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Costs and Practices in Producing Honey in Oregon

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SUMMARY

During 1931 and 1932 detailed enterprise records were obtained from practically all Oregon beekeepers having 50 or more colonies of bees. One hundred and eighty records were obtained from 102 cooperators, of whom 91 produced mainly extracted honey and 11 produced comb honey. During the two-year period, this study covers the operation of 34,279 colonies of bees producing 2,182,668 pounds of honey, which amounts to more than half of the total production of the state for this period.

The average net cost of producing extracted honey in Oregon was found to be 6.0 cents per pound for the two-year period, 1931 and 1932. The net cost per colony averaged $3.84 and the gross cost $4.48. Of the gross cost, 34 per cent was for labor, 12 per cent for materials and supplies, 18 per cent for miscellaneous expenses, and 36 per cent for depreciation and interest. Credit for wax, pollination fees, small amounts of comb honey, etc., amounted to $0.64 per colony.

The average yield of extracted honey per colony was 64 pounds plus 1.6 pounds of comb honey. Twenty-two per cent of the apiaries produced more than 90 pounds and 20 per cent produced less than 30 pounds of honey per colony. The high-yield group produced extracted honey at an average cost of 4.2 cents per pound compared with 16.1 cents per pound for the low-yield group.

The net cost of producing comb honey amounted to $2.25 per case of 24 sections. The net cost per colony was $4.13 and the gross cost $5.40. Of the gross cost 50 per cent was for labor, 17 per cent for materials and supplies, 15 per cent for miscellaneous expense, and 18 per cent for depreciation and interest. Credit for small amounts of extracted honey, etc., amounted to $1.27 per colony.

Apiaries producing comb honey as a major product produced an average of 1.84 cases of comb honey and 14 pounds of extracted honey per colony. Estimating a case of comb honey to contain 18 pounds of honey, these apiaries produced on the average a total of 47 pounds of honey per colony. This honey was produced at a cost of 10.3 cents per pound.

The most important factors affecting costs were found to be yield per colony, use of labor, disease control, regional differences, and skill in manipulation of colonies to assure full strength at the time of the major honey flow.

Labor accounted for 34 per cent of the total gross cost of producing extracted honey, more than 85 per cent being performed by the operator and his family.

Marked differences in costs were found in the three major honey regions of the state: the cost per pound of extracted honey for the fireweed region averaged 8.0 cents, for the mixed-blossom region 7.2 cents, and for the alfalfa region 5.5 cents.

Approximately three-fifths of the operators included in this study reported American foulbrood disease in their apiaries. For the entire group there was an average colony loss of 5.7 per cent from this cause. This was the only disease of widespread importance reported.

To develop colonies to full strength at the time of the main honey flow appears to be a perplexing problem to Oregon beekeepers. Forty-three per cent reported that their colonies reached the peak too early in the season, 13 per cent too late, and only 44 per cent at the start of the main flow.

Costs and Practices in Producing Honey in Oregon

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INTRODUCTION

BEEKEEPING is a very ancient enterprise. Honey was the world's chief sweet until about 1,000 years ago, when the cultivation of sugar cane was developed by the Spaniards. During Biblical times and for several hundred years thereafter honey was considered as a staple article of food. With the production of cheap sugar, honey tended to shift from a staple to a luxury commodity.

The movable-frame hive, comb foundation, and extractor, invented about the middle of the nineteenth century, made possible quantity production of honey and served to place honey on a better competitive basis with sugar and other sweets. Even with improved and cheaper production methods, larger total production, and wider use, honey has never regained the prominent position held prior to the introduction of sugar and throughout most of the world is still considered as a luxury product rather than as an essential food. In spite of its luxury or semiluxury standing, honey in many countries continues to be an important article of commerce and provides a means of livelihood for many people.

HONEY PRODUCTION IN THE UNITED STATES

The honeybee (*Apis mellifera* L.)† is not a native to the United States. It is probable that the first honeybees were imported to this country from Europe during the early part of the seventeenth century. Early American beekeepers used hollow logs, boxes, and similar containers, designated collectively as "bee-gums," as hives for the bees. No great expansion in the

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† For many years the honeybee has been called both *Apis mellifera* L and *A. mellifica* L. The Bureau of Entomology and Plant Quarantine now gives preference to *A. mellifera* L., the name under which it was first described.

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enterprise occurred until the invention of three important aids to beekeeping: a successful movable-frame hive (Langstroth, 1851), an artificial comb foundation (Mehring, 1857), and the extractor (Hruschka, 1865).

Following these developments, honey production in the United States expanded rapidly. The census of 1880 shows a total production for the entire United States of 25,743,208 pounds. Ten years later this production was 63,897,327 pounds. The next three census periods showed a slight decline in honey production on farms. Specialization that was not recorded in the census, however, was taking place.

The census enumeration covered only bees on farms, and therefore did not record the development of specialized beekeeping. Around the turn of the century this development was somewhat retarded by loss of public confidence because of adulteration of extracted honey. Passage of the pure food law of 1906 restored public confidence in this type of honey, which started a trend away from comb-honey production and toward greater specialization. This trend was accentuated by the demand for honey during the World War. Therefore, while the 1930 census showed a production of 83,000,000 pounds of honey on farms, estimates compiled by the Market News Service of the United States Department of Agriculture indicated a total United States production of 168,000,000 pounds during that year. Similar data covering the period 1930 to 1936 indicated that the average yearly production was 163,000,000 pounds.

Beekeeping is practiced in every state, although there are few localities where it is concentrated. The states that led in honey production during the period 1932-1938 are California, Ohio, Michigan, Iowa, Illinois, Minnesota, Wisconsin, New York, and Texas. No state produced more than approximately 9 per cent of the nation's total.

The bulk of the honey produced in the United States is consumed domestically. Imports from Hawaii and Puerto Rico averaged about 2,300,000 pounds annually during the period 1932-1937, while exports were made chiefly to the United Kingdom, Germany, Italy, and the Netherlands. During the 6 years prior to 1935, the average net exportation amounted to about 3,500,000 pounds annually. From 1935 to 1937, the annual net movement into the United States was about 900,000 pounds. During 1938, however, exports exceeded imports by approximately 400,000 pounds.

HONEY PRODUCTION IN OREGON

Oregon is not a leading honey-producing state, but it does have a substantial honey industry. According to unofficial estimates published by the Market News Service, the average number of colonies in Oregon during the five year period 1929-1933 was approximately 50,000. The annual production of extracted honey from these colonies amounted to about 2,000,000 pounds. For the five-year period 1932-1936 the average number of colonies in Oregon decreased to approximately 43,000 and the average annual production dropped correspondingly to about 1,700,000 pounds. There were 28 states producing more and 19 states producing less honey than Oregon during the earlier period, and during the latter period Oregon dropped one point in rank, making it the 30th largest honey-producing state in the Union.

Oregon has three distinct types of important honey flora: the fireweed of Northwestern Oregon, the clover-vetch mixed-blossom flora of the Wil-

lamette and Umpqua Valleys and areas in Southern Oregon lying outside the Rogue River Valley, and the clover-alfalfa flora of Eastern Oregon and the Rogue River Valley in Southern Oregon. These regions, and the number and distribution of cost records obtained in each region, are indicated in Figure 1, and will be referred to as the fireweed, mixed-blossom, and alfalfa regions.

Of the bees on farms, according to the 1930 census, 8.7 per cent are located in the fireweed region, 44.6 per cent are in the mixed-blossom region, and 46.7 per cent are in the alfalfa region. As there is some migration from the mixed-blossom region to the fireweed region during the fireweed honey flow, the census enumeration of number of colonies in the fireweed region is only roughly indicative of the bees that pasture there. From the commercial standpoint, the alfalfa region is of major importance, and the fireweed and mixed-blossom regions of secondary importance. Much of the honey produced in the mixed-blossom region is for home consumption rather than for sale.

At present the bulk of Oregon-produced honey is consumed within the state. The per-capita consumption of honey in the United States is variously estimated at from one to one and one-quarter pounds. For each of the approximately one million persons in Oregon there was, during the period 1929-1933, about 2 pounds of honey produced in the state. There is, of course, considerable cross shipment, Oregon honey being shipped out and honey from neighboring states being shipped in.

Strong demand for honey during the World War, when it was used as a substitute for sugar, caused wholesale prices of extracted honey to rise to above 20 cents a pound. Since then prices have been declining until at the time of this study honey was being sold wholesale for about 6 cents a pound.

PURPOSES OF STUDY

The keen competition for markets and the resultant low prices bring this question to the minds of many Oregon beekeepers: "Are we keeping bees for pleasure and profit or only for pleasure?" Most Oregon beekeepers operating commercial-size units cannot afford to operate bee yards as an avocation but must make a profit or else discontinue business, and all beekeepers, it is believed, are interested in securing larger profits. Increasing price is one method of doing this, but this factor cannot be controlled by individual growers. Another method, and one that is ordinarily within the control of the producer, is to decrease costs. Many Oregon beekeepers believe that the future of their apiaries is dependent on the cost at which they can produce honey.

At the request of the Oregon State Beekeepers' Association, the Oregon Agricultural Experiment Station cooperating with the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, conducted a study during 1931 and 1932. The specific objectives of this study were:

(1) To determine the cost of producing honey in commercial apiaries.

(2) To determine the major and minor factors responsible for variations in the cost of producing honey.

(3) To determine and recommend adjustments that would reduce the cost of producing honey.

It is the purpose of this bulletin, therefore, not to discuss ways and means of honey production, but rather to examine the economic side of commercial beekeeping. Beekeeping methods and instructions for handling bees appear in another Oregon publication.*

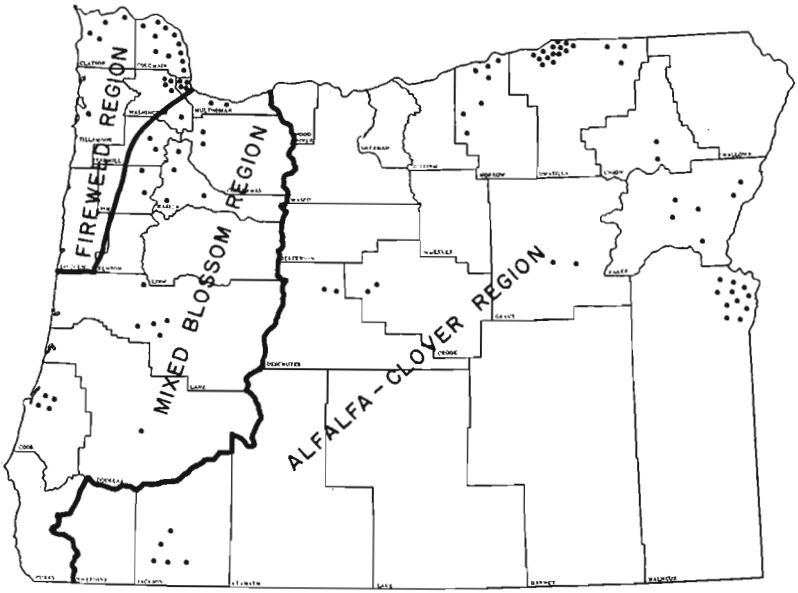

Figure 1. Approximate location of the 102 apiaries included in the Oregon honey study.

Study of the data presented should aid beekeepers in analyzing their bee-enterprise problems. Such an analysis in many cases will, it is believed, point the way to lower costs and greater net returns.

A detailed description of the methods used in obtaining and analyzing the data is presented in the Appendix.

AREAS STUDIED

Oregon beekeeping is located in three distinct honey-flora and geographical areas (Figure 1). The salient features of these three regions, particularly as they affect beekeeping, will be described.

The fireweed region. The humid fireweed region, characterized by a heavy annual rainfall and foggy conditions, ranges in elevation from sea level to 2,500 feet. Winter temperatures are comparatively mild, but bees are confined to the hive over long periods by stormy, wet weather. Even though the area has a rich spring flora the surplus honey comes mainly from the fireweed plant *(Epilobium angustifolium),* which blossoms during the drier

* Scullen, H. A., *Beekeeping in Oregon,* Bulletin 513, Federal Cooperative Extension Service, Oregon State College, 1938.

portion of the year (July—September). Good honey plants (willow and maple) are available in the spring, but bad weather conditions at this season make it necessary to provide an abundance of proper stores, else colony development may be retarded. After the fireweed flow there are few attractive honey plants until the following spring. The main problem reported by beekeepers in this humid area are disease, moisture in the hive during winter, retarded colony development in the spring, and difficulty in making an increase.

The mixed-blossom region. The mixed-blossom region is of low elevation (100-500 feet), and has comparatively mild winter temperatures, but it also has long periods of damp foggy weather which confine the bees to the hive. Cultivated crops consisting largely of unirrigated clovers and vetches are the main sources of surplus honey. Total honey yield may be influenced by rainfall. The area has a rich spring honey flora, both native and cultivated, but weather conditions may influence its value to bees, and colony development may be retarded by inadequate stores. The fall honey flora is quite deficient, resulting in a long semidormant period during which supplementary feed must be provided. In spite of its fine honey plants, the area has not produced much successful commercial beekeeping.

The alfalfa region. The alfalfa region constitutes the third area. Here beekeeping is confined to irrigated areas. The elevation is high (1,200-3,500 feet), conditions are dry, and winter temperatures are rather severe. The honey crop is produced during the summer months, preceded by satisfactory spring conditions, and followed by fall honey flora that develops a young-bee force for wintering. It is here that Oregon beekeeping has reached its greatest development. The main problems reported by beekeepers are disease, spray-residue poison, and cold spells that cut short the honey flows.

SCOPE

Records were taken from practically all Oregon beekeepers having, at the time of the study, 50 or more colonies of bees. These cooperators were distributed in the three main beekeeping regions of the state as shown in Figure 1.

The study covers a two-year period, during which 180 cost records were obtained. These records cover the 1931 operations of 93 apiaries,* and the 1932 operations of 87. Of the latter group, all but nine furnished data both years. The study shows the average cost involved, during the two-year period, in the operation of 34,279 colonies producing 2,182,668 pounds of honey. The regional distribution of cooperators, number of colonies operated, and pounds of honey produced are shown in Table 1.

The study deals mainly with the costs involved in the production of extracted honey. Seventeen records, however, were from apiaries specializing in the production of comb honey. These have been segregated and the data presented in a separate section of this bulletin. *Where not otherwise noted, the study is confined to the production of extracted honey.*

* In this study the term "apiary" is used to designate all of the bee enterprise under the management of one operator; a "colony" to designate one hive of bees; a "location" to designate a yard where colonies of bees are kept; an "outyard" to identify locations other than home yards; and "operator" or "beekeeper" to designate an apiarist.

Table 1. REGIONAL DISTRIBUTION OF HONEY COST RECORDS
1931 and 1932 crops.

Region	Total records taken*	Colonies of bees	Total extracted honey produced	Total comb honey produced†	Total all honey produced	Yield per colony all honey	Average colonies per beekeeper
	Number	*Number*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Number*
Extracted honey							
Fireweed	41	6,136	353,050	2,845	355,895	58	149
Mixed-blossom	30	2,703	134,870	6,364	141,234	52	90
Alfalfa	92	22,427	1,500,834	41,943	1,542,777	69	244
TOTAL	163	31,266	1,988,754	51,152	2,039,906	65	192
Comb honey							
Fireweed	2	44	.....	666	666	15	22
Mixed-blossom	6	271	2,000	9,218	11,218	41	45
Alfalfa	9	2,698	40,725	90,153	130,878	49	300
TOTAL	17	3,013	42,725	100,037	142,762	47	177
TOTAL, ALL RECORDS	180	34,279	2,031,479	151,189	2,182,668	64	190

* During the two-year period, records were taken from 91 different apiarists who produced mainly extracted honey and 11 who produced mostly comb honey, making a total of 102 cooperators, most of whom furnished records for both years of the study.

† Comb-honey production was converted to pounds for comparative purposes. For purposes of conversion a section of comb honey was estimated to contain 12 ounces of actual honey.

THE CAPITAL INVESTMENT

The average investment in the bee enterprise was $10.02 per colony, or $1,924 per apiary of 192 colonies. Owing to the nature of beekeeping, very little capital is required for land and buildings. The major share of the investment is for bees, hives, combs, etc., which make up four-fifths of the total. Buildings, apiary sites, and beekeeping equipment account for the remainder of the investment. Since bee pasture is obtained from land used primarily for other purposes, the value of such land is not considered as a part of the capital invested in the bee enterprise.

The largest single item was for hives and parts, which made up 33.9 per cent of the total (Table 2). This item included hive bodies, supers, covers, bottom boards, and frames. Of these, hive bodies and supers are the main investment items. The inventory showed, in addition to one hive body, an equivalent of 3.2 deep supers per colony.*

Table 2. AVERAGE INVESTMENT FOR APIARIES PRODUCING EXTRACTED HONEY
Data from 163 apiaries, average size 192 colonies

Investment item	Average investment per beekeeper	Average investment per colony	Proportion of total investment
			Per cent
Hives and parts	$ 653	$ 3.40	33.9
Combs	480	2.51	25.0
Bees	458	2.38	23.8
Buildings	111	.57	5.8
Miscellaneous equipment and supplies	108	.56	5.6
Harvest equipment	104	.54	5.4
Apiary sites	10	.06	.5
TOTAL INVESTMENT	$1,924	$10.02	100.0

* Two shallow supers were considered as one deep super.

The combs, exclusive of the frames that contain them, accounted for 25 per cent of the investment. There were provided an average of 31 drawn combs per colony, including those in the broodnest. When first drawn, the deep super combs were valued at 16 cents, and the shallow extracting combs at 13⅓ cents each.

Trucks and automobiles used in the bee enterprise have not been included in the capital investment, but are charged to operating expenses, as this equipment was used mainly for purposes other than honey production.

The values of equipment and buildings shown in Table 2 do not reflect original cost but rather actual value at the time of the study. Bees and apiary sites were valued at the prevailing prices for such items.

Investment by regions. The bee-enterprise investment per colony was lowest in the alfalfa region, next lowest in the mixed-blossom region, and highest in the fireweed region, the amounts being as follows:

Fireweed region	$13.19
Mixed-blossom region	10.74
Alfalfa region	9.08

The low investment in the alfalfa region is due chiefly to the fact that the average number of colonies handled per operator was greater than in the other two regions. As some items of equipment, such as honey houses, extractors, steam boilers, and motors cost about the same whether 100 or 200 colonies were handled, beekeepers by buying such equipment as top and bottom boards, hive bodies, and frames in large lots were able to buy at lower prices.

The high investment in the fireweed region appears to be due chiefly to the fact that more equipment is used per colony and that the beekeepers placed a higher valuation on drawn combs. As the fireweed flow is frequently short but heavy, it is probable that more supers and drawn combs are needed to take care of the flow than in the other regions. Drawn combs are valued more highly because minor flows prior to the main flow are not heavy enough to cause much comb building, and the main flow is so short that any delay in comb building may cause a heavy loss of surplus honey.

THE COST OF PRODUCING EXTRACTED HONEY

The itemized annual cost of production per colony and per pound of honey, for 31,266 colonies producing extracted honey during the two-year period 1931-1932, is shown in Table 3. The net cost per colony was practically identical for the two years, as is shown in the last two lines of the table. Owing to variation in production, however, the net cost per pound of honey varied 0.7 cent per pound, or 11 per cent.

The commercial pack for extracted honey in wholesale lots is ordinarily the 60-pound can. In this study, therefore, costs of producing extracted honey were computed in terms of 60-pound cans, two cans to a case. Irrespective of the method of producing and marketing honey, the individual beekeeper's costs were adjusted to a comparable basis.

In considering the costs presented in Table 3, it is helpful to think of the colonies reported on as comprising one huge apiary. Some of the colonies receive one kind of management and some another, some items of

Table 3. COST OF PRODUCING EXTRACTED HONEY IN OREGON
Data for 31,266 colonies producing 64 pounds of extracted honey per colony.*

Cost item	Apiaries reporting item†	Cost per colony (all colonies)	Cost per pound of extracted honey	Proportion of gross cost
	Number			*Per cent*
Labor				
Hired and contract	40	$0.21	.3¢	4.7
Operator and family	163	1.33	2.1	29.7
TOTAL LABOR	163	$1.54	2.4	34.4
Materials and supplies				
60-pound cans and cases	163	.39	.5	8.7
Bee feed (honey and sugar)	54	.04	.1	.9
Power and fuel	110	.04	.1	.9
Other materials and supplies	83	.07	.1	1.5
TOTAL MATERIALS AND SUPPLIES	163	$0.54	.8	12.0
Miscellaneous				
Use of auto or truck	130	.46	.8	10.3
Bees and queens purchased	65	.12	.2	2.7
Taxes	163	.08	.1	1.8
Apiary rent	93	.09	.1	2.0
Other miscellaneous expense	96	.07	.1	1.5
TOTAL MISCELLANEOUS EXPENSE	163	$0.82	1.3	18.3
Depreciation				
Combs	163	.59	.9	13.2
Hives and parts	163	.36	.5	8.0
Harvest equipment and supplies	163	.05	.1	1.1
Buildings	163	.04	.1	.9
Miscellaneous equipment	163	.04	.1	.9
TOTAL DEPRECIATION	163	$1.08	1.7	24.1
TOTAL OPERATING COST	163	$3.98	6.2	88.8
Interest at five per cent				
Hives and parts	163	.17	.3	3.8
Combs	163	.12	.2	2.7
Bees	163	.12	.2	2.7
Harvest equipment, supplies, buildings, apiary sites, and miscellaneous equipment	163	.09	.1	2.0
TOTAL INTEREST	163	$0.50	.8	11.2
TOTAL GROSS COST	163	$4.48	7.0	100.0
Credit for by-products				
Wax	156	.16	.2	3.6
Comb and cut-comb honey	63	.24	.4	5.3
Pollination	23	.12	.2	2.7
Miscellaneous credits	91	.12	.2	2.7
TOTAL CREDITS	163	$0.64	1.0	14.3
TOTAL NET COST (Average 1931-1932)	163	$3.84	6.0	85.7
TOTAL NET COST—1931 (61 pounds per colony)	85	$3.89	6.4	82.6
TOTAL NET COST—1932 (67 pounds per colony)	78	$3.80	5.7	89.4

* In addition to 64 pounds of extracted honey per colony, an average of 1.6 pounds of comb and cut-comb honey per colony was produced. This comb honey was sold at an average price of 15 cents per pound, and it is entered as a credit to the production of extracted honey.

† A total of 85 apiarists furnished cost information for the 1931 extracted-honey crop. Of these, 72 also furnished cost information for the 1932 crop and together with 6 new cooperators constitute the 78 cooperators reporting in 1932. The data shown in this column refer to annual cost records. If the same apiarist reported a cost item during both 1931 and 1932, it is counted as two records. For the two years, there was a total of 163 annual records but only 91 different apiarists were involved.

expense are incurred for some parts of this apiary and not for other parts, and some parts of this apiary operate at a profit while others suffer a loss. Nevertheless, when the year's business is summed up and an average is taken for each colony the status of the whole is shown. In many ways the situation is analogous to a corporation where various plants manufacture and sell various products, but the survival of the corporation depends on the average net result from the united efforts of its several plants.

The average costs presented in Table 3 are for the entire number of colonies and pounds of extracted honey. Some items of cost, such as operator and family labor, taxes, and cans and cases, were incurred by all beekeepers; other items, such as automobile and truck use, bee feed, and bees and queens purchased, were not incurred by all apiarists cooperating in this study. For each item, however, the average cost per colony and per pound of extracted honey refers to the portion of the expenditure that each colony or each pound of honey bears when the apiaries are considered as component parts of one large apiary. The actual number of apiaries incurring each item of expense is indicated, so that the relative frequency of each kind of expenditure can be observed.

The major items of cost, in order of importance, were labor 34.4 per cent; depreciation 24.1 per cent; miscellaneous, which includes truck and automobile, 18.3 per cent; materials and supplies 12 per cent; and interest 11.2 per cent.

CREDITS

In addition to the production of honey, the bees produced miscellaneous income including beeswax, pollination service, and small amounts of comb and cut-comb honey. The value of these by-products was deducted from the gross cost to arrive at the net cost of extracted honey. The value of these by-products amounted to an average of 64 cents per colony, and reduced the gross cost of producing honey by 1.0 cent per pound.

LABOR COSTS

The average cost of labor amounted to 2.4 cents per pound of honey. The average annual labor requirement was 4.8 hours per colony, of which 0.8 hour was hired labor. Contract labor was a negligible item, accounting for less than one per cent of the total cost. Approximately two-thirds of the labor (3.2 hours per colony) was devoted to preharvest care of colonies and included such items as disease control, swarm prevention, requeening, moving, care of equipment, etc. Most of the hired labor was used in extracting and shop work, where a high degree of skill is not necessary. Beekeepers reported that competent hired labor to assist with the manipulation of bees was difficult to procure. Only one-fourth of the cooperators hired labor during the two-year period.

The average value placed on labor was 32.1 cents per hour. The labor of the operator and his family was valued at 33.3 cents and hired labor at 26.3 cents per hour.

Labor is the largest single item of cost in honey production, accounting for 34 per cent of the total gross cost. Great variation was found in the amount of labor used per colony. The minimum time expended was 0.6 hour and the maximum 17.6 hours. The magnitude of the labor item and its extreme variation from apiary to apiary indicate a possible point of attack on the problem of obtaining greater production efficiency.

MATERIALS AND SUPPLIES

The total outlay for materials and supplies was only slightly more than ¾ cent per pound of honey. Of this amount, about two-thirds was for cans and cases. The remaining third included such items as honey and sugar used for bee feed, gas and oil, electricity, wood and coal used for boiler fuel, paint, nails, and lumber used for repairs, and disinfectants. Aside from possible savings on the purchase of cans and cases, only minor economies appear possible in materials expense.

Cans and cases. Most of the 60-pound cans used by Oregon beekeepers were purchased new, as good second-hand cans suitable for marketing honey were hard to obtain in most sections. Cases were usually available from local lumber mills.

Bee feed. Feeding was practiced by approximately one-third of the beekeepers. About half of the beekeepers who practiced feeding used honey and the other half used sugar sirup. Feeding was most prevalent in the fireweed region, with the alfalfa region ranking second in this respect. The relation of feeding to bee management is more fully discussed on page 30.

Power and fuel. The cost of electricity for lights and motors, kerosene and gasoline for stoves, lights and engines, and wood or coal for steam boilers and heating stoves is included in the charge for power and fuel. Only about two-thirds of the operators reported a power and fuel cost of $1 or more.

Other materials and supplies. Paint, nails, and lumber for repairs, lye, disinfectant, section boxes, section foundation, etc., constitute the other materials and supplies. Many beekeepers consider comb-foundation an operating expense, but it is properly a capital investment in the production of extracted honey since it is drawn out into comb and used for several seasons. In this cost summary, expense for comb-foundation is covered by the charge for comb depreciation.

MISCELLANEOUS COSTS

Of the miscellaneous costs, almost two-thirds is for the use of automobile or truck. This one item is nearly equivalent to the entire charge for all materials used. Other items of miscellaneous costs include bees and queens purchased (which covers both package bees and swarms), taxes on bees and bee equipment, apiary rent (paid in cash or with honey), insurance, telephone calls, and rent paid for buildings or equipment used for the benefit of the bee enterprise.

Use of automobile or truck. Extensive beekeeping requires the use of outyards to keep the bee population within range of an adequate nectar supply. Whenever outyards are used, transportation of men and equipment is a considerable item. This expense accounted for 10.3 per cent of the average cost of producing extracted honey. About 80 per cent of the apiary cost records contained a charge for automobile or truck expense. The remaining apiarists were operating home yards and did not require automotive transportation in connection with their bee work.

Bees and queens purchased. About 40 per cent of the cost records show expense for purchased queens, package bees, swarms, or colonies. Taking these items individually, 26 per cent of all records show queens purchased, 19 per cent show package bees purchased, and 12 per cent show swarms or colonies purchased. Some operators purchased bees in two or more of these ways. All package bees and most of the queens were purchased from California beekeepers, whereas swarms and colonies were purchased locally.

Taxes. The charge for taxes covers the taxes paid on the colonies themselves and also on buildings used for the enterprise and on any apiary sites that were owned. Most of the tax charge shown, however, is for the colonies rather than for buildings, equipment, or land, since in Oregon bee yards are assessed on a colony basis.

Apiary rent. Over the two-year period, the Oregon beekeepers cooperating in this study used an average of 4.6 bee yards each. Of these locations, 58 per cent were rented, 33 per cent were used without charge, and 9 per cent were owned. The rented yards contained an average of 43 colonies, those used without cost 33 colonies, and those owned 78 colonies.

Of the rented locations, 84 per cent were paid for with honey and 16 per cent were paid for in cash. The average honey rent was equivalent to 75 pounds of extracted honey per yard, or 1.8 pounds per colony. Cash rent amounted to $12.75 per yard, or 30 cents per colony.

Apiary rent is a minor item of cost, and any attempted economy in this item that will result in less bee pasture, or more travel or labor, is likely to be poor economy. A good location may be cheap at any reasonable price, whereas, a less desirable so-called free location may be very dear.

Other miscellaneous expense. Aside from the four principal items of miscellaneous cost just discussed, there are several small items that have been designated collectively as other miscellaneous costs. Included in this group are such items as insurance on honey houses, telephone charges, rent of buildings and equipment, and ferry tolls.

DEPRECIATION AND INTEREST

Over a period of years, bee equipment wears out and must be replaced. A portion of this wear should be charged to the bees each year. All depreciation was computed according to the beekeeper's estimate as to the average life of each piece of equipment. The largest item of depreciation was for combs (without frames) and the second largest was for hives and parts (top and bottom boards, hive bodies, and frames). Depreciation on harvesting equipment, buildings, and miscellaneous equipment was of minor importance. Depreciation of all kinds accounted for slightly less than one-fourth of the total gross cost of production.

Comb depreciation. Comb depreciation is usually met to some extent each year by furnishing replacements in the form of comb foundation, which the bees draw out into combs. Instead of actually buying foundation most commercial beekeepers send beeswax to a manufacturer to be made into foundation.

The rate of depreciation on combs averaged 9 per cent, or, expressed in years, the average life of combs was 11 years. One of the most important causes of rapid comb depreciation was the widespread prevalence of American foulbrood disease. A minor cause was failure to protect stored combs from the wax moth. Breakage in the extractor does not appear to be an important cause of high comb depreciation. Wide variations were found in the years of life obtained from combs by different operators. Comb depreciation, as is pointed out in a later section of this report, can be materially lessened by proper management through disease control and care of stored combs.

Hives and parts depreciation. The depreciation of hives and parts accounted for 8 per cent of the total cost of producing honey. Tops and bottoms depreciated at an average rate of 9 per cent, frames at 10 per cent, and inner covers at 8 per cent. Expressed in years, the average total life of tops and bottoms was 11 years, of frames 10 years, and of inner covers 12 years.

High depreciation costs for these items are caused mainly by rough handling in the process of moving colonies about and in handling hive parts during the manipulation and extraction processes; exposure to weather of supers left in the open; and decomposition of wood by fungi when parts are left any length of time in contact with the ground.

By regions, the average rate of depreciation for hives and parts was 9 per cent for the fireweed region, 8 per cent for the mixed-blossom region, and 10 per cent for the alfalfa region. The higher depreciation in Eastern Oregon is apparently due to the greater tendency among beekeepers of that region to leave supers piled in the open during the winter and to place hive bodies directly on the ground. Eastern Oregon beekeepers also move colonies from one location to another more often. More pronounced differences in temperature and humidity between day and night may also be a factor, causing boards to warp and crack at a higher rate.

Interest charges. The investment item in beekeeping is not large as compared with that in most other agricultural enterprises, hence the charge for interest on money invested is of minor importance. The interest at 5 per cent on the average investment of $10.02 per colony (Table 2), is $0.50. This amount represents 11.2 per cent of the total gross cost of production. The interest charge per item of investment is shown in Table 3.

Beekeepers are, as a whole, rather conservative in the matter of investment, although wide variation occurred. The variation in the present value of the investment was from a minimum of $4.40 to a maximum of $39.20 per colony. Interest on investment, figured at 5 per cent, varied from $0.22 to $1.96 per colony.

CASH AND NONCASH COSTS

Costs of production may be classified as cash and noncash items (Figure 2). Cash costs are those that represent immediate out-of-pocket expense, such as hired labor, taxes, gas and oil, and materials and supplies. Noncash items are those that require no immediate cash outlay, such as payment for operator's labor and interest and depreciation on equipment.

Cash costs of producing extracted honey amounted to 32 per cent of the total gross cost. This low cash cost may allow many operators to stay

in the business even though they are receiving but little pay for their labor and for the use of their equipment. Each year, however, some new equipment must be purchased, and some operators may have borrowed money for which cash interest must be paid. The cash cost of $1.43 per colony or 2.2 cents per pound of honey probably represents the minimum annual cash outlay that apiarists must make.

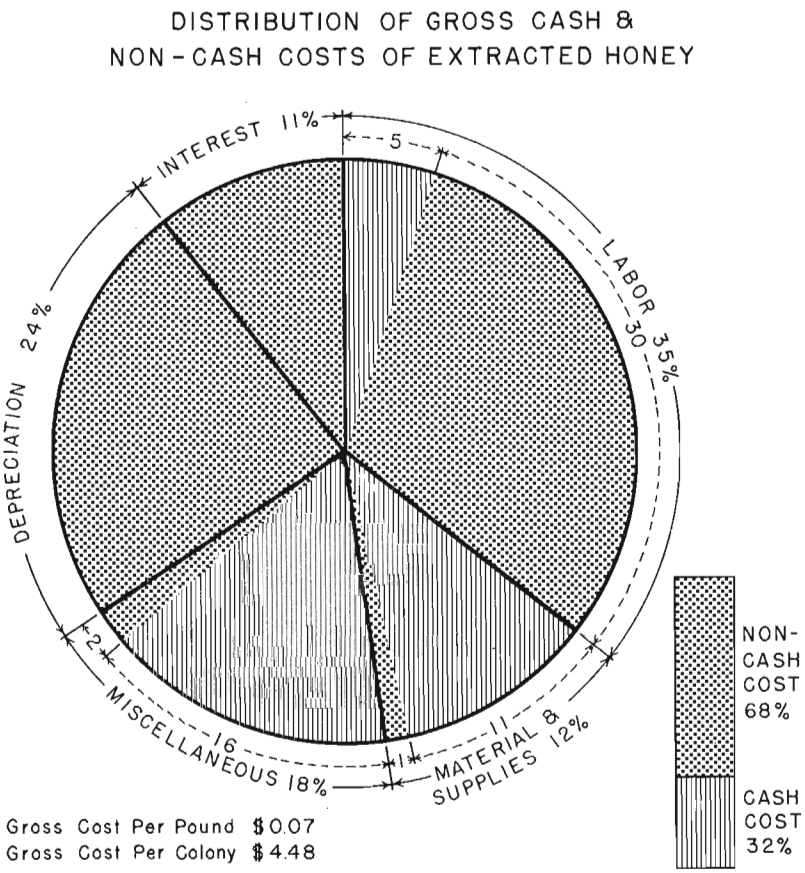

Figure 2. Individual items included under each of the classifications above are as shown in Table 3.

Materials and supplies accounted for 35 per cent of the total cash cost, automobile and truck cost 32 per cent, hired labor 15 per cent, bees purchased 8 per cent, taxes 6 per cent, and apiary rent and incidental expense 4 per cent.

VARIATION IN COST OF PRODUCING EXTRACTED HONEY

As has been previously noted, variations in production costs occur among the three honey-producing regions of Oregon. These variations were much less, however, than the variations occurring between apiaries located within the same region. In each region, apiaries were found with very low costs and others with very high costs. The amount and extent of these variations is indicated in Table 4. The extreme range in cost was from 2.7 cents to 41 cents per pound of honey produced.

Table 4. VARIATION IN COST OF PRODUCING EXTRACTED HONEY

Cost per pound	Apiaries studied	Average cost per pound	Total colonies	Percentage of total colonies	Cumulative proportion of total colonies
	Number	*Cents*	*Number*	*Per cent*	*Per cent*
Under 4 cents	29	3.3	5,807	19	19
4 to 5 cents	22	4.6	5,449	18	37
5 to 6 cents	18	5.5	2,962	9	46
6 to 7 cents	21	6.6	5,279	17	63
7 to 8 cents	12	7.5	2,144	7	70
8 to 10 cents	21	9.1	3,955	13	83
10 to 20 cents	28	14.3	4,243	12	95
20 cents or more	10	29.4	1,039	5	100
TOTAL OR AVERAGE	161*	6.0	30,878	100	.....

* This total omits two operators in the fireweed belt who harvested no crop at all in 1932.

FACTORS INFLUENCING THE COST OF PRODUCING EXTRACTED HONEY

Analysis reveals that low honey costs are usually associated with certain very definite conditions of management and production. The various factors concerned may be compared to links of a chain. To obtain reasonably low costs apiaries should be managed in such a manner that weak links do not occur in the chain.

It is the purpose of the following analysis to point out some of the salient factors affecting production costs. Other factors, such as a poor requeening system; failure to provide sufficient stores of honey and pollen; presence of disease; lack of hive room in which the bees can rear brood; and poor bee pasture constitute important links in the chain but are difficult to measure statistically. These factors are discussed in a later section of this report devoted to efficiency factors in honey production.

EFFECT OF YIELD

Yield per colony has a decided effect on production costs. Such costs as interest, depreciation, taxes, apiary rent, and preharvest labor are largely constant regardless of the honey crop harvested. As the yield per colony increases, these fixed costs become less and less per pound. As yield increased from less than 30 pounds to more than 90 pounds per colony, the net cost per pound decreased from 16.1 cents to 4.2 cents (Figure 3).

Yields of at least one can (60 pounds) per colony are usually necessary if honey is to be produced at a profit. Analysis of 80 records of apiaries

producing less than 60 pounds per colony reveals that only 1 per cent produced honey for 6 cents or less per pound. In the past 25 years, the price to producers for alfalfa and clover honeys, which constitute about 75 per cent of the honey produced in Oregon, has exceeded 6 cents per pound in about half the years. Hence, for the other half of the time producers of this type of honey having costs of more than 6 cents per pound were not breaking even.

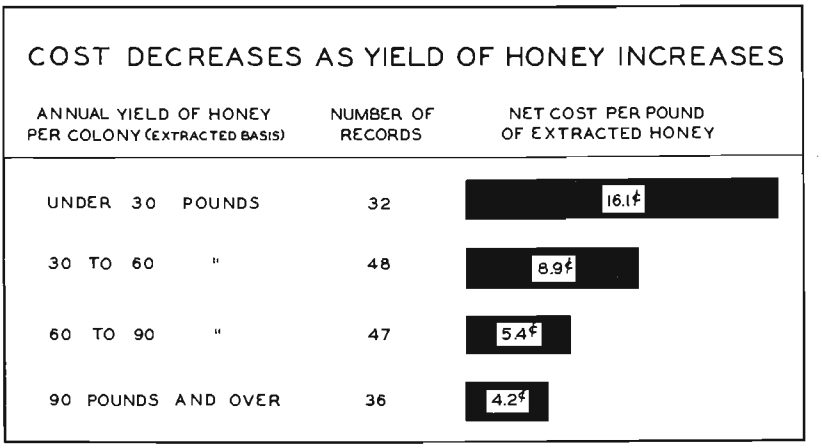

Figure 3.

Although good yields of honey appear to be essential to low costs, they do not constitute a guarantee of low costs. Sometimes so much is spent in obtaining a good yield that the benefits are largely or entirely offset. For example, 5 operators, even though having yields of 90 pounds or more per colony, produced honey at a cost of 8.1 cents per pound, or over 2 cents per pound more than the average cost for all producers in this study. This may happen when bees are moved from one honey flow to another if the extra honey obtained does not pay for the labor and other expenses of moving. A beekeeper may also increase yield by using a number of small yards scattered over a large area, but the increase may not be great enough to offset the extra labor and travel cost.

Honey flora, or "bee pasture" as it is commonly called, is probably the main determinant of yield. Without an ample supply of nectar, bees cannot store honey. Some sections of Oregon, such as nonirrigated areas in Eastern Oregon and heavily timbered areas in the western part of the state, do not appear to have a sufficient supply of nectar-bearing flowers to make commercial honey production feasible. In many areas, however, it appears that management of bees rather than supply of nectar is chiefly responsible for short honey crops.

EFFECT OF LABOR

Labor, which accounted for 34 per cent of the gross cost, exerts by its very magnitude a powerful influence on the cost per pound of producing honey. Low-cost operation demands labor efficiency. The high-cost 10 per

cent of the apiarists included in this study used almost twice as much labor as the low-cost 10 per cent.

To illustrate further the fact that labor expended in excess of the minimum necessary for the performance of standard apiary practices apparently did not pay, the apiaries in the alfalfa region using 2 hours or less of preharvest labor per colony were compared with those using 4 hours or more.

Of 92 apiaries in the alfalfa region, 36 fell in the low-labor group and 21 in the high. The low-labor group used an average of 1.3 hours preharvest labor per colony, had an average yield of 61 pounds of honey per colony, an average colony loss of 19 per cent, and produced honey at a cost of 5.1 cents per pound. The high-labor group, by comparison, used 5.0 hours of labor, had a yield of 70 pounds per colony, an average colony loss of 24 per cent, and a cost of 7.0 cents per pound. The apiarists in the latter group, therefore, although expending about four times the amount of labor, obtained only 9 pounds more honey per colony, had a 5-per-cent greater colony loss, and produced honey at a cost 2 cents per pound higher than the low-labor group.

EFFECT OF SIZE OF BUSINESS

Cost per colony and per pound of honey decreased as the number of colonies operated increased. Apiaries with less than 50 colonies had an average cost of $4.17 per colony, or 6.8 cents per pound of honey, compared with $3.63 per colony, or 4.8 cents per pound of honey for those operating more than 600 colonies. As the number of colonies per apiary increased, the cost per pound of honey produced decreased in the items of labor, use of automobile and truck, depreciation, and interest, and remained about constant for materials and supplies and miscellaneous costs. Cost of production for apiaries of different sizes is shown in Table 5, and the effect of size of business on returns is discussed on page 29.

As the size of business increased, the number of locations used for colony sites also increased. Operators having less than 100 colonies averaged 2 locations, those with from 100 to 299 had 4, those with from 300 to 599 had 10, and those with more than 600 had 15 locations. On the average, each beekeeper operated 192 colonies, and utilized 4.6 locations containing 42 colonies each.

EFFECT OF DEPRECIATION

Depreciation of equipment is shown to be nearly one-fourth of the gross cost of production, amounting to 1.7 cents per pound of honey. Most of this charge was for depreciation of combs and hive parts. This appears to be a place where improvement may be made.

Comb depreciation accounted for 0.9 cent per pound of honey. Disease, wax moth, mice, and breakage were chiefly responsible for this item. Losses from wax moth and mice can be eliminated by the application of known methods of control. Such losses are due to negligence.

The individual apiarist can make considerable progress toward controlling disease, but maximum control can be obtained only by united action. Several states, where disease was once as serious as it was found to be in Oregon at the time of this survey, have been able to control it effectively. This was possible only through the united efforts of beekeepers to secure and maintain an adequate state inspection service.

Table 5. COST OF OPERATION FOR APIARIES OF DIFFERENT SIZES
Extracted-honey producers only.

Item	Apiaries with					All apiaries
	Less than 50 colonies	50-99 colonies	100-299 colonies	300-599 colonies	600 or more colonies	
Location of apiaries						
Fireweed region (number)	1	17	18	5	....	41
Mixed-blossom region (number)	9	12	8	1	....	30
Alfalfa region (number)	6	30	32	11	13	92
Total apiaries (number)	16	59	58	17	13	163
Average colonies per apiary (number)	40	72	175	381	753	192
Average yield of extracted honey per colony (pounds)	61	57	62	60	75	64
Locations per beekeeper (number)	2	2	4	10	15	5
Miles traveled per colony (number)	3	11	8	9	9	9
Cost per colony of bees						
Labor	$1.50	$1.58	$1.60	$1.45	$1.55	$1.54
Material and supplies	.49	.46	.52	.54	.60	.54
Auto and truck	.18	.66	.37	.50	.49	.46
Depreciation	1.33	1.06	1.12	1.14	.97	1.08
Interest on investment	.72	.62	.53	.51	.40	.50
Miscellaneous*	.36	.18	.54	.33	.26	.36
TOTAL GROSS COST	$4.58	$4.56	$4.68	$4.47	$4.27	$4.48
Credits	.41	.53	.68	.68	.64	.64
TOTAL NET COST	$4.17	$4.03	$4.00	$3.79	$3.63	$3.84
Cost per pound of honey						
Labor	2.4¢	2.8¢	2.6¢	2.4¢	2.1¢	2.4¢
Material and supplies	.8	.8	.8	.9	.8	.8
Auto and truck	.3	1.2	.6	.8	.7	.8
Depreciation	2.2	1.8	1.8	1.9	1.3	1.7
Interest on investment	1.2	1.1	.9	.8	.5	.8
Miscellaneous*	.6	.3	.9	.6	.3	.5
TOTAL GROSS COST	7.5¢	8.0¢	7.6¢	7.4¢	5.7¢	7.0¢
Credits	.7	.9	1.1	1.1	.9	1.0
TOTAL NET COST	6.8¢	7.1¢	6.5¢	6.3¢	4.8¢	6.0¢

* Miscellaneous costs include bees and queens purchased, taxes, apiary rent, insurance, etc.

REGIONAL FACTORS AFFECTING COSTS

The cost of producing extracted honey varied with the type of flora available for bee pasture. Over the two-year period, 1931 and 1932, the net cost per pound of producing extracted honey was lowest in the alfalfa region, next lowest in the mixed-blossom region, and highest in the fireweed region. The net cost per colony and per pound, and the average yield of extracted honey in the different regions was as follows:

Region	*Cost per colony*	*Cost per pound of honey*	*Average yield per colony, pounds*
Fireweed	$4.56	8.0¢	57
Mixed-blossom	3.44	7.2	48
Alfalfa	3.69	5.5	67

The low net cost per pound for the alfalfa region is due chiefly to better yields per colony. The net cost per colony in the alfalfa region was slightly higher than in the mixed-blossom region, but the average yield was large enough to more than compensate for this slight difference in cost per colony. Beekeepers in the alfalfa region had a slight advantage in labor costs, miscellaneous costs, and interest costs, whereas beekeepers in the mixed-blossom region had slightly lower costs for materials and supplies and depreciation. An additional factor that made for lower costs in the alfalfa region than in the others was a larger average size of business. The average number of colonies per operator in the alfalfa region was 244, compared with 90 in the mixed-blossom region and 149 in the fireweed region.

The per-colony costs in the fireweed region were so high that even with a 9-pound advantage in yield, the cost per pound was higher than for the mixed-blossom region. The principal items of cost that were higher in the fireweed region were labor, auto and truck use, bees and queens purchased, apiary rent, and depreciation and interest. There appear to be two causes for these higher costs in the fireweed region. One is the serious disease situation, which increases labor, travel, depreciation, and stock replacement costs, and the other is a higher investment per colony, which increases interest and depreciation charges.

COMPARISON OF HIGH- AND LOW-COST PRODUCERS

Certain aspects of beekeeping affecting costs have been mentioned in preceding sections. To further illustrate the effect of these and other factors, a comparison was made between 10 per cent of the producers having the highest costs and 10 per cent of the producers having the lowest costs, based on cost per pound of honey. The outstanding characteristics of these high 16, low 16, and the average of all 163 apiarists producing extracted honey are as follows:

	16 high-cost producers	*16 low-cost producers*	*All 163 apiarists*
Yield of honey per colony—*pounds*	20	108	64
Preharvest labor per colony—*hours*	4.77	2.52	3.2
Colonies per apiary—*number*	96	259	192
Use of auto and truck—*miles*	10.9	3.9	9
Total colony loss—*per cent of total colonies*	41.8	15.4	22.6
Investment per colony—*dollars*	12.80	7.80	10.02
Total net cost per colony—*dollars*	4.38	3.31	3.84
Total net cost per pound of honey—*cents*	23.1	3.1	6.0

Yield was the most important single cause of high or low cost per pound of honey produced. The low-cost operators all obtained more than 60 pounds of honey per colony, 10 of the 16 obtaining 100 pounds or more. None of the high-cost group had a yield of as much as 60 pounds, 10 of them obtaining less than 30 pounds per colony.

Low-cost operators made much better use of their labor than did those with high costs. Among the 16 low-cost producers only one used more than 4 hours preharvest labor per colony, whereas half of the high-cost producers used more than this amount.

Superior management on the part of the low-cost group is evidenced not only by low labor requirements and high yields but also by fewer miles traveled per colony, 3.9 compared to 10.9; lower losses from disease, 2.6 per cent compared to 8.4 per cent; less winter killing, 12.1 per cent compared to 22.5 per cent; lower losses from other causes, 0.7 per cent compared to 10.9 per cent; and by a lower investment per colony, $7.80 compared to $12.80.

That location is a material factor in low-cost operation is brought out by the fact that 12 of the 16 low-cost producers were situated in the alfalfa region, whereas only 4 of the 16 high-cost producers were located in this region.

It will be noticed that the low-cost group in the foregoing tabulation had an average of 259 colonies per apiary and a yield of 108 pounds of honey per colony, whereas the high-cost group averaged only 96 colonies per apiary and had a yield of but 20 pounds of honey per colony. From this evidence it might appear that size of apiary has an important influence on yield per colony. Careful analysis of all of the records, however, failed to disclose any significant relationship between size of apiary and yield of honey per colony.

COST OF PRODUCING COMB HONEY

The gross cost of producing *comb honey** was $5.40 per colony, or $2.94 per case of 24 sections (Table 6). Of this cost, 50 per cent was for labor; 17 per cent for materials and supplies; 15 per cent for miscellaneous items such as use of automobile, truck, bees purchased, etc.; 11 per cent for depreciation; and 7 per cent for interest on the investment. The net cost amounted to $4.13 per colony, $2.25 per case, or 12.5 cents per pound of comb honey.

Comb-honey producers obtained an average yield of 1.84 cases of comb honey plus 14.4 pounds of extracted honey per colony. Since a case contains about 18 pounds of honey, the average total yield per colony was 47 pounds. This compares with a 66-pound average yield obtained by extracted-honey producers.

The depreciated value of the investment of comb-honey producers averaged $7.20 per colony, or $1,274 per apiary of 177 colonies. Of this amount, 34 per cent was for hives and parts; 33 per cent for bees; 11 per cent for combs; 14 per cent for buildings and apiary sites; and 8 per cent for equipment.

Both the gross and net costs per colony were higher for comb honey than for extracted honey. Labor and supplies cost more, depreciation and interest less, and miscellaneous costs about the same.

Comb honey, of course, commands a higher price per pound than does the extracted product. During the years of this study, producers were selling comb honey at from $1.30 to $4.80 per case of 24 sections. The variation in price seemed to depend partly on the grade of honey, the type of pack, and whether retailed or wholesaled, and partly on the bargaining ability of the individual beekeeper. The price received per case when retailed averaged $3.29, and when wholesaled $1.82. On a pound basis, comb honey

* "Comb" honey is honey produced and sold in individual sections that contain, on the average, an estimated weight of 12 ounces of honey. "Chunk" or "cut-comb" honey is honey produced in large frames from which it is cut into smaller pieces before being marketed.

was sold wholesale at an average of 10.5 cents compared with 6.0 cents received for extracted honey.

The differential in favor of comb honey, however, has not been sufficient to make its production attractive or profitable to most beekeepers. The trend of comb-honey production has been downward since 1931 and

Table 6. COST OF PRODUCING COMB HONEY
Data for 3,013 colonies producing 1.84 cases of comb honey per colony.*

Cost item	Apiaries reporting†	Cost per colony	Cost per case	Proportion of gross cost
				Per cent
Labor				
Hired and contract labor	6	$0.12	$0.06	2.2
Operator and family labor	17	2.59	1.41	48.0
TOTAL LABOR	17	$2.71	$1.47	50.2
Materials and supplies				
Section boxes and foundation	17	.54	.31	10.0
Section shipping cases	12	.18	.10	3.3
Other materials and supplies	17	.22	.10	4.1
TOTAL MATERIALS	17	$0.94	$0.51	17.4
Miscellaneous				
Use of auto and truck	13	.49	.29	9.1
Bees and queens purchased	6	.21	.10	3.9
Other miscellaneous	17	.10	.05	1.8
TOTAL MISCELLANEOUS	17	$0.80	$0.44	14.8
Depreciation				
Hives and parts	17	.25	.14	4.6
Brood combs	17	.24	.13	4.4
Miscellaneous	17	.10	.05	1.9
TOTAL DEPRECIATION	17	$0.59	$0.32	10.9
TOTAL OPERATING COST	17	$5.04	$2.74	93.3
Interest				
Bees	17	.12	.07	2.2
Hives and parts	17	.12	.07	2.2
Combs	17	.04	.02	.8
Miscellaneous	17	.08	.04	1.5
TOTAL INTEREST	17	$0.36	$0.20	6.7
TOTAL GROSS COST	17	$5.40	$2.94	100.0
Credits				
Wax	13	.07	.04	1.3
Extracted honey	11	.73	.39	13.4
Pollination	3	.02	.01	.4
Increase in bee inventory	15	.36	.20	6.7
Miscellaneous	17	.09	.05	1.7
TOTAL CREDITS	17	$1.27	$0.69	23.5
TOTAL NET COST	17	$4.13	$2.25	76.5

* In addition to an average of 1.84 cases of comb honey, an average of 14.4 pounds of extracted honey per colony was produced. This extracted honey, at the average price received of 5 cents per pound, is entered as a credit to the cost of producing comb honey. A case of comb honey contains 24 sections or combs and contains about 18 pounds of honey. Based on this weight, comb-honey producers averaged a total production of 47 pounds of honey per colony at a cost of 10.3 cents per pound.

† A total of 8 apiarists furnished data for the 1931 crop and of these, 6 also cooperated in the 1932 study. These 6, together with three new cooperators, constitute the 9 operators reporting in 1932, making a total of 17 annual records pertaining to comb-honey production.

1932 with the result that comb honey is even more scarce on the market now (1939) than it was then.

Since only a limited number of comb-honey records were included in this study, the differences in cost are of less significance than if a larger sample had been available. It is of interest, however, to compare the cost of production of the two types of honey.

THE ORGANIZATION OF BEE FARMS

It was the intention in selecting cooperators for this study to include only those who had commercial-sized units, which, for the purpose of this study, was arbitrarily considered to be 50 colonies. To secure a representative sample throughout the state and to include areas that otherwise would be missed, however, it was sometimes necessary to include operators who had less than 50 colonies. This study covers practically all commercial-sized apiaries in Oregon that were in operation during 1931 and 1932.

That these commercial beekeepers account for but a fraction of all beekeepers in the state is shown by the fact that while only 102 different operators were included during the two years of the study, the 1930 census reports 5,328 beekeepers on farms. These 5,328 beekeepers operated a total of 33,849 colonies, or approximately 6 colonies each. Since only 36 farm operators having commercial-sized units are included in this study, it appears that a vast majority of the 5,328 beekeepers living on farms have but a few hives of bees. These bees are kept largely for pollination purposes and for production of honey for home use.

Commercial bee farming is not always carried on in conjunction with other farm enterprises. Of the 77 beekeepers answering a question regarding this subject, one-third operated no acreage at all and about one-half operated less than ten acres. Beekeepers living in town had, on the average, a much larger bee enterprise than those who were also operating another farm enterprise. Town operators averaged 274 colonies each, whereas rural operators averaged only 155 colonies.

Thirty per cent of the operators included in this study were exclusively beekeepers and reported no other source of income, 30 per cent had some outside work or source of income, and 40 per cent had farm enterprises of one kind or another. Those who were engaged exclusively in beekeeping averaged 349 colonies each, those who had some outside work averaged 128 colonies, and those who had other farm enterprises averaged 129 colonies. Beekeeping was a major farm enterprise on only one-fourth of the farms on which bees were kept. Those for whom beekeeping was a major farm enterprise had an average of 211 colonies, as compared with 102 for those keeping them as a minor enterprise.

The commercial bee enterprise apparently can be successfully operated in conjunction with almost any vocation, as those who kept bees included school teachers, railroad men, lumber-yard managers, sawmill workers, fox-farm operators, etc., as well as regular farm operators. Beekeeping, it should be noted, requires special skills and temperaments; not all people are fitted for it. Potential beekeepers should test individual adaptability with a few colonies before embarking on a commercial-sized venture.

Table 7. RETURNS FOR APIARIES OF DIFFERENT SIZES*
Extracted-honey producers only.

Item	Apiaries with					All apiaries
	Less than 50 colonies	50-99 colonies	100-299 colonies	300-599 colonies	600 or more colonies	
Receipts per apiary						
Cash						
Extracted honey at 6¢ per pound	$147.00	$247.00	$654.00	$1,379.00	$3,392.00	$751.00
Comb and cut-comb honey	4.00	12.00	39.00	105.00	183.00	44.00
Wax at 13.6¢ per pound	9.00	11.00	28.00	50.00	126.00	30.00
Pollination	.....	14.00	20.00	6.00	146.00	25.00
Other	10.00	23.00	59.00	136.00	107.00	53.00
TOTAL CASH RECEIPTS	$170.00	$307.00	$800.00	$1,676.00	$3,954.00	$903.00
Noncash						
Increase in bee inventory†	3.00	−1.00	31.00	48.00	29.00	19.00
TOTAL RECEIPTS	$173.00	$306.00	$831.00	$1,724.00	$3,983.00	$922.00
Costs per apiary						
TOTAL CASH COSTS	29.00	57.00	149.00	301.00	824.00	174.00
TOTAL NONCASH COSTS	137.00	231.00	551.00	1,142.00	1,909.00	565.00
TOTAL COSTS	$166.00	$288.00	$700.00	$1,443.00	$2,733.00	$739.00
Cash income per apiary						
TOTAL CASH RECEIPTS	170.00	307.00	800.00	1,676.00	3,954.00	903.00
TOTAL CASH COSTS	29.00	57.00	149.00	301.00	824.00	174.00
TOTAL NET CASH INCOME	$141.00	$250.00	$651.00	$1,375.00	$3,130.00	$729.00
Net income per apiary						
TOTAL RECEIPTS	173.00	306.00	831.00	1,724.00	3,983.00	922.00
TOTAL COSTS	166.00	288.00	700.00	1,443.00	2,733.00	739.00
TOTAL NET INCOME PER APIARY	$7.00	$18.00	$131.00	$281.00	$1,250.00	$183.00
Net income per colony						
RECEIPTS PER COLONY	$4.33	$4.25	$4.75	$4.40	$5.25	$4.80
COST PER COLONY	4.17	4.03	4.00	3.79	3.63	3.84
TOTAL NET INCOME PER COLONY	$0.16	$0.22	$0.75	$0.61	$1.62	$0.96
	Number	*Number*	*Number*	*Number*	*Number*	*Number*
Miscellaneous data						
Apiaries included	16	59	58	17	13	163
Colonies per apiary	40	72	175	381	753	192
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Yield of wax per apiary	66	81	196	376	931	219
Yield of honey per apiary‡	2,451	4,117	10,898	22,985	56,534	12,515
Yield of honey per colony	61	57	62	60	75	64
Quantity of extracted honey per colony required to pay costs§	70	67	67	63	60	64

* Items are expressed in nearest dollar except in case of averages.
† Minus denotes loss.
‡ Extracted honey only.
§ Based on extracted honey priced at 6 cents per pound which was approximately the price received by producers during the period of the study.

The average size of business for extracted-honey producers included in this study was 192 colonies per operator. Individual operations, however, varied greatly in size. Among cooperators in this study, the smallest number of colonies was 20 and the largest single unit consisted of 1,033 colonies. The variation in the size of the Oregon commercial bee enterprise is shown in Table 7. Forty-six per cent of the operators included in this study had less than 100 colonies, while 18 per cent had more than 300 colonies. The latter group operated 52 per cent of all the colonies included in this study.

SIZE OF BUSINESS AND INCOME

Returns from beekeeping are commensurate with the size of unit operated, as is shown in Table 7. Those operators with apiaries of less than 100 colonies made a small net cash income and just about broke even when their labor and charges for use of equipment and land were included. It should be pointed out, however, that in cases of this kind the charge for the operator's labor, although an expense item to the enterprise, represents cash income to the operator.

In all size groups except the largest, the yield of honey was insufficient to pay the cost of production when honey was selling at 6 cents per pound. The beekeepers in all groups, however, realized some net income when the returns from the sale of wax, pollination charges, queen sales, etc., were included. It appears that a good economic unit where honey production is to be the principal source of income is approximately 600 colonies. This size unit can be handled by one man with but little additional labor needed.

SELLING CHANNELS

Honey requires no elaborate processing to prepare it for the consumer's table. As might be expected, therefore, a considerable proportion of the crop passes from producer either direct to the consumer or into the retail store.

Out of 113 beekeepers reporting, 18 per cent sold mainly to wholesalers; 36 per cent sold largely to retailers; 12 per cent sold mostly from roadside stands; 26 per cent peddled honey from house to house; and 8 per cent bartered honey for other commodities. Although these percentages show the principal outlets used, many operators sold through two or more channels. For example, half of those listed as selling to wholesalers also sold to either retail stores or directly to consumers, and a third of those listed as selling to retailers also sold directly to consumers. Comb honey, because it is difficult to store and transport, is commonly sold directly to retailers or consumers.

This disorganized system of marketing obviously gives opportunity for price cutting and may lead to the industry's penalizing itself. Each channel of trade performs a special service for which compensation should be expected. Unless the wholesaler and retailer are protected by producers selling in the various trade channels, prices cannot be effectively maintained.

The Federal-State Market News Service* issues free reports on the honey and beeswax prices in various markets and market channels. With such a service at his command the producer can easily obtain information on the state of the market. A better understanding on the part of beekeepers of the services rendered by the various trade channels, their important contribution to the movement of honey, and the demoralizing effect of price cutting would do much to aid the industry.

MIGRATORY BEEKEEPING

Oregon beekeeping is essentially nonmigratory, except in the fireweed region, where about 75 per cent of the apiaries are migratory. In this region, difficulty is experienced in developing colonies in the spring and moves are made principally to the Willamette Valley where better conditions prevail. Some operators in the Willamette Valley move their bees to the fireweed region during the main honey flow. In other regions, bees are moved mostly to pollenize fruit, to avoid spray poison, or to secure more promising locations. Regular moving programs were not generally used.

EFFICIENCY FACTORS IN HONEY PRODUCTION

The analysis of cost as recorded in previous sections of this report shows that certain factors are necessary for profitable honey production. Among the more important are high yields per colony, disease control, economy in the use of labor and transportation, properly balanced investment, and judicious care of equipment. In the following paragraphs is presented information obtained in the survey concerning equipment and management as practiced in Oregon apiaries.

WINTERING AND WINTER PREPARATION

Maintenance of vigorous colonies through the winter and into the spring is the objective of winter preparation. Various methods are employed by Oregon producers to attain this end.

Hives. The survey shows a lack of agreement among regions, as well as among individuals, on the preparation of hives for winter. Slightly more than half the producers were wintering their bees in two-story hives, with fully open entrance and without any special packing. Most of the others were wintering in one-story hives with contracted entrance and some form of winter protection. Packing was practiced by some beekeepers in each region, but was most prevalent in the alfalfa region in Eastern Oregon.

Three methods of packing were in use by about equal numbers of cooperators. These consisted of wrapping in tar paper, using wooden cases, and covering the hives with straw, sacks, or soil. A sharp difference of opinion on the value of packing was evident. There were also indications that less packing was being done than formerly.

Stores. The quality of honey produced in Oregon is such that it may be used for winter stores without danger to the bees from dysentery. No losses from dysentery were reported during this survey.

* Market News Service Reports may be obtained from either the Federal-State Market News Service, Sacramento, California, or from the Bureau of Agricultural Economics, U. S. Department of Agriculture, Washington, D. C. Honey market news is also broadcast over radio station KOAC, Corvallis, Oregon.

Winter stores* left for the bees ranged from 25 to 110 pounds of honey per colony. The majority of beekeepers in the fireweed and mixed-blossom regions left 40 to 50 pounds, and in the alfalfa region 45 to 55 pounds per colony. Beekeepers leaving less than 40 pounds generally resorted to feeding during the spring. Some fed to stimulate brood rearing, a practice which they consider to be more effective than leaving honey in the hives in the fall. Others fed to prevent starvation.

Winter-spring losses. Loss of colonies during the winter-spring period amounted to 11.0 per cent of the total colonies operated, but varied considerably between regions (Table 8). Such losses in the fireweed region were 12.9 per cent, in the mixed-blossom region 8.5 per cent, and in the alfalfa region 10.7 per cent. The chief causes assigned for these losses were, in order of importance, loss or failure of queen, starvation, and weak colonies.

The disease situation. Both American and European foulbrood were reported as affecting Oregon apiaries, American foulbrood being by far the more serious. During the two years of this study, the average loss of colonies due to American foulbrood was 5.7 per cent. Losses were somewhat greater in the fireweed region (8.2 per cent) than in the mixed-blossom region (4.7 per cent) or in the alfalfa region (5.1 per cent).

Approximately 25 per cent of the operators reported disease-free apiaries. The prevalence of disease varied greatly by regions. The fireweed region had only 13 per cent disease-free apiaries as compared with 38 per cent in the mixed-blossom region and 26 per cent in the alfalfa region. A larger percentage of the small apiaries, 100 colonies or less, were disease-free than was the case with larger ones. Of the 67 apiaries reporting disease, 18 had less than 3 per cent infection, 19 had from 3 to 9 per cent, and 30 had a higher percentage.

Records indicated a wide variation in methods of disposal of diseased colonies. While "shaking and melting" was the most widely used method, the trend was towards burning the contents of infected hives. This burning method is the one now recommended by the United States Department of Agriculture† and required by Oregon law when American foulbrood is found by inspectors.

Honey from diseased hives is in no way impaired for human consumption but it is considered dangerous as bee feed. Data concerning its disposal showed that extraction of honey from infected colonies was the most prevalent method, with a growing trend toward its destruction by burning. The majority of beekeepers made an effort to process it or otherwise guard against its general distribution.

In controlling American foulbrood, the data indicate that most cases of disease are found in spring inspections, with fall inspections second in importance. The spread of the disease appears to be more rapid during the winter-spring season. For this reason it is important that all colonies be disease-free when prepared for winter.

* In view of recent work on the importance of pollen reserves in the wintering of bees, it is of interest to note that no cooperator reported any data on the amount of pollen in the winter stores. One cooperator did report losses due to pollen shortage.

† Hambleton, Jas. I. "The Treatment of American Foulbrood," U.S.D.A. Farmers' Bulletin 1713, 1933.

The beekeeper can eradicate disease from his own apiaries, but he is helpless to protect his property against reinfection if disease exists in his neighborhood. An effective inspection service administered by the State has proved to be the best safeguard. The period covered by this study was one of transition in methods of handling diseased colonies; hence, bee inspection was at a very low ebb. This work has since been placed under the direction of the State Department of Agriculture and an active campaign has been carried on.

Table 8. COLONY LOSS DUE TO VARIOUS CAUSES
Data from 163 apiaries.

Cause or type of loss	Fireweed region		Mixed-blossom region		Alfalfa region		All regions	
	Colonies		Colonies		Colonies		Colonies	
	Number	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*	*Number*	*Per cent*
Winter-spring	792	12.9	232	8.5	2,370	10.7	3,394	11.0
American foulbrood	501	8.2	126	4.7	1,152	5.1	1,779	5.7
European foulbrood	4	.....	7	.3	30	.1	41	.1
Queenless and weak	144	2.4	69	2.6	267	1.2	480	1.5
Fire and flood	3	.....	8	.3	168	.7	179	.6
Theft	29	.5	9	.3	160	.7	198	.6
Spray poison	.....	.....	20	.7	483	2.2	503	1.6
Miscellaneous	309	5.0	42	1.6	116	.5	467	1.5
TOTAL LOSSES	1,782	29.0	513	19.0	4,746	21.2	7,041	22.6
Colonies remaining	4,354	71.0	2,190	81.0	17,681	78.8	24,225	77.4
TOTAL COLONIES AT BEGINNING OF YEAR	6,136	100.0	2,703	100.0	22,427	100.0	31,266	100.0

SPRING WORK

The swarming problem. Swarming was found to be a problem common to all regions. The data gathered in the survey indicate that May and June are the main swarming months in Oregon. The majority of beekeepers were able to hold swarming down to less than 10 per cent of their colonies, although a third of the cooperators reported that more than 10 per cent of their colonies swarm annually. Included in the latter group were most of those having production averages of less than 40 pounds per colony.

The chief measures taken by Oregon beekeepers to control swarming, in the order of the frequency with which they were reported, were: giving room for honey storage by adding supers; giving egg-laying space by raising brood or honey from brood chambers to super; dividing the strong colonies; providing young queens by annual requeening; and cutting queen cells. The last method is laborious, often ineffective, and is resorted to only after other methods have failed. It is indicative of a faulty swarm-control program.

Maintaining apiary strength. The maintenance of the desired number of colonies in Oregon apiaries appears to be a serious problem. Cooperators were questioned concerning the amount of annual increase necessary to maintain a constant number of colonies in their apiaries. A summary of the data indicates that between 10- and 20-per-cent annual increase is required. The highest requirements were found to be in the fireweed and alfalfa regions, where disease and winter losses were most prevalent.

Most of the increase was made during the critical swarming months of May and June. Making increase may serve as a swarm-control measure, but it may prove to be expensive if the bee strength of producing colonies is reduced for the main honey flow.

A study of how increase was made showed that swarms played an important part, particularly in the mixed-blossom region. Division of colonies, however, was the most frequent method reported and was most important in the alfalfa region. The making of nuclei was confined largely to the same region and was the method used for fall increase. Most of the increase made by package bees was in the fireweed region.

Methods of making increase in the most productive apiaries were shown to be about equally divided between divisions, on the one hand, and nuclei and package bees on the other. Higher production appears to be associated with the use of early spring divisions, fall nuclei, and packages; lower production with swarming and late spring divisions.

The requeening problem. The queen is probably the most important single factor under the beekeeper's control. Two-thirds of the colonies were in apiaries having regular requeening programs. Approximately half

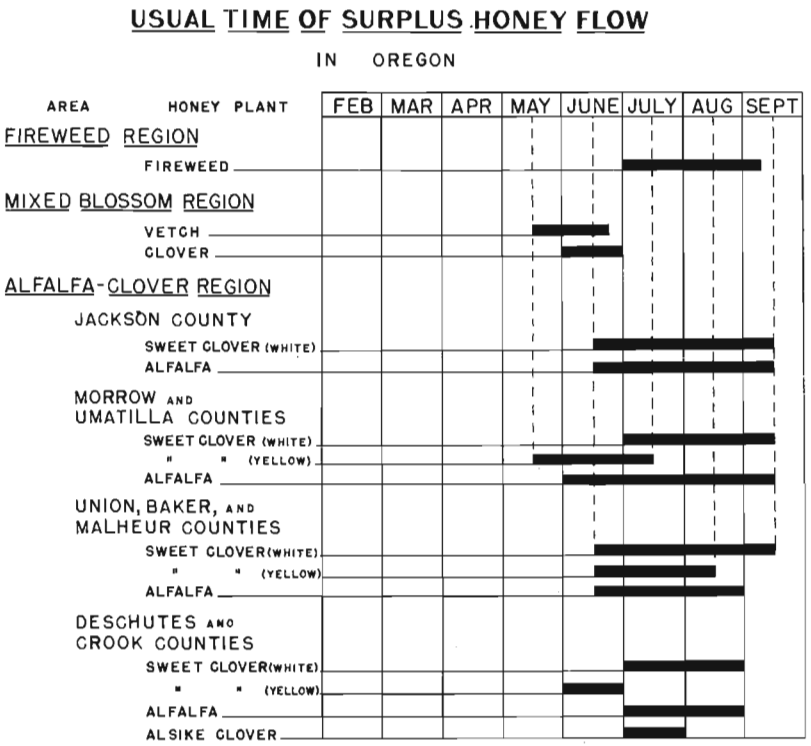

Figure 4.

the colonies were requeened each year, the total requirements being about 8,000 queens. Of these, 40 per cent were purchased from regular queen breeders, and 60 per cent were reared by the beekeepers.

Apiaries with regular requeening programs had less winter-spring loss and a lower percentage of swarming than did those with no regular program. Furthermore, these apiaries also tended to produce more honey per colony than those with no regular requeening program.

Pollination. The value of bees for the pollination of certain fruits probably greatly exceeds their value for honey production. In this survey, beekeepers reported renting bees to orchardists producing apples, pears, cherries, plums, prunes, and raspberries. In a few cases bees were rented for pollination of alsike clover. The renting of bees for pollination has not been highly developed, but since poisonous spray residues tend to destroy the natural pollinating insects, the importance of bees for this purpose is likely to be greatly increased as time goes on.

Rental prices appeared to be on a competitive basis. In many cases the rental fees did not pay transportation costs. Beekeepers reported a lack of standardization as to size of colony used for this purpose. It is believed that much benefit would accrue to both the beekeeper and the fruit grower if standards could be developed both as to colony strength and rental prices for colonies of various strengths.

Spray-residue poisons. In the fruit areas, including Hood River County, Rogue River Valley, and Willamette Valley, producers reported considerable damage from spray-residue poison. Fruit growers were reported as cooperating in the matter, confining spraying to periods after blossom time. Much of the damage, however, appeared to be from spray residue on cover crops in orchards. In such cases the beekeeper has no alternative to moving his bees to a safe place. The loss of bees through spray damage is often serious.

PRODUCING AND HARVESTING

Strength of colonies. Beekeepers were asked to appraise their success in developing colonies in relation to the main honey flows. The time of the surplus flow of the major honey plants in each of the three regions is shown in Figure 4. Difficulties in timing were found in each region. Satisfactory results were obtained by only 36 per cent of the operators in the fireweed region, 61 per cent in the mixed-blossom region, and 43 per cent in the alfalfa region (Table 9). The reasons for these difficulties were outside the scope of this investigation but afford a field for further study.

Taking off honey. Beekeepers were asked how many times during the year they took off honey. In the majority of apiaries, honey was taken off once or twice a year, although in those with less than the average number of supers honey was sometimes taken off three or four times a year.

Separating honey from the bees was usually done by shaking the combs and brushing off the remaining bees. This method of taking off honey usually requires about as much time as extracting. Many beekeepers reported spending the morning taking off honey and the afternoon extracting it. In twenty-six apiaries the honey was taken off by use of bee escapes.

While this eliminates the necessity for handling each comb, it requires two trips to the bee yard, and if supers are not tight there is danger of robbing.

Table 9. DEVELOPMENT OF COLONIES IN RELATION TO MAIN HONEY FLOWS

Time when colonies reached peak of development	Percentage of colonies			
	Fireweed region	Mixed-blossom region	Alfalfa region	All regions
	Per cent	*Per cent*	*Per cent*	*Per cent*
Too early	53	22	46	43
Too late	11	17	11	13
Properly	36	61	43	44
TOTAL	100	100	100	100
Number of beekeepers reporting	18	14	49	81

Handling of honey. In 63 per cent of the apiaries the transfer of honey from extractor to tank was a hand process accomplished by use of pails. Gravity was used by 26 per cent, and honey pumps by 11 per cent. Most of the honey pumps were used in the alfalfa region. The use of gravity was prevalent in both the fireweed and the alfalfa regions. Transfer by pail was confined largely to apiaries of less than 300 colonies. The use of gravity and of pumps were the only methods used in apiaries containing more than 600 colonies.

Heating is useful in speeding up the straining and settling of honey. In only 37 per cent of the apiaries, however, was heating between the extractor and honey tank practiced. Of those practicing heating, only a third were using direct heat. Water jackets and steam coils were the most prevalent methods in use.

During the transfer of honey from extractor to honey tank, opportunity is given to strain out foreign matter. This practice was followed by the majority of beekeepers. The most common equipment consisted of screens to remove the larger particles. In about 28 per cent of the apiaries, the honey was passed through cheesecloth to remove the finer particles.

Most Oregon honey is well ripened when taken off the hive and for this reason is settled for a comparatively short time. In three-fourths of the apiaries the settling process lasted less than three days. Most of the fireweed honey, however, being of light body, was settled a week or ten days before canning.

Beeswax. Beeswax is three or four times as valuable as honey on a weight basis. As a by-product it has an important bearing on costs. In apiary practice there is considerable wasting of this product because methods of wax rendering are probably the least satisfactory of all apiary operations. The survey indicated a production ratio of about 1 pound of wax to 50 pounds of extracted honey.

To separate honey from cappings, 42 per cent of the operators drained off the honey, 46 per cent used capping melters, and 12 per cent used centrifugal outfits. Water vats were used in almost all cases for rendering wax, only one operator making use of a solar wax extractor. Tests of the various waxes have shown that a superior product can be made with the solar wax extractor. This method seems to hold particular promise in Eastern Oregon where intense sun light prevails during the summer. Many bee-

keepers, dissatisfied with present methods of rendering cappings, expressed a desire to have experimental work done on this problem.

Care of super combs. Combs account for 25 per cent of the investment in beekeeping equipment. During the warmer part of the year they may be subject to serious depreciation from wax moths. In many cases, fumigation at regular intervals is necessary. Stored combs may also be seriously damaged by rats and mice. American foulbrood disease is another important cause of comb depreciation. Proper care of combs is essential to economical operation of the apiary.

The cooperators were asked where they stored their super combs during the winter when not in use. Storage inside of a building was the most common practice in the fireweed and mixed-blossom regions. The buildings afford protection from the heavy rainfall and permit more effective fumigation. In the alfalfa region, more than two-thirds of the cooperators stacked the super combs outdoors. Lower rainfall and cooler weather throughout much of the year in this area aids in the control of wax moths.

A thin coating of honey remains on the combs after the extraction process. Such combs are spoken of as wet combs. About one-third of the producers, chiefly those in the alfalfa region, stored combs without removing this honey. Operators following this practice reported that supers with wet combs had a stimulating effect on bees. Those drying the combs before storage, particularly in the regions with much precipitation, reported that dry combs were less likely to mold and that there was less danger of robbing, and of spreading disease.

Extractors and use of power. Hand power was used to turn 60 per cent of the extractors, electricity 22 per cent, and gas engines 18 per cent. Hand power was used extensively in apiaries of 100 or fewer colonies. In apiaries of 300 or more colonies, hand power was used to operate only 24 per cent of the extractors. Extractors of less than the four-frame size were turned by hand. Of the 32 four-frame extractors, 17 were power-driven and 15 hand-driven. With one exception all large extractors were power-driven.

By far the most popular extractors were the four-frame and two-frame sizes. In the larger apiaries the eight-frame extractor was most popular. Many producers expressed the opinion that the eight-frame extractor was more economical than larger sizes. No radial extractors were being used by cooperators at the time of the study. Their use, however, is increasing in the state.

Extractors represent a relatively heavy investment when it is considered that they are used only a very small portion of the year. The average life was estimated at about 20 years, but obsolescence frequently caused them to be discarded in a much shorter time.

Appendix

METHODS USED IN CONDUCTING THE HONEY-COST STUDY

In general, the methods used in conducting the honey-cost study were similar to those used by the Department of Farm Management of the Oregon Agricultural Experiment Station in conducting similar studies.

Selection of cooperators

Cooperators for this study were in most cases beekeepers operating 50 or more colonies of bees, the primary purpose of the study being to obtain facts concerning commercial honey production. Practically all Oregon beekeepers operating 50 or more colonies cooperated in this study during one or both years. These operators owned about 43 per cent of all the colonies in Oregon.

Method of obtaining the field data

Field work on this two-year study commenced January, 1932, at which time records of cost and management practices were secured for the previous year. By carefully questioning each operator on every detail of his year's operation of the apiary, a record was secured of costs and management practices for the 1931 crop year. Book accounts were used wherever available, but the data largely represent careful estimates made by the beekeeper. Similar records covering the 1932 crop were obtained in the spring of 1933.

The records were checked by the enumerator in order to verify their completeness and accuracy. They were then checked by at least one other member of the field party, and if they appeared to be incomplete they were taken back to the cooperators for additional checking. Where reliable data could not be obtained the record was discarded.

Method of analysis

The method used in analyzing the data for each year was based on grouping and cross-tabulation. Annual results represent weighted arithmetical averages. Averages for the two-year period were obtained by computing the mean of the annual averages, thus giving each year equal weight. Unless stated otherwise, all averages presented were so computed, and reflect as equal the results of the two years of the study.

The data were tabulated mostly on a regional basis to observe the effects of this important factor. All records included in one tabulation are included in all others, except as specifically stated in the text or in footnotes to tables.

Production per colony

For extracted-honey records, the yield per colony represents the total production of surplus honey reduced to an extracted-honey basis. Of the 163 annual records obtained from beekeepers classed as extracted-honey producers, 38 per cent produced some comb or cut-comb honey. For the

two-year period, 93 per cent of the total production consisted of honey actually extracted.

The years during which this study was made are believed to have been normal years as regards yield of honey per colony. According to data released by the Bureau of Agricultural Economics the average yield for all colonies in Oregon has varied only about 10 pounds during the ten-year period, 1928-1937, and furthermore, the yield during the period of this study was average.

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