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Hawaii Institute of Tropical Agriculture and Human Resources College of Tropical Agriculture and Human Resources, University of Hawaii

THE LIVESTOCK INDUSTRY IN HAWAII

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INTRODUCTION

Livestock production in Hawaii has always made a major contribution to the state's agricultural community. Long before agriculture developed into the industry it is today, some forms of livestock--notably pigs and poultry-played an important role in the early Polynesian society in Hawaii. Not only were they a source of food, but pigs were involved in religious and ceremonial functions and furnished material for making implements and ornaments. From the time of early importations made by Capts. James Cook and George Vancouver during the late 1700s to the present day, the livestock industry has expanded in scope and economic importance, so that currently it ranks third. next to sugarcane and pineapple, in terms of farm income. In 1984, the animal industries in Hawaii grossed \$87 million in farm sales. This amount represented 16 percent of the total value of all crop and livestock sales, including sugar and pineapple, and 42 percent of the total farm income from diversified agriculture in Hawaii.

All of the animal products are processed and consumed locally and generate a sizable amount of money within the state. The animal industries provide 90 percent of the fluid milk consumed, 31 percent of all beef and veal consumed, 78 percent of the eggs, 25 percent of all broiler meat and 21 percent of the nonprocessed pork consumed within the state.

In general, the level of consumption of animal products in Hawaii is approaching that of the Mainland. In 1950, the consumption of animal products--milk, meat, eggs, and poultry meat--was considerably lower than the consumption of these same products on the Mainland. The consumption patterns in recent years have shown these products to be used at more nearly the same rate per capita locally as on the Mainland. The animal industries within the state have made special efforts to provide an adequate supply as well as a quality product desired by the consuming public.

BACKGROUND AND PRESENT SITUATION

The first cattle, originating from California, were introduced by Capt. George Vancouver on his second trip in 1793. On this trip and again in 1794, a total of eight females and four males were landed on the island of Hawaii. One male and one female died shortly after landing. After the initial importation, King Kamehameha I placed a taboo on the slaughter of cattle, so that by 1830 when it was removed, cattle were very numerous. Between 1850 and 1900, Angus, Devon, Dexter, Shorthorn, and Hereford cattle were imported. During this time, largescale ranching operations were established, many of which are still in operation.

Of the total land area of 4,128,263 acres within the Islands, the beef cattle industry uses 1,085,000 acres for beef production. This represents one-fourth of the total acreage in the state. In 1984, there were 850 cattle owners listed in the state, of which 410 were classified as commercial beef cattle enterprises (20 or more head of cattle). The island of Hawaii ranks as the most important beef cattle production area, with approximately 68 percent of the state's cow herd (Table 1). The other islands in order of Maui, Kauai, rank are Oahu. and Molokai/Lanai. In 1984, Hawaii's beef industry contributed more than \$28 million in gross sales to the state's economy. This represented 14 percent of all sales of diversified agricultural products.

Three major sources supply beef to consumers in Hawaii: local producers, the U.S. Mainland, and New Zealand-Australia. From 1965 through 1984, the total annual market supply of beef and veal in Hawaii increased from 60 million pounds to 104 million pounds--about a 73 percent increase. During this period, the supply from Hawaii production remained relatively constant at about 30 million pounds. The supply from New Zealand-Australia remained also relatively constant at about 15-20 million pounds (Table 2). Imports from the Mainland, however, increased its market

share to approximately 53 percent of the total supply.

Recently, Hawaii producers have made explicit attempts to compete with Mainland beef. Many have tried to produce quality beef for the "choice" market. At present, this is a major problem, as less than half of the cattle fed in the state grade out as choice beef (Table 3). In addition, the time it takes to feed cattle to choice grade has been relatively long (160 days) and expensive. Thus, there is major controversy within the beef cattle industry as to the proper product or products it should supply. While the industry recognizes that the form of the product should be boxed beef rather than carcasses, the specific grades and ultimate market channels are not so obvious. As a consequence, there is considerable discussion as to the appropriate target market form for the beef industry.

The term "target market form" is used to describe the specific grades and forms of beef to be produced by the Hawaii beef cattle industry. Listing of some of the market potentials would include choice beef for the Oahu market, no-roll beef for the Oahu market, Hawaii specialty products, feeder cattle for export, or some combination of the above. For each relevant target market form, the industry would gain by identifying all information and institutions required to make that target form a reality. For example, if it was decided that a no-roll beef was a relevant target market form, the following information would need to be analyzed: signals from the consumer through the system to the producer indicating the preference for this type of beef, breeding and pasture-management programs to produce feeder cattle heavy enough to make feedlot finishing an economic proposition, and sufficient coordination between producers and processors to ensure orderly use of feedlot and slaughter-processing facilities. The main point to be considered is that once a particular target market form is identified, all relevant information required to make this market form a reality must be assembled so that members of the beef cattle industry can make rational choices.

BEEF CATTLE INVENTORY BY COUNTIES (1,000 Head)

	HAWAII		MAUI		KAUAI		02	AHU	STATE		
YEAR	Cow Herd	Yearlings, Calves, Bulls	Cow	Calves,	Cow		Cow	Yearlings, Calves, Bulls	Cow	Yearlings, Calves, Bulls	
1965 1966 1967 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978	56.9 57.4 59.0 62.0 61.8 56.4 58.0 58.5 59.1 55.5 52.4 49.3	67.5 74.1 76.6 76.6 71.6 79.6 82.1 83.3 77.5 70.2 78.6 81.2 78.0 74.1	<pre>18.1 19.6 19.1 20.0 21.0 21.6 22.4 20.6 20.7 21.2 21.7 22.0 22.2 20.4</pre>	25.4 25.9 25.3 26.3 24.3 24.8 29.2 27.5 26.3 25.1 26.6 24.2 26.8 26.8 26.5	6.8 7.3 7.2 7.3 7.9 6.8 6.1 6.7 7.4 8.6 7.9 7.7 7.7	10.0 10.1 10.7 10.6 10.1	2.7 2.6 2.9 2.2 2.0 2.1 3.4 4.3 3.7 2.6 3.3 3.6 2.7 2.6	11.5 12.0 14.7 15.5 16.7 16.5 17.5 18.4 17.7 18.8 16.6 19.9 18.1 19.7	87 87 89 92 92	115 122 127 129 123 131 139 135 132 130 135 137 135 133	
1979 1980 1981 1982 1983 1984	50.6 56.4 52.2 53.1 55.7 55.1	64.0 59.1 70.4 74.2 72.1	19.5 18.9 18.9 18.6 18.3 18.4	23.0 21.8 25.3 25.8 22.7 20.9	6.1 6.4 7.4 6.8 6.5	11.3 11.0 10.3 9.6 11.0 9.5	1.8 1.7 1.7 1.8 2.4	17.7 18.1 13.5 17.4 20.7 19.0	78 83 80 80 83 81	116 110 120 127 127 126	

Note: Collection system was changed from sex and age classification to sex and weight classification in 1970. Totals may not add due to rounding.

STATE MARKET SUPPLY OF BEEF AND VEAL (1000 Pounds - Carcass Weight - Equivalent)

	HAWAI	Il	MAINL	AND	NEW ZEA AUSTRA		
YEAR	Carcass Weight	Percent of Total	Carcass Weight	Percent of Total	Carcass Weight	Percent of Total	TOTAL ²
1954	17,851	54	14,037	43	938	3	32,826
1955	20,445	56	13,738	38	2,250	6	36,433
1956	21,426	53	15,919	39	3,084	8	40,429
1957	23,788	54	14,768	35	4,666	11	42,132
1958	23,970	57	10,457	25	7,701	18	42,128
1959	24,749	53	10,838	23	11,116	24	46,703
1960	25,001	51	11,423	24	12,327	25	48,751
1961	25,691	49	12,254	24	14,247	27	52,192
1962	24,345	50	10,517	21	14,163	29	49,025
1963	26,272	51	12,775	25	12,052	24	51,099
1964	26,083	45	13,904	24	17,467	31	57,454
1965	26,332	43	16,242	27	18,304	30	60,878
1966	30,134	49	15,967	26	15,436	25	61,537
1967	32,362	51	15,287	24	15,327	25	62,976
1968	33,621	50	15,512	24	17,162	26	66,295
1969	31,364	47	16,305	24	19,789	29	67,458
1970	32,210	48	17,708	26	17,604	26	67,522
1971	33,604	51	16,728	25	15,892	24	66,224
1972	32,183	47	20,434	30	15,532	23	68,149
1973	31,617	45	23,583	32	16,910	23	72,110
1974	28,070	37	31,253	42	15,636	21	74,959
1975	27,000	31	41,473	48	17,756	21	86,229
1976	32,320	35	39,839	43	20,414	22	92,573
1977	32,325	34	44,645	47	17,493	19	94,463
1978	33,544	36	43,553	46	17,146	18	94,243
1979	29,325	32	47,453	51	16,030	17	92,808
1980	28,809	31	50,348	53	15,202	16	94,359
1981	28,666	30	49,622	52	16,504	18	94,792
1982	29,048	30	51,709	53	16,273	17	97,030
1983	31,985	32	53,259	53	14,555	15	99,799
1984	32,116	31	55,274	53	16,548	16	104,388

Excludes slaughter cattle and calves shipped out-of-state.
After 1971, total supply was estimated and mainland inshipments derived

FEDERALLY GRADED BEEF IN HAWAII¹ Data for Fiscal Years U.S.D.A

64-65 80 6,945 7,151 1,914 1,497 3,073 315 168 2	14,302 ³ 21,143	569.0 ⁴ 535.2
68-69 57 14,382 13,884 882 1,591 5,363 1,072 187 33 70-71 91 16,156 13,913 521 675 6,166 1,055 140 33 72-73 87 17,754 14,278 500 881 3,875 1,284 56 33 74-75 93 12,599 14,034 599 692 2,901 1,700 97 33 76-77 469 16,672 15,936 1,357 630 2,639 2,061 380 44 78-79 392 12,440 15,079 2,489 647 2,791 1,602 336 336 80-81 331 10,465 9,031 1,947 691 2,178 1,597 451 22 82-83 224 12,214 12,842 3,069 341 462 136 3 24	31,297 37,418 38,717 38,715 32,715 40,144 35,776 26,691 29,291 34,750	551.5 575.2 609.1 615.5 592.2 590.2 579.0 567.4 595.3 590.4

¹Data include only cattle offered for federal grading. ²Number of head.

7

³Limited numbers of cull cows and bulls are offered for grading. The above information will not reflect the total kill of this class of animals. ⁴Average carcass weight of graded slaughter animals (pounds).

SPECIFIC COMPONENTS OF THE INDUSTRY

Pasture and Range Land

Much of the 1.3 million acres devoted to pasture and range land is marginal and is not suitable to sustain high forage production because of the limitation in rainfall (or suitable irrigation) and the chemical and physical characteristics of the soils. Land used for range or pasture may vary in elevation from sea level to 8,000 feet. Rainfall on these ranges varies greatly. Forage quality is often superior on the dry lands but deficient in quantity, with the reverse being true in the high rainfall areas. Much of the land is not easily accessible, is covered with brush and weeds, and/or is not planted with desirable species of grasses. There are, however, some areas on the island of Hawaii that have the potential for productive pasture if cleared of trees and brush and then rough-leveled where needed. Also, within the past several years, marginal sugar plantations on Kauai, Oahu, and Hawaii have discontinued operations, which affords a possibility of developing additional land for pasture or production of forage.

Lands used for grazing are a combination of fee simple and state leased. Fee-simple lands are very often situated where the pressures for more intensive use (crop production or housing) are great. State-leased lands, which comprise about 250,000 acres. come under the jurisdiction of the Department of Land and Natural Resources (DNLR) and the Hawaiian Homes Commission (HHC). Lease rents have escalated in recent years, and annual rents of \$20 to \$30 per acre are not uncommon for the better pasture lands. Lease rentals are generally determined at public auction. Upset rentals for auction are established at a level deemed equitable.

Leases also can be offered through direct negotiation. Negotiated leases, however, must first be publicly advertised and interested persons invited to apply. If more than one person qualifies, the disposition of lease must be through sealed bids. All capital

improvements become a part of the land; therefore, the holder of a lease at the time of auction can lose all investment and capital improvements if he does not bid successfully to retain the lease. This, in effect, puts him as a bidder against himself, as those bidding against him will obtain the benefit of the improvements if they get the lease. Under state law, the minimum length of a lease is 15 years and the maximum length 55 years. However, the latter is not normally awarded. Within two years before lease expiration, DLNR may offer a new lease. This is done to provide incentives to ranchers to make capital improvements. Credit is given leases for cost of approved improvements. The amount of credit is limited to two years' rent.

State lands in pasture with uncertain future uses are presently leased on a monthto-month basis, and leases are subject to revocation with a 30-day notice. State lease extensions are possible for farm lands, but not for pasture lands, to the extent necessary to secure improvement loans. The HHC is empowered to withdraw from leases land needed for homesteading purposes. Withdrawal can take place between one and five years after notification of intent to withdraw. Because of this short withdrawal period and the lack of collateral, ranchers find it virtually impossible to obtain improvement loans.

Pasture and Range Management

Although pasture and range lands in Hawaii contain a variety of grasses, the principal species are kikuyugrass (Pennisetum pangolagrass clandestinum), (Digitaria decumbens), stargrass (Chloris divaricata), guineagrass (Panicum maximum), paragrass mutica), buffelgrass (Brachiaria and (Cenchrus ciliaris). Kikuyugrass is best adapted to middle-elevation areas (1500-5000 feet) of continual rainfall between 40 and 80 inches annually in soils of high fertility. Pangolagrass is best adapted from sea level to about 3000 feet elevation in areas with annual rainfall of 50-60 inches or more, equally distributed throughout the year. It grows better than kikuyugrass on land areas of low fertility. Guineagrass is grown in Hawaii from sea level to about 1500 feet

elevation under seasonally alternating wet and dry conditions, with annual rainfall of more than 40 inches. Buffelgrass has two ranges: one near sea level and extending for several hundred feet elevation; the other at 3.000 feet and bevond in seasonally alternating wet and dry areas. Stargrass is extremely versatile, ranging from the dry fringes of kikuyugrass areas to midelevation of both wet and dry areas. Other grasses include signalgrass (Brachiaria ciliatissima), (Brachiaria ruziziensis), congograss rhodesgrass (Chloris gayana), bermudagrass (Cynodon dactylon), limpograss (Hemarthria napier grass (Pennisetum altiosinin), purpureum), setaria (Setaria glauca), orchard grass (Dactylis glomerata), and rye grass (Lolium perenne). In addition, koa haole (Leucaena leucocephala) a leafy, deep-rooted perennial shrub, grows prolifically in many areas of the state from sea level to 1500 feet.

Three broad categories of weeds infest grazing land. Brush is the biggest problem. Herbaceous broadleaves and sedges, while not as serious a problem, can be extremely noxious in certain areas. Some are essentially "poverty grasses," which occupy areas that, over the years, have become too impoverished to support good pasture or range grasses. Examples of this type are rattail (Sporobolus africanus) and, to a certain extent. In fountaingrass (Pennisetum setaceum). wet, lowland areas, tree or brush weeds such as christmasberry (Schinus terebinthifolius), (Melastoma malabathricum). melastoma guava (Psidium guajava), hau (Hibiscus tiliaceus), lantana (Lantana camara), and gorse (Ulex europaeus) are of concern. In general, the incidence of weeds in well managed and maintained pastures tends to be Overgrazing, when accompanied by low. drought, sometime makes the invasions of weeds such as rattail inevitable. Mechanical, chemical, and biological procedures have been used for weed control.

The most serious insect pests attacking pasture and range grasses have been the armyworm (<u>Pseudaletia unipuncta</u>) and the grass webworm (<u>Herpetogramma licarsisalis</u>). Kikuyugrass pastures have been particularly affected by these insects. Other pests of concern include the koa haole looper (<u>Anacampodes</u> <u>fragilaria</u>), hunting billbug (<u>Sphenophorus</u> <u>vanatus</u> <u>vestitus</u>), cottony cushion scale (<u>Icerya</u> <u>purchasi</u>), and flea beetle (<u>Epitrix</u> <u>hirtipennis</u>).

Most pasture soils in Hawaii are low in phosphorus and require high rates of application to provide plant needs. These soils are very high in phosphate fixers. Pastures in high rainfall belts usually have acid soils and require applications of lime. magnesium, and potassium for optimum growth and successful legume establishment. Sulphur deficiency is generally found where rainfall is less than 35 inches annually. Most of the grassland areas in Hawaii receive very little nitrogen fertilizer, except in those areas where legumes are abundant. Because of the low price for beef and the increasing cost of fertilizer, ranchers tend to be reluctant to fertilize pastures. An alternative to using nitrogen fertilizer has been the establishment and maintenance of grass-legume pasture.

In 1982, intensive grazing management was introduced to the state. This system, using many paddocks per herd, short grazing periods, variable paddock rest periods, and high stocking densities, has resulted in increased animal performance and greater carrying capacities than was possible under the previous, traditional form. Cost of production has been dramatically decreased on a per-unit land basis, while increased animal performance has been attained.

Herd Health

Disease problems in Hawaii's beef cattle are less predominant than those in other states. Hawaii's insularity and the fact that herd additions are limited are important factors that contribute to this favorable situation. Nonetheless, there are problems of consequence, whose solution would increase the economic gain for the industry. Some diseases, such as keratoconjunctivitis (pink eye) and those affecting the respiratory system, are of greater concern in this state because of its climate, soil, and topography. Hawaii is free of brucellosis and anaplasmosis in cattle, and, except for the isolated cases on Molokai, it is free of tuberculosis. Presently, cattle herds on

Molokai are being depopulated to eradicate tuberculosis in Hawaii.

Ranchers and feedlot operators suffer economic losses from shipping fever complex when cattle are moved far or often to new environments, particularly when they are barged from neighbor islands to the main feedlot on Oahu. Data show that 30 to 40 days are required for the animals to regain shipping losses. Reproductive failure causes the greatest economic loss in the industry This includes failure to breed, locally. abortions, dystocia losses, and losses in pounds of beef produced per cow per year because of extended calving intervals. There is no information on reproductive failure due to infection.

Metabolic diseases resulting from deficiencies or imbalance of minerals (e.g., "yellow calf") are also of concern under range conditions. Mineral deficiencies or imbalance appear to be limiting growth under intensive grazing management programs.

Insects that cause problems to the local beef cattle industry have been well Both species of the heel fly researched. (Hypoderma lineatum and H. bovis) are a Control is not good, because problem. treated individually. animals must be Chemical formulations for fly control, including those for the horn fly (Haematobia irritans), are not as effective as they were. because these pests have developed resistance to the chemicals used.

Liver flukes (<u>Fasciola hepatica</u> and <u>F</u>. <u>gigantica</u>) cause problems in low-lying wet areas. The incidence of liver condemnation due to the liver fluke has increased since hexachloroethane was banned for use in the control of this parasite.

Breeding

The use of purebreeding practices is gradually changing to crossbreeding programs. The Hereford is still the predominant breed used in the state, followed by Angus and Santa Gertrudis. Other breeds used in crossing programs include Simmental, Limousin, Charolais, Murray Grey, Shorthorn, Brahman, Brangus, Beefmaster, Sales, Holstein-Friesian, and Maine Anjou. The Hawaii Beef Cattle Improvement Association program currently in progress has done much to promote selection of genetically superior animals, but the emphasis has been largely restricted to growth rate and conformation.

There appears to be some justification for the development of a breed of beef cattle from a multibreed foundation and selected for excellence in specific performance and fitness traits and adaptability to the Hawaii The inclusion of tropically environment. adapted Bos indicus cattle in a breed development program may help to alleviate low reproduction rates commonly observed in the British breeds. which are not metabolically adapted tropical to a A program to develop a environment. synthetic breed of beef cattle specifically adapted to the Hawaii environment is under way at the Hawaii Institute of Tropical Agriculture and Human Resources (HITAHR).

Low calf crop is a problem on many ranches. A calf crop of less than 75 percent is fairly common. It is a common practice for the first calf to be produced when the dam is three years old or older. A limited number of ranchers practice supplemental feeding of replacement heifers in order to have them calve as two-year-olds. The better ranching operations will have a calving rate of 90 percent or better. There appears to be a high correlation between good nutritional management and high calving rate, indicating that nutrition is a major factor in reproduction in beef cattle in the state.

Most of the small ranches in Hawaii are on a year-round breeding program. The practice on larger ranches is to concentrate breeding cattle during certain periods.

Artificial insemination is practiced on a limited basis in the state. If it is combined with synchronized breeding, this can result in more concentrated calving periods, thus permitting more intensive supervision.

Marketing

Hawaii's ranchers use two major systems for of finishing range cattle market. Ranchers may carry their stock on pasture until they are grass fattened or heavy enough for slaughter; or the ranchers may confine their cattle in feedlots, either at weaning or finish 25 vearlings, and them on a concentrated ration. Pen feeding of beef cattle is conducted on the islands of Hawaii, Maui, and Oahu. The largest operation is the Hawaiian Milling Corporation feedlot in the Campbell Industrial Park on Oahu. This feedlot was established in 1965, having moved there from a site closer to central Honolulu. Using a feeding period of about 150 days, the feedlot is able to average slightly more than two turnovers per year. About 30,000 animals are fed out yearly from The feeding program is this facility. generally handled on a consignment basis whereby the ranchers own the cattle sent to the feedlot through the fattening period. Title passes upon slaughter. In recent years, the number of cattle going into the feedlots has fallen because of the export of feeder cattle to California.

During the past two decades, the market for beef in Hawaii has undergone some dramatic changes. The population of the state has increased about 50 percent. The form in which beef is marketed has changed --from primarily carcasses to primals, boxed beef and portion control. Demand for choice beef has increased proportionally more than the demand for beef, because of the changing resident population mix and the growth of tourism. Current consumption patterns in Hawaii are not well understood. The Hawaii Agricultural Reporting Service has ceased to collect actual data on imports of beef into the state, using estimates instead. Also, large but unknown amounts of beef are imported in semiprocessed or processed form.

Miscellaneous

CAPITAL. Pasture and other ranch improvements require capital outlays that may take several years to recover. This is especially a problem for leaseholders, who often must make substantial capital outlays

during the first few years with no immediate Short-term leases limit capital return. availability for pasture improvement. The state Department of Agriculture's Farm Loan Program can lend up to \$100,000 at Federal Land Bank rates for periods up to 40 years for land purchase and improvements and up to \$100,000 at a rate up to 12 percent (as of 1984) for periods up to 10 years for operating expenses. The Department of Agriculture has a new entry loan program with more favorable terms for beginning farmers. The ceiling on this type of loan is \$100,000. The department can also arrange financing with other lending institutions. The Farmers Home Administration can lend up to \$200,000 for a period up to 40 years for land purchase and improvements and up to \$100,000 for five years or the life of the security for operating expenses. The Hawaii Production Credit Association can lend unspecified amounts at a floating interest rate for up to 10 years. The Federal Land Banks and some commercial banks also make loans to agricultural enterprises. Most lenders have procedures for participating with other lenders on financing given projects.

RUSTLING. Cattle rustling is one of the oldest and most constant problems ranchers face. Although accurate data are not available, ranchers have estimated that rustling losses on individual ranches may vary from 1 percent to 20 percent. Enforcement of existing laws to control rustling seems to be ineffective. In addition, law enforcement agencies appear to have little knowledge of the value of rustled cattle, particularly breeding stock.

BACKGROUND AND PRESENT SITUATION

The exact beginnings of dairying in Hawaii are not clearly defined. It probably began as early as 1793, with the importation of beef cattle into the islands. After this beginning, dairying became a separate entity in the mid-1800s, when cattle were first imported for the purpose of producing fresh milk, butter, and cream. The first recorded commercial dairy dates back to 1869. By 1919, there were dairies of sorts on all islands, some commercial and others worked in conjunction with the plantations.

Statistics relating to the development and current status of the dairy industry are given in Tables 4, 5, and 6.

The commercial dairy industry in Hawaii is mostly involved in the production, processing, distribution, and marketing of fresh fluid milk. It has geared its production for Class 1 milk and is regulated by state law. Consumption of fluid milk within the state on a month-to-month basis determines the price paid to the dairymen. Compared with the Mainland average, the industry in Hawaii specializes and represents large-sized producers with an average herd size of more than 500 animals in production. The sales of milk in 1984 totaled 148 million pounds, of which 112.5 million pounds were produced on Oahu and 35.5 million pounds on the neighbor islands. For 1984, the value of milk sales was \$22.5 million for Oahu and \$6.8 million for all other islands, resulting in a state income of \$29.3 million. The increase over 1982-83 was primarily because of the drop in milk production and dairy cash receipts that occurred in 1982-83 as a result of the problem with pesticide-contaminated milk on Oahu, which disrupted production, processing, and distribution of milk.

The industry in Hawaii is a concentrated, animal-intensive operation. The majority of dairies in the state are housed on 9-12 acres. More than 75 percent of all milk cows are on Oahu, with approximately 60 percent in the Waianae district, a primary area of livestock concentration. The majority of locally produced heifer replacements spend more than 50 percent of their early life on pasture. These animals are pastured on the neighbor islands as well as on Oahu. Some are reared in drylot.

Cull dairy animals, approximately 4,000 head per year, are slaughtered primarily on Oahu. Price differential between cull and replacement animals is very wide. There is some potential market for bull calves and dairy beef.

Factors influencing the potential of the fluid milk market in Hawaii are population increase, competition from imitation milk, high cost of milk, nutrition education, and imported fluid milk. The dairy industry is capable of producing what the market demands. Expansion will tend to be based on population increase, which is about 2 percent per annum. Growth in the visitor industry should also be considered. Improved advertising and marketing of milk might also lead to expansion by increasing consumption per capita. Approximately 7.5 percent of the milk consumed in the state is filled milk, normally referred to as imitation milk in Hawaii. There is a potential for replacing this with fresh fluid milk.

The cost of producing milk in Hawaii is relatively high, primarily because of the large amounts of expensive imported feeds and the high cost of labor. An increase in per capita consumption of whole milk and the use of more whole milk in place of imitation milk would be encouraged by lowering the cost of producing milk in the state by allowing producers to take furthur advantage of economies of scale.

The importation of fluid milk from the Mainland is now a reality, with first shipments arriving in 1984. It is too early to tell what expansion might occur in this supply of fluid milk and what effect this will have on local milk production. Although the pesticide contamination problem in milk is no longer present, there is still a carry-over effect in the minds of consumers relating to wholesomeness and quality. There is need to

Table 4COWS TWO YEARS OLD AND OVER, KEPT MAINLY FOR MILK PRODUCTION

										-	
		1899	1909	1919	1929	1938	1970	1974	1978	1980	1984
	973 483 639 639 659 669 689 699 699 699 699 699 699 699 69			10 600 60 0 600 600 600 600 600							
	Oahu			2,281	4,622	5,989	11,200	10,500	10,000	9,800	9,100
13	Kauai			319	1,413	520	500	400			
	Maui/Molokai/Lanai			847	1,636	943	1,300	925	2,900	3,200	3,000
	Hawaii			1,140	2,794	1,181	1,600	975			
	State/Territory	4,020	6,861	4,587	10,465	8,633	14,600	12,800	12,900	13,000	12,100

		Tabl	e 5				
DAIRY	STATISTICS	FOR	THE	STATE	OF	HAWAII	

Avg. no. of cows/farm 129 132 171 216 217 218 245 261 287 441 496 542 Lb. of milk produced (million lbs.) 77 90 122 149 151 147 134.4 131 135 139 150 152		1950	1955	1960	1965	1966	1967	1968	1969	1970	1974	1978	1980	1984
10+ head) 75 86 81 70 69 66 55 49 45 29 26 24 o. of dairy cows 9,700 11,340 13,900 15,100 15,000 14,400 13,500 12,800 12,900 12,800 12,900 12,900 13,000 vg. no. of cows/farm 129 132 171 216 217 218 245 261 287 441 496 542 b. of milk produced 77 90 122 149 151 147 134.4 131 135 139 150 152 b. of mild prod./cow/yr. 7,938 7,937 8,777 9,868 10,067 10,208 9,956 10,391 10,620 10,859 11,628 11,692 received by dairy farms 6.8 8.1 11.2 13.4 13.0 13.5 12.6 12.7 12.9 19.4 23.7 27.1 rice of milk to farmers 8.42 8.70 8.55 8.45 8.03 8.74 9.18 9.33 9.29 13.64		•••••												
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Imillion lbs.) 77 90 122 149 151 147 134.4 131 135 139 150 152 .b. of mild prod./cow/yr. 7,938 7,937 8,777 9,868 10,067 10,208 9,956 10,391 10,620 10,859 11,628 11,692 .c. received by dairy farms 6.8 8.1 11.2 13.4 13.0 13.5 12.6 12.7 12.9 19.4 23.7 27.1 Price of milk to farmers 8.42 8.70 8.55 8.45 8.03 8.74 9.18 9.33 9.29 13.64 16.10 18.12 .mshipment of dairy cows <t< td=""><td>wg. no. of cows/farm</td><td>129</td><td>132</td><td>171</td><td>216</td><td>217</td><td>218</td><td>245</td><td>261</td><td>287</td><td>441</td><td>496</td><td>542</td><td>50</td></t<>	wg. no. of cows/farm	129	132	171	216	217	218	245	261	287	441	496	542	50
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<pre>© received by dairy farms (million \$) 6.8 8.1 11.2 13.4 13.0 13.5 12.6 12.7 12.9 19.4 23.7 27.1 Price of milk to farmers (\$ cwt) 8.42 8.70 8.55 8.45 8.03 8.74 9.18 9.33 9.29 13.64 16.10 18.12 Inshipment of dairy cows</pre>	(million lbs.)	(/	90	122	149	151	147	134.4	131	135	139	150	152	148
(million \$) 6.8 8.1 11.2 13.4 13.0 13.5 12.6 12.7 12.9 19.4 23.7 27.1 Price of milk to farmers 8.42 8.70 8.55 8.45 8.03 8.74 9.18 9.33 9.29 13.64 16.10 18.12 Inshipment of dairy cows 8.42 8.70 8.55 8.45 8.03 8.74 9.18 9.33 9.29 13.64 16.10 18.12	b. of mild prod./cow/yr.	7,938	7,937	8,777	9,868	10,067	10,208	9,956	10,391	10,620	10,859	11,628	11,692	12,23
Price of milk to farmers (\$ cwt) 8.42 8.70 8.55 8.45 8.03 8.74 9.18 9.33 9.29 13.64 16.10 18.12 Inshipment of dairy cows		(0	0.4	44.0	47 /	17.0	17 F	12 (10.7	12.0	40 /			
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	(* (W()	0.42	8.70	0.00	0.43	8.05	0.74	9.10	9.33	9.29	13.04	16.10	18.12	20.0
rom mainland 2,148 1,757 2,495 3,833 1,024 988 100 785 1,029 1,395										122 Internal				
	rom mainland	2,148	1,757	2,495	3,833	1,024	988	100	785	1,029	1,395			
ows slaughtered 3,390 2,170 3,420 3,000 4,000 3,000 3,000 2,000 3,000 3,000	ows slaughtered	3,390	2,170	3,420	3,000	4,000	3,000	3,000	2,000	3,000	3,000			

	1950	1955	1960	1965	1966	1967	1968	1969	1970	1974	1978	1980	1984
No. of dairy farms	41	56	55	45	44	42	37	33	30	23	18	18	16
No. of dairy cows	7,300	9,060	11,202	12,530	12,480	11,900	10,600	10,350	10,510	10,500	10,000	9,800	9,100
No. of cows/farm	196	173	200	278	283	283	286	314	350	456	500	544	569
Lb. of milk produced (million lbs.)	62.2	76.6	103.9	128.7	128.2	123.2	111.5	110.5	114.5	114.5	120.3	119.9	112.5
Lb. of milk prod./cow/yr.	8,521	8,455	9,428	10,271	10,272	10,353	10,519	10,700	10,910	10,905	12,030	12,235	12,364
<pre>\$ received by dairy farms (million \$)</pre>	5.5	6.9	9.4	11.4	10.9	11.2	10.4	10.4	10.7	15.6	19.3	21.7	22.5
Price of mill to farmers (\$/cwt)	8.37	8.60	8.60	8.45	8.04	8.80	9.30	9.40	9.35	13.65	16.15	18.19	20.04
Inshipment of dairy cows from mainland	2,148	1,757	2,495	3,675	1,024	946	100	785	1,029				
Inshipment of dairy cows from outer-islands	267	7,26	853	1,389	1,048	1,173	1,253						

Table 6 DAIRY STATISTICS FOR THE ISLAND OF OAHU

maintain high quality standards within the industry to produce a wholesome product and confidence for regain consumer milk in Hawaii. The conservative produced projection for the fluid milk industry, therefore, is for it to keep up with population increases and with the anticipated increase in per capita consumption brought about by improved marketing.

SPECIFIC COMPONENTS OF THE INDUSTRY

Land

Most dairy operations are situated on small acreages and run basically as dry-lot operations. Some are on leasehold land; thus, land tenure can be a problem at times. In recent years, as marginal sugarcane plantations have gone out of production, some of these lands have become available for feed and forage production. As a result, it is possible that coordinated or integrated dairy feed and forage operations could develop.

Feeding Programs

The dairy industry is dependent upon outside sources of feed. Cereal grains, protein supplements, and mineral supplements are all imported at costs increased by ocean freight and handling expenses. Some byproducts have been developed locally and are used as a source of roughage. Pineapple bran, a byproduct of the pineapple canning industry, is a high-energy roughage and is used exclusively by the cattle industry. Byproducts from the sugarcane industry include sugarcane strippings, bagasse, and molasses. Of these, only molasses is used in reasonably large quantities. The livestock industry in the state uses approximately 25,000 tons of molasses each year in its feeding programs. Efforts are being made to increase the use of the fibrous sugar waste products to replace a portion of the imported feeds.

The high cost of feeds is a major limiting factor to more efficient milk production in the local industry. Grain prices to the industry are about \$60 to \$90 per ton higher than on the Mainland. Because of the lack of quality roughages, dairymen feed large quantities of grains to obtain a good production response. Before the heptachlor problem, when pineapple green chop was used, it was estimated that feed represented about 50 percent of the total cost to produce milk. Today, feed cost probably represents about 55 percent of the total. Roughages that are being imported include alfalfa cubes. baled alfalfa, cottonseed hulls, and almond The lack of readily available hulls. roughages has resulted in depressed fat tests, fat cow problems, and many of the other metabolic disorders associated with restricted roughage intake.

The local dairy industry has not developed storage systems to maintain a sizeable inventory of feeds. The imported feeds are generally fed on a short-term basis. with most farms storing approximately two to three weeks' supply. Any local forages that are used, such as green chop, are used on a day-to-day basis, with very limited amounts being stored on farms in the form of silage. Most local forages cannot be cured properly and thus have a high water content and tend to ensile poorly. Mixing local roughages of high moisture content with dry grains in the ensiling process may be worthy of investigation.

Breeding

Because all milk produced is sold as fluid milk, Holsteins are the predominant breed. Artificial insemination is used extensively, with an estimated 70 percent of the breeding females bred artificially. A large percentage of the local herds participate in local production testing. Conception rates of dairy cattle in the state are low compared with those on the Mainland. The average firstservice conception rate, taken on a month-tomonth basis for dairies, is estimated to be about 30 percent. First-service conception rates in the state range from a high of about 50 percent in some of the better herds during the cooler periods of the year to a low of about 15 percent in herds in the Waianae area during the hot period. Identifiable factors affecting reproduction are nutrition, climate, and management.

The nutritional aspects of this problem are associated with the situation of highgrain, limited-roughage feeding and are compounded by climate. An equally important nutritional factor is the abnormal mineral profiles contained in some of the byproducts and crops produced in the state. Identifiable thus far are the very low copper and selenium and relatively high molybdenum contents, along with the high iron and manganese contents, in local forages.

Climate is an important factor that affects cattle reproduction in the state. Poor reproductive performance is observed in late summer--July through October--and during the wet months from December through March. Research to date has shown that conception rate decreases by 5 percent for temperature-humidity index (THI) each change from 69 through 79. There appears to be a critical point at a THI of 75 to 76. This is observable in daily milk production as well as in reproductive performance. Seasons in which there are continuous days above THI 76 contribute to a verv depressed reproductive performance.

Intensive dairy operations that maintain large numbers of animals on limited areas contribute to disease and reproduction problems. Calving in muddy or dusty corrals, such as exist during parts of the year, may be causing problems as yet unidentified. It has been observed that many animals are not clean on their 30-day postpartum check, which suggests that the animals are having difficulty coming back to a normal reproductive cycle. Because of the many possible contributing factors involved in reproductive efficiency, it has been difficult to pinpoint exact causes on specific operations.

Replacement Animals

First-calf heifers entering the herds tend to be lower producing than second-calf and more mature animals within the herd. Firstcalf heifers are usually grown on the neighbor islands and suffer many of the same problems described by the beef industry as postweaning slump. In the past, Hawaii dairymen have depended upon imports from the Mainland for their replacement animals. High price combined with poor quality often made this practice a costly one. Most replacement heifers now are locally produced.

Marketing

The area of great concern in marketing is the sale of fluid milk. Because of the pesticide crisis, milk sales have dropped considerably. Milk sales and distribution of milk products on Oahu and Hawaii are governed by the Milk Commission in the Hawaii Department of Agriculture. Before the pesticide crisis and during the "school year," 95-100 percent of the milk was sold at the Class 1 level. After the crisis, sales dropped to 85-90 percent. During the summer months, this declined further to 70-75 At that time, prices received by percent. dairymen for Class 1 (fresh fluid milk), Class 1A (filled or imitation milk), Class 2 (for ice cream and cottage cheese), and salvage (for butterfat) were \$21.07/100 pounds, \$18.77/100 pounds, \$12-\$13/ 100 pounds and \$2.80/100 pounds, respectively. Thus, the producer suffers if his milk cannot be used as Class 1. Fresh milk is now being imported from the Mainland by one of the supermarkets. What effect this will have upon demand for the local product remains to be seen.

BACKGROUND AND PRESENT SITUATION

No accurate record is available as to the introduction of pigs to Hawaii, but it is likely that pigs of Asian ancestry were introduced during ancient times by the Polynesians. Captain Cook brought English pigs on his first voyage to Hawaii in 1778. A boar and a sow were landed on Niihau during that year. After the visit of the English explorer, hogs increased in such quantity that they were shipped to California in 1853 during the gold rush. They were worth 4-6 cents per pound liveweight at that time. Swine production in Hawaii reached its peak in 1945, when a population of more than 90,000 head was attained. The trend has been downward since then.

There were 650 hog farms in the state in 1984, with 420 of these having more than 10 head (Table 7). Excluding interfarm sales, but including custom slaughter for home use and direct sales on farms to consumers, a total of 60,000 head weighing 10,504,000 pounds were sold, generating an income of \$8,088,000. This was 9 percent of the total state livestock sales in 1984.

Swine production in Hawaii continues to be a specialized, intensive, family-owned and -operated enterprise. Operations are confinement in nature, with continuous farrowing the normal practice. Most of the commercial operations are farrow-to-finish. The center of pork production in the state is on Oahu, where the industry is concentrated in the Waianae area. This is because of the ready market outlet in Honolulu and the available supply of garbage. Oahu accounts for about 60 percent of the pigs marketed Maui (23 percent), annually in the state. Hawaii (9 percent) and Kauai (8 percent) follow. However, the industry on Oahu is becoming increasingly vulnerable to urban pressures, and alternate land areas on Oahu suitable for swine production are not readily The level of market hog available. production on the neighbor islands is basically geared for local consumption on the specific island. There is some interisland shipment of market hogs to Honolulu, but the number tends to fluctuate depending upon supply and demand on the particular island.

The number of commercial swine producers in the state is decreasing, with the remaining operations becoming larger. Prospective producers have difficulty getting into the swine business because of the high and hard-to-get capital required and the unavailability of suitable land. Where land is available, costs are high.

Production costs are high, largely because of the higher feed ingredient cost compared with cost on the Mainland. Most of the feed ingredients used in swine rations are imported. On an all-grain feeding operation, it is estimated that feed cost amounts to about 55 cents per pound of live animal produced (including breeding herd charge in addition to the feed consumed by the pig).

The local industry is basically geared to the production of "fresh hot pork." Of the total unprocessed pork (fresh-frozen or chilled), about 21 percent is produced locally. During the past 10 years or so, local production has been somewhat static in terms of pounds of pork produced. In terms of percentage of the total market supply, however, the trend has been downward (Table 8). Although the total consumption of unprocessed pork in the state has been increasing with the proportionate rise in population, the growth has been made up of imported frozen and chilled pork. As a result, the local producers have not benefited. It is anticipated that local swine production will remain at the average level of recent vears or increase slightly to replace live animal inshipments for the "hot pork" trade.

SPECIFIC COMPONENTS OF THE INDUSTRY

Land

Land needs for swine production are not extensive. Most current operations are less than 10 acres in size. The quality of land compared with that for raising crops does not need to be high, as swine rearing is basically

SWINE STATISTICS FOR THE STATE OF HAWAII

SALES

NUMBER OF FARMS

YEAR							
	Total	10+	NUMBER OF HOGS	Number	Pounds (liveweight)	Farm Price (liveweight)	Value
	0 400 400 500 600 600 600 600 600 600 600 600 6		1,000	1,000	1,000	Dollars per	1,000
			head	head	pounds	hundredweight	dollars
1965	950	580	72	68	12,444	30.10	3,746
1966	890	520	69	68	11,832	33.60	3,976
1967	790	500	68	64	11,017	33.40	3,680
1968	710	490	64	66	11,458	33.80	3,873
1969	650	480	57	65	11,253	35.80	4,029
1970	570	460	58	59	10,538	38.90	4,099
1971	540	450	62	62	11,262	39.60	4,460
1972	540	450	58	61	11,142	40.60	4,524
1973	560	450	61	56	9,910	47.80	4,737
1974	580	450	61	58	10,604	54.90	5,822
1975	620	450	58	60	10,536	58.30	6,142
1976	640	450	60	58	10,362	64.30	6,663
1977	640	470	62	63	11,667	60.90	7,105
1978	650	520	54	71	13,135	60.50	7,947
1979	650	470	53	63	10,380	67.70	7,027
1980	650	430	57	63	10,683	69.80	7,457
1981	650	420	55	69	11,610	72.20	8,382
1982	650	410	49	67	11,409	74.20	8,465
1983	650	430	48	59	10,257	75.80	7,775
1984	650	420	47	60	10,504	77.00	8,088

MARKET SUPPLY OF PORK -- HAWAII (1,000 POUNDS-CARCASS WEIGHT-EQUIVALENT)

YEAR	MAINLAND	FOREIGN	HAWAII	TOTAL
1970	17,346	57	7,903	25,306
1971	18,555	71	8,447	27,073
1972	19,510	157	8,357	28,024
1973	21,179	105	7,433	28,717
1974	21,795	24	7,953	29,772
1975	21,543	3	7,910	29,456
1976	23,287	4	7,781	31,072
1977	22,399	2	8,762	31,163
1978	22,076	0	9,869	31,945
1979	25,796	45	7,785	33,626
1980	26,685	133	8,012	34,830
1981	25,827	97	8,708	34,632
1982	26,392	27	8,557	34,976
1983	27,505	802	7,693	36,000
1984	28,739	875	7,878	37,492
	· · · · · ·		•	

confinement rearing in buildings. Consequently, producers are not competing for high-value land. Hog farmers have been generally regarded as undesirable neighbors. With increasing urbanization, many have been forced to relocate, particularly on Oahu and to a lesser extent in the Hilo area of Hawaii.

On Oahu, much of the land used for hog rearing had been leasehold. The lease is often on a short-term basis, which makes it economically infeasible to invest high capital Also, on Oahu, outlay for improvements. agricultural lands have been differentiated those that permit all types of into agricultural activities except hog enterprises and those that permit swine operations. The latter lands are relatively scarce, with the primary location in the leeward (Mikilua Valley) area. Those hog operations that do exist in other agricultural areas on Oahu do so because they come under the "grandfather clause." Where fee-simple lands are available on Oahu, prices exceed \$50,000 per acre.

Recently, the state has initiated an "agricultural park" concept. This sets aside land areas for agricultural development with long-term tenure assurance. To date. however, swine operations have been excluded from these developments. It is questionable for the long term whether the swine industry can remain on Oahu, unless a program such as the agriculture park concept is accessible for swine production. If it is necessary to relocate the industry to neighbor islands, this could result in changes in certain production. slaughtering, and marketing practices. Garbage probably would be used less as a primary source of feed, as the neighbor islands do not have a large supply, compared with Honolulu's. Also, instead of shipping the live animal to Honolulu for slaughter as at present, it would be more economical to slaughter on the island of production, with the end product shipped as chilled carcasses or primals. If this should occur, the current advantage of local "fresh hot" pork over mainland chilled pork would disappear.

Feeding and Management

Cost of feed continues to be the major operating expense of swine operations in Hawaii. Because swine enterprises are situated on small acreages, there is no space to raise feed ingredients for use in swine diets. Thus, most swine producers rely on complete rations from local and mainland feed manufacturers. A few enterprises do practice on-farm ration formulation and mixing, using a combination of local and imported feed ingredients. Local ingredients used include molasses, meat and bone meal, animal and vegetable fats, wheat millrun, and bakery wastes. Garbage is extensively used on Oahu, primarily in the growing-finishing Garbage originates phase of production. from military establishments, hotels and restaurants, and institutions. By law, all garbage must be cooked. Usually, the garbage is combined with supplements or concentrates to offset possible nutrient deficiences.

During recent years, some lands formerly in sugarcane and pineapple have become available for alternate crop usage. Should a feed grain-forage industry emerge, this could offer possibilities for more on-farm feed formulating and mixing operations. Observations to date indicate that locally grown feed ingredients are usually harvested as "high moisture" products. This would limit their use somewhat, depending upon the proximity of the production area to the swine enterprises.

Most commercial swine operations are farrow-to-finish confinement enterprises. They range from about 100 breeding females to more than 350. Because of the fairly continuous demand for pork throughout the year, farrowing is on a continuous, monthly basis. The local industry has kept pace with mainland trends in production practices: earlier weaning (4-5 weeks), use of elevated farrowing stalls and elevated flat-deck nursery pens, slotted floors, flush gutter systems, lagoons for waste disposal, and the use of computer recordkeeping programs.

Breeding

A majority of swine producers practice some form of crossbreeding. Breeds commonly used include Yorkshire, Hampshire, and Duroc, with lesser use of Spot and Chester White. Within the state, there are no regular sources of male breeding stock. Consequently, producers must go to the Mainland to obtain stock. The large commercial swine operations are generally in a position to do this. The small operator is seldom able to afford the additional costs involved. More recently, interest has been shown in the use of terminal crossing F-1 females (Yorkshire x programs. Landrace) have been imported from the Mainland to cross, usually, with boars of colored breeds. Because of the distance from mainland sources of replacement F-1 females. it is likely that some type of modified terminal system will be used in which replacements are produced on local farms.

Artificial insemination is being used to a limited extent locally, but it appears that management practices will need to be upgraded before it becomes a common practice. Frozen semen is being imported from the Mainland. This is used to breed select females within the herd to produce boars for use in the herd. In some instances, local producers are inseminating with fresh semen collected from boars out of dams bred with frozen semen.

Herd Health

Because of Hawaii's insularity, hog farmers have a better chance to control introduction of diseases into the state than do farmers on the Mainland. The chance of disease transfer from one farm to another is greatly increased, however, because swine particularly operations. on Oahu, are concentrated in certain geographic areas, with units side by side. The continuous farrowing nature of most operations, plus the fact that all phases of production are under one roof in many instances, enhances the perpetuation of disease problems.

Joint state-federal eradication programs have eliminated diseases such as hog cholera

brucellosis from commercial swine and operations. Brucellosis, although under control effective in commercial hog enterprises. has not been completely eliminated from the swine population in the This is because of the presence of state. infection in wild swine, particularly on the island of Hawaii. Pseudorabies, a highly contagious and serious disease of swine, was confirmed in wild pigs on the island of Hawaii in 1983. A quarantine now restricts the movement of pigs from Hawaii to the other islands except for direct slaughter. Also, in 1984, a shipping permit program was reinstituted on movement of cattle, swine, sheep, and goats in interisland shipments.

For swine entering the state from outside areas, a permit is required from the state Department of Agriculture. Also required is a health certificate verifying freedom from communicable diseases. Animals must originate from brucellosis-validated herds or areas. Animals entering the state must also have been tested for pseudorabies. A followup test is done after entry. Imported animals are usually quarantined for 30 days on the farm of destination. The Department of Agriculture does have facilities available for off-farm isolation, however, if the producer so desires. Costs are borne by the producer. There is industry movement to require mandatory quarantine of all imported swine at a central off-farm unit.

Herd health problems are generally similar to those experienced in mainland swine enterprises. Common problems include internal and external parasites, baby pig scours, atrophic rhinitis, and respiratory and reproductive problems.

Marketing

Of paramount importance is the fact the local industry must operate within a "pocket" market. What is produced here must be consumed here. Local pork has traditionally been marketed and merchandised differently from the imported product. The industry is geared to the "fresh hot pork" trade, and hogs are slaughtered during the very early morning to meet this demand. Local hogs are marketed at lighter weights than are those on the Mainland: 185-200 pounds liveweight. Over the years, hogs have been slaughtered at increasingly heavier weights. In 1959, average slaughter weight was 162 pounds.

Facilities doing the slaughtering are basically "custom slaughterers." Unless they are involved in wholesaling, they do not buy hogs and process carcasses. Without being chilled, split carcasses, head on, are moved directly out to wholesalers or retailers for further breakdown into wholesale and retail cuts.

The "Hawaiian" method of cutting pork carcasses into wholesale or primal cuts differs from mainland methods in several aspects. The head is removed, deboned and sold intact. The hind and front legs are removed at the stifle joint and inferior extremity of the humerus, respectively. The hams and shoulders are cut much longer and completely boned. The loin is cut much shorter and includes only the center cut section. The ribs are left on the belly, which has been squared up to remove the teat line. The spareribs include the neck bones and first six ribs. The exact method of cutting varies considerably, depending upon the size of carcass and the amount of fat. At the retail level, much of the pork is sold as boneless pork and used in Oriental-style cooking. This uniqueness of processing and merchandising of the local product has the effect of probably had partially protecting the local producer from feeling the full effect of imported pork, as the two are not truly comparable products.

All pork produced locally is moved as fresh pork. Gaps in production necessitate importation of live pigs from the Mainland for the "fresh hot pork" trade. There is also a market for lighter pigs, 120-130 pounds, which are used as roasters. There are no regular marketing channels for culled sows. These are normally sold directly off the farm to be used for kalua pork. Little use is made of local pork in processed products that are manufactured locally. Imported pork is used. Higher price compared to Mainland imported pork, inconsistent supply, and higher moisture content are reasons given for not using local pork.

The future of the local swine industry appears to depend on maintaining and expanding the demand for local pork. The present marketing and merchandising practices, which differ somewhat from those on the Mainland, tend to place certain restrictions on the industry. because everything is marketed as a fresh product. The maintenance and expansion of consumer demand for local pork will require a product of consistently good quality and supply in addition to closely coordinated programs between the production and marketing areas.

Retailers have identified several problems in selling local pork. Among them: (1) retail prices are higher compared to prices imported pork, although in many for instances the comparison is between bone-out and bone-in cuts; (2) local pork, being fresher, tends to have greater shrinkage on the counter than imported pork; (3) although the quality of pork from large producers is good, that from small operators is less desirable; (4) the supply and types of cuts available are uncertain at times.

Traditionally, mainland pork is more strongly promoted than the local product by the markets handling both types. This is because the demand for local pork is rather constant and high among the older generation of consumers in Hawaii and immigrants from areas whose consumers are used to that type of pork (the Orient, Southeast Asia, and the Philippines). The local industry probably should look at alternatives to the present pork merchandising methods to see if it can become more competitive and displace some of the imported pork supply.

BACKGROUND AND PRESENT SITUATION

Early establishment of poultry in Hawaii is not well documented, but apparently chickens were introduced by the early Polynesian settlers. Capt. James Cook found poultry on Kauai during his visit in 1778. Later written records indicate that about the middle 1800s native stocks of poultry were improved through the introduction of breeds from China: Frizzles, Cochin, Chinas, Shanghais, and Spanish. More systematic introduction of poultry breeds began about 1900, and by 1905 most of the popular breeds had been introduced. The poultry industry had its true beginning in 1903 on Oahu, when one operation was started with more than 1000 imported layers.

The present commercial poultry industry in Hawaii is composed of the chicken egg and meat segments. No other species of fowl is being raised in significant numbers for commercial purposes. Income is principally from the sale of shell eggs and ready-to-cook young chicken meat and, on a lesser scale, from the sale of cull and spent hens and manure.

In 1984, total value of sales by the industry was \$20,724,000, which was 24 percent of the total livestock sales in Hawaii. The egg segment of the industry averaged 939,000 layers (Table 9). These were spread among 21 major farms, i.e., farms having 100 layers or more. Thirteen of these farms, or 62 percent, were on Oahu. Of the total production of 209.7 million eggs, farms on Oahu accounted for 85 percent. The average farm price for shell eggs was 88.9 cents per The total value of sales was dozen. \$15,535,000, of which \$12,809,000 (82 percent) was generated by Oahu farms. This segment of the industry met 78 percent of the market need for shell eggs in 1984.

Although the number of major farms in the state decreased from 59 in 1970 to 21 in 1984, the number of layers remained at about the 850,000 to 1 million bird level throughout the period.

Per capita consumption of shell eggs in the United States in 1983 was estimated to be about 261. For Hawaii, estimated per capita consumption was about 255 eggs.

The broiler segment of the industry is concentrated on Oahu. In 1984, seven of the eight commercial farms in the state were on Oahu, with the other on Kauai. These farms raised and sold a total of 2,647,000 broilers, weighing 9,794,000 pounds liveweight, at an average price of 50 cents per pound. Total value of sales was \$4,995,000 (Table 10). All broiler farms except the one on Kauai are contract farms. Each producer is a contract grower for one of two processing plants in Honolulu. Two of the eight operations on Oahu are owned by the processing companies.

Per capita consumption of young chicken meat in Hawaii is difficult to determine accurately, because imported meat comes into the state marked "poultry," which includes chicken, duck, turkey, and other fowl. The 9,794,000 pounds (7,346,000 pounds on a ready-to-cook basis) marketed by the local industry represents about 25 percent of the total market need for young chicken meat in the state. This represents an estimated annual per capita consumption of about 47 pounds, compared with about 51 pounds on the Mainland. The greatest competition for the local broiler industry for island markets comes from the large, highly integrated companies on the Mainland. Because of their degree of integration, these size and companies are able to produce meat cheaply and can capture small pocket markets such as Hawaii with little difficulty. The local industry has responded by devoting much of its efforts to heavier roaster birds for the Oriental market outlets.

Some income is derived from the sale of cull or spent hens. In 1984, a total of 1.08 million pounds liveweight of chicken meat was marketed at an average price of 18 cents per pound, with a total value of \$194,000. None of this class of chicken meat is imported.

LAYER STATISTICS FOR THE STATE, OAHU, AND NEIGHBOR ISLANDS

	YEAR	NUMBE TOTAL	R OF FARMS ¹ 100+ LAYERS	AVERAGE NO. OF LAYERS 1,000 BIRDS	AVERAGE PRODUCTION/ LAYER EGGS	PRODUCTION ² MILLION EGGS	AVERAGE PRICE ³ CENTS/DOZEN	VALUE OF SALES 1,000 DOLLARS
	1960	900	207	670	209	140.0	60.1	6,911
	1965	600	138	843	225	190.0	47.3	7,449
STATE	1970	160	59	938	210	197.0	51.4	8,395
	1975	80	36	993	211	209.0	64.5	11,234
	1980	60	26	1,035	214	220.5	75.7	13,910
	1983	55	19	855	231	197.3	85.4	14,041
	1984	55	21	939	223	209.7	88.9	15,535
	1960	190	82	418	207	86.5		
	1965	160	55	548	227	124.8	43.6	4,522
OAHU	1970	45	27	689	208	143.6	49.5	5,915
	1975	26	21	815	210	171.2	65.2	8,892
	1980	26	19	894	214	191.1	74.0	11,767
	1983	19	11	712	232	165.1	83.0	11,412
	1984	20	13	796	223	177.7	86.5	12,809
	1960	700	125	252	214	53.9		
HAWAII -	1965	440	83	295	221	65.2	54.6	2,927
MAUI/MOLOKAI	1970	115	32	249	217	53.6	56.5	2,480
KAUAI	1975	54	15	178	212	37.5	74.7	2,342
	1980	34	7	141	209	29.4	87.5	2,143
	1983	36	8	143	225	32.2	98.0	2,629
	1984	35	8	143	224	32.0	102.0	2,726

1 Difference between "Total" and "100+" is operations having 1-99 layers
2 Home consumption less than 0.5 million eggs included
3 Equivalent delivered processing plant

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BROILER	STATISTICS	FOR	THE	STATE	OF	HAWAII

YEAR	NO. FARMS	NO. BROILERS	POUNDS	AVG. PRICE ¹	VALUE OF
	WITH	SOLD	SOLD LIVEWT	LIVEWT	SALES
	BROILERS	1,000	1,000 LBS	& PER POUND	1,000 DOLLARS
1960	39	1,142	4,454	40.6	1,808
1965	36	1,292	74,910	35.1	1,723
1970	31	1,845	6,458	31.8	2,054
1975	10	1,789	6,262	39.6	2,480
1980	10	2,576	8,758	45.0	3,941
1983 1984	9	2,891 2,647	10,697 9,794	50.0	5,349 4,995

¹ Equivalent delivered processing plant

SPECIFIC COMPONENTS OF THE INDUSTRY

Sources of Stock

The poultry industry relies entirely on imports for its pullet replacements and Two local hatcheries that broiler chicks. have franchises of mainland United States and Canadian breeders had previously been flying in day-old chicks but now are importing eggs to be hatched here. This has come about because of the increase in freight rate for chicks. The added transportation and handling costs make replacement pullet and broiler chick prices much higher here than on the Mainland. There are three pullet-rearing enterprises on Oahu that are sources of 16- to 18-week-old started pullets for layer operations. Forced molting is practiced by many local egg produers to reduce replacement pullet cost. The HITAHR Animal Sciences Department has conducted a feasibility study on producing commercial hybrid broiler chicks locally. Although this study has indicated that a multiplier flock is feasible, the industry has taken no action.

Flock Health

The greatest threat to Hawaii's poultry industry lies in the possibility of the introduction of epidemic diseases such as velogenic viscerotropic Newcastle disease (VVND) from the Mainland. Recent changes in state Department of Agriculture import regulations have made both preand postshipment requirements more stringent. This has greatly reduced the chances of the introduction of VVND into the state and outbreaks of the disease within the state. The Department of Agriculture has also increased inspection of imported birds of all species and has increased the penalty to \$450-\$500 for illegal entries.

Infectious diseases--such as coryza, air sac disease, and infectious bursal disease (IBD)--and parasitic infestations are constant threats to efficient poultry production in the state. A survey conducted by the Department of Agriculture during the period 1982-84 indicated that there were no major or new diseases. Flock problems appeared to be the same as in previous survey years. Near the end of the survey period, two bacterial pathogens, <u>Campylobacter sp.</u> and <u>Salmonella</u> <u>sp.</u>, were isolated from two farms. A coryzacausing bacterium has been isolated in the past in some flocks. The Department of Agriculture provides diagnostic services to poultry producers in addition to conducting monitoring programs on broilers at slaughter plants.

Feeding and Management

Feed represents the major operating cost for poultry producers. It is estimated that feed cost represents 60-70 percent of the total production cost for eggs and 60-65 percent for broilers. All diets fed are purchased as complete rations from either local or mainland manufacturers. Local manufacturers normally carry feed inventories sufficient for two to three months in case of interruption of feed supplies from the Main-Limited use is made of locally land. available materials for poultry diets. Tuna meal has been used in the past, but this supply has been discontinued. There is no on-farm ration formulation and mixing.

Availability of suitable litter material for broiler rearing is an increasing problem. In the past, the broiler industry has relied heavily upon wood shavings for litter material. This commodity, however, has become scarce and more expensive. As a result, many producers have resorted to the reuse of old litter for up to one year. involving four broods. This practice increases the possiblilty of disease outbreaks and parasite infestations. Studies have been conducted by the HITAHR Animal Sciences Department on the use of alternate materials for broiler litter. Chopped guinea grass hay, shredded newspaper, steer manure, sawdust, and combinations are some of the materials evaluated.

From the standpoint of pest and odor control and of nuisance to adjacent residential areas, the handling and disposal of poultry wastes are of increasing concern, particulary on Oahu. Poultry operations adjacent to truck crop farms generally have been able to dispose of the material. Some producers have composted, screened, and bagged the materal for homeowner use. The costs involved in preparing and marketing the product, however, are often greater than the income derived. But it is a method of disposal. Pineapple and sugarcane fields have used livestock wastes in the past, and this affords an avenue of disposal.

There has been some demand on the neighbor islands for processed poultry manure. In the past, regulations restricted the interisland movement of any materials containing soil particles without fumigation. In 1981, these regulations were amended. Under the new regulations, a farmer may obtain a permit to ship manure without fumigation to another island if his farm is at least one-fourth mile from sugarcane fields. if the manure has not supported prior plant life and if it is not mixed with clumps of soil. There appear to be some possibilities of marketing local livestock manures, if it can be done economically. Comparable products are being shipped in from the Mainland, so apparently there is a demand.

Several poultry enterprises are incorporating computerized farm records into their operations. Numerous main-frame programs are available from the HITAHR Animal Sciences Department relating to production performance and cost. There is also a trend toward the use of on-farm microcomputers to supplement main-frame programs.

Marketing

Like other Hawaii livestock products, eggs and poultry meat are sold within a "pocket market." What is produced here must be consumed here. Local production accounts for about three-fourths of the eggs consumed in the state. No eggs are exported, and nearly all local eggs are marketed as shell There is one egg-breaking plant on eggs. established in 1983. Oahu, Even with Hawaii's geographic isolation, local wholesale prices are directed by prices on the Mainland, especially those in California. When prices are lower on the Mainland because of overproduction, California egg handlers look to their export markets to "dump" their surpluses at reduced prices. One of these markets is Hawaii, where large supermarkets are both importers and retailers of a significant quantity of California eggs. At time of dumping, large numbers of eggs are imported, which creates a glut locally. Hawaii producers and handlers must then lower their prices to meet competition. If this does not eliminate the surpluses. operators must decrease their flock size. Some suppliers need to fill 40-foot containers. The eggs are "fillers" and are mixed in with other commodities. Some supermarkets prefer imported eggs rather than local ones. To hold on to their share in the markets, local

Table 11

MARKET SUPPLY OF EGGS 1,000 DOZENS

	1960	1965	1970	1975	1980	1983	1984
INSHIPMENTS	1,992	1,008	824	1,497	2,371	5,158	4,810
HAWAII	10,700	15,730	16,300	17,400	18,375	16,442	17,475
TOTAL	12,692	16,738	17,124	18,897	20,746	21,600	22,285

MARKET SUPPLY OF POULTRY MEAT (BROILERS) 1,000 POUNDS (READY-TO-COOK WEIGHT)

	1960	1965	1970	1975	1980	1983	1984
INSHIPMENTS	6,170	10,327	17,214	19,242	25,455	26,932	29,785
HAWAII	4,550	3,682	4,844	4,697	6,569	8,023	7,346
TOTAL	10,720	14,009	22,058	23,939	32,024	34,955	37,131

producers and handlers must sell their eggs at discount to the retailers.

Imported eggs are required to be stamped, which identifies them as originating from outside the state. Also, a marketing regulation administered by the state Department of Agriculture can "stop sales" of eggs not meeting quality standards when checked in the markets.

Local poultry meat is marketed as lightweight broilers for the barbecue trade, fryers, and heavier roasters for the restaurant and Oriental market outlets. Local markets buy imported poultry products outright by container loads or through importers. Because of their short shelf life, these products must be marketed as soon as possible, very often at low markups. These same markets, on the other hand, can be supplied with local products several times a week. Thus, there is less tendency to promote or push sales very hard.

A former state law specified special labeling requirements beyond those required by the federal government. This law was declared unconstitutional and repealed. The requirement for notification that the product has been previously frozen and thawed is still enforced by the state Department of Health. Deceptive statements as to origin are prohibited under laws and rules enforced by both the state and federal departments of agriculture.

Within the local poultry industry, it appears that the growth potential might be greater for broilers than for eggs. Since 1970, local egg production has been somewhat static. However, the portion of the market supplied by local eggs has dropped from more than 90 percent to about 75 percent. Possible reasons for this are the declining per capita consumption of eggs nationally, caused partly by the "cholesterol controversy," and the fact the large market chains and egg processors have greatly increased importation of eggs into the state (Table 11).

On the other hand, local broiler production has remained fairly constant in terms of its percentage of the total market supply but has increased substantially in terms of pounds of poultry meat marketed (Table 12). Undoubtedly, this is a result of population increase in the state as well as the increase in per capita consumption of poultry meats. The anticipated continued population increase, combined with recent moves by some of the local processors to get into the fast-food business in which poultry meat is used, should encourage expanded production.

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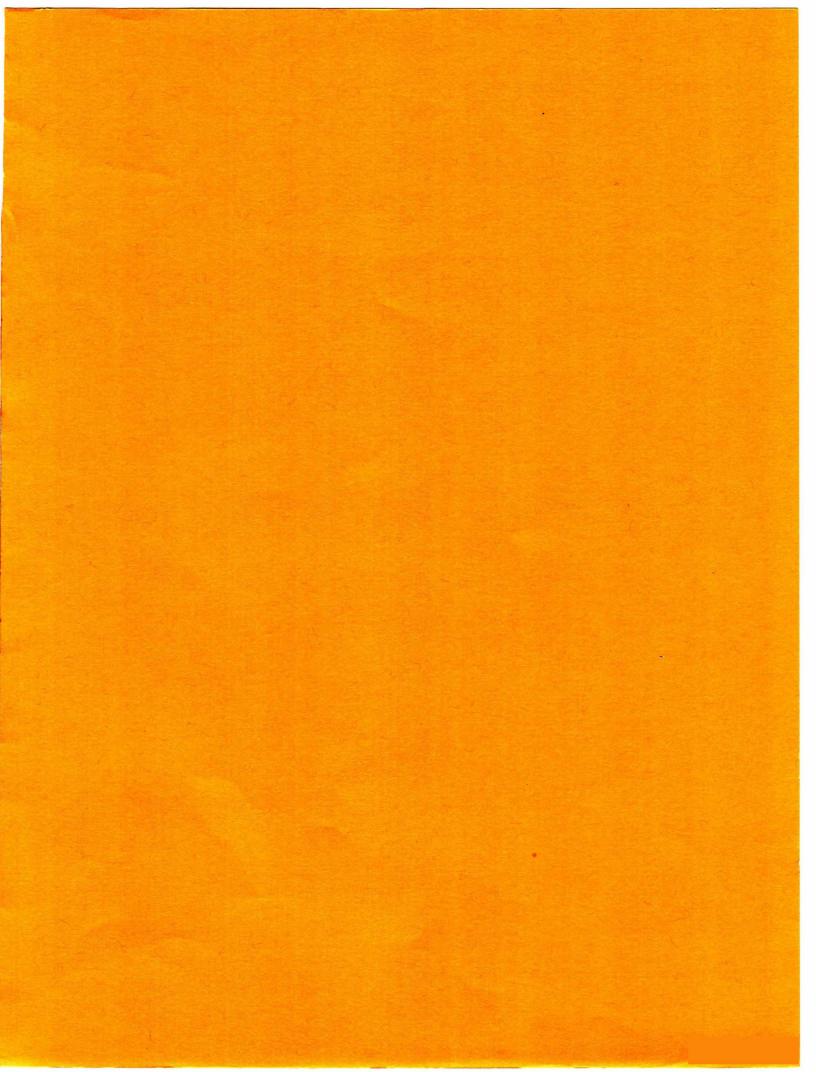
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