labor used at the prevailing wage rate. Growers surveyed for this study indicated that family labor accounted for approximately 56 percent of the total labor supply used (see Table 5). Family labor as such would not represent an out-of-pocket cost.

Table 5. Labor used in producing watermelons on the island of Kauai, 1966

Type	Hours per acre	Percent of total ^{a/}
Hired Labor	428	44
Family Labor	542	56
Total	970	100

^{a/} Within the three operations surveyed the actual amount of labor supplied by the family varied widely.

Labor and Management Earnings

Assuming that the farmer realizes 12 cents per pound after shipping charges have been deducted, total returns per acre would be \$3,264. Subtracting both the direct and indirect costs leaves approximately \$1,346.03 as return to management.^{2/}

^{2/} This study was not designed to study the marketing process. Information developed indicated that the prices received vary from year to year and even from shipment to shipment. A one-cent variation in prices in the above example would increase or decrease return to management by \$272.

To determine the income to the farmer growing melons, it is necessary to estimate the amount of total labor contributed by the farm family. Assuming that, on the average, one-half the labor required could be derived from this source, family income per acre would amount to \$1,951.93.

Note on Shipping Costs

Shipping costs and spoilage enroute to market are important in determining the economic feasibility of producing watermelons on Kauai. The barge service charge amounts to \$6.00 per skip. Growers on Kauai estimated that between 1,150 and 1,500 pounds of watermelons could be put on one skip. The average cost of shipping per acre for the interviewed farmers was reported at \$177.39 or 0.6 cent per pound. The average cost of trucking watermelons to the ports was reported to be \$67.35 per acre or 0.2 cent per pound.

**UNIVERSITY OF HAWAII
COLLEGE OF TROPICAL AGRICULTURE
HAWAII AGRICULTURAL EXPERIMENT STATION
HONOLULU, HAWAII**

THOMAS H. HAMILTON
President of the University

C. PEAIRS WILSON
Dean of the College and
Director of the Experiment Station

G. DONALD SHERMAN
Associate Director of the Experiment Station