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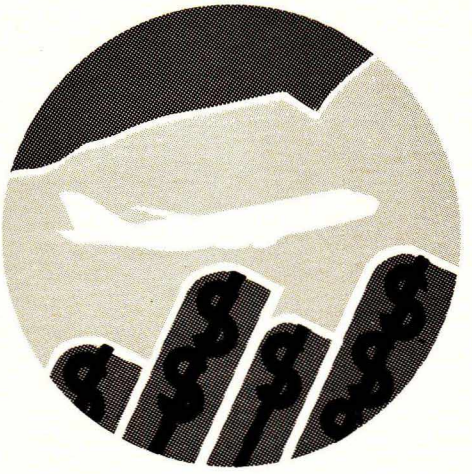

TRANSPORTATION COSTS OF AGRICULTURAL PRODUCTS IN HAWAII: 1980

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April 9, 1981

ABSTRACT

Transportation costs are very important to the agricultural sector of Hawaii, accounting for a significant portion of the expenses incurred by producers in marketing their products. Transport costs have increased dramatically during the past two years due to rising fuel costs and changes in air services. This paper summarizes the transport costs incurred during the past two years for agricultural products, other than sugar and processed items, destined for overseas markets. The costs of transport for agricultural products shipped between the Islands is also presented but in less detail. Estimates of other logistic costs such as packing, cooling and farm to port transportation are also given.

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1. SUMMARY AND OVERVIEW

The current transport situation facing Hawaii's agricultural sector was described by one shipper as "bad and getting worse." Transportation costs are increasing faster than the value of the goods being transported. The producers of some commodities are currently facing transport problems which require that immediate actions be taken. Many of Hawaii's export crops are currently unable to reach their markets at reasonable costs due to elimination of their customary transport channels or lack of available capacity. The State may have available policy alternatives with regard to the intrastate movement of agricultural products that would remove some of the bottlenecks or alleviate the cost burdern to the agricultural sector.

In the fall of 1980, the Governor's Agricultural Coordinating Committee commissioned a study of the transportation system serving the agricultural sector. The study was carried out by the Department of Agriculture of the State of Hawaii and the College of Tropical Agriculture and Human Resources of the University of Hawaii. The first objective was to determine the current costs of transporting the products of Hawaii's agricultural sector from the production region to market. The second objective of the study was the formulation of policy alternatives available to the State of Hawaii and the evaluation of their potential impact on the shippers and growers of Hawaii's agricultural products.

1.1 GENERAL METHODOLOGY

Transport costs were estimated using the quantities shipped in 1979 and the rates in effect during the fall of 1980. This approach was necessary as shipment data for 1980 were not available. The exception is papayas. All figures relating to papayas are based on estimated 1980 production. Transportation costs have been increasing rapidly. In order to obtain an indication of the current situation and obtain comparable data, the rates in effect at one point in time were used. Agricultural products from Hawaii are sent as far east as Europe. In order to obtain useful and comparable estimates, only the cost of transporting the products as far as the West Coast was determined. Significant quantities do move farther east than the West Coast, but the amounts vary widely and depend on different shippers' perceptions of market conditions. By limiting the presentation to the costs incurred in reaching the West Coast, it is possible to compare the costs for different commodities and different modes.

1.2 SHIPMENTS DESTINED FOR LOCAL MARKETS

The great majority of interisland shipments of agricultural products destined for local consumption went via barge. Almost 50 million pounds of surface freight were shipped between the islands in 1979 as compared to slightly less than 7 million pounds of air freight. Sixty percent of surface shipments were fresh fruits and vegetables, including papayas and pineapples, while slightly less than 30 percent were livestock. The remainder was composed of flowers and nursery products. The quantities and associated costs of interisland shipments destined for in-State markets are given in Table 1.

The total cost of transporting the products destined for local consumption was 1.48 million dollars. The air freight charges were typically more on a per pound basis than surface freight charges. The average cost per pound for air freight was approximately eleven cents while the average for surface freight was less than two cents a pound. Although only slightly more than 10 percent of the cargo went via air, the cost of air shipments accounts for over 40 percent of total transport charges.

Generally only products with a high per-unit value or a highly perishable nature were shipped by air. Fresh fruits and vegetables including papayas accounted for 75 percent of the air shipments and cut flowers and nursery products the remainder.

TABLE 1

Interisland Shipments of Fresh Commodities in 1980: Estimated Quantities and Costs

Commodity and Mode	Quantity (1,000 pounds)	Average Cost per Pound (cents)	Total Transport Cost (1,000 dollars)
Papayas			
Via Air	2,149	6.7	144.0
Via Sea	4,824	1.2	57.9
Pineapples			
Via Sea	1,300	1.1	14.3
Cut Flowers			
Via Air	1,238	23.6	291.9
Nursery Products			
Via Air	471	14.6	68.7
Via Sea	278	3.0	8.4
Fruits and Vegetables			
Via Air	2,542	7.9	200.8
Via Sea	28,282	1.3	367.7
Livestock			
Via Sea	15,403	2.1	324.5
Total	56,487	2.6	1,478.2

1.3 OVERSEAS SHIPMENTS

The great majority of Hawaii's agricultural production is destined for overseas markets. Over 176 million pounds of unprocessed agricultural goods are exported from the State (See Table 2). In terms of volume, the most important product is fresh pineapple, accounting for nearly eighty percent of the total. Over a third of the exports are shipped by air. Air freight typically costs about 13 cents a pound to the West Coast which is almost five times more expensive than surface freight. The cost of surface freight is typically about 2.8 cents per pound. Air freight to Japan is very expensive relative to domestic rates. The cost per pound of shipping papayas to Japan was 63 cents. The total cost of shipping fresh agricultural products from the State to the West Coast or Japan was 14.6 million dollars.

Over 11 percent of the products exported from the State had to be transshipped via Honolulu. This increased the transport costs for these items. Table 3 gives the quantities transshipped and their associated costs. Over two-thirds of the commodities transshipped moved via air carriers to Honolulu. Transshipment increased the cost of transport an average of 5.3 cents per pound. Including transshipment costs, the total cost of transporting crops exported from Hawaii to the West Coast and Japan was 15.6 million dollars.

TABLE 2

Estimated Overseas Shipments in 1980: Quantites and Costs

Commodity, Destination and Mode	Quantity (1,000 pounds)	Average Cost per Pound (cents)	Total Transport Costs (1,000 dollars)
Papaya			
To Mainland			
Via Air	20,685	12.2	2,523.6
Via Sea	3,685	2.8	103.2
To Japan			
Via Air	5,972	63.0	3,762.5
Pineapple			
To Mainland			
Via Air	31,200	10.5	3,276.0
Via Sea	108,700	2.8	3,043.6
Cut Flowers			
To Mainland			
Via Air	3,939	37.5	1,496.8
Nursery Products			
To Mainland			
Via Air	1,297	23.5	304.8
Via Sea	1,276	9.5	121.2
Total	176,754	8.2	14,614.7

1.4 TOTAL LOGISTIC COSTS

Transport costs are not the only costs incurred in moving agricultural products from the farm or ranch to the market. The products must also be transported from the farm to the harbor or the airport. Most commodities will require packaging and commodities such as fruits and vegetables will require cooling. These other logistic costs will increase the total cost of moving the products from the production area to the market.

A summary of the total transport costs incurred moving the unprocessed agricultural products of Hawaii's agricultural sector as well as the total logistic costs is given in Table 4. Logistic costs include packing costs, inland transport costs, and cooling costs as well as the cost of moving the product from the island where produced to the final market. For shipments destined for overseas markets, transportation costs accounted for two-thirds of the total logistic costs incurred. For shipments to local markets, transportation costs only accounted for a third of total logistic costs. Total logistic costs are quite large relative to transport costs for commodities like flowers and nursery products. These commodities require relatively large amounts of packaging and handling on a per unit of weight basis because of their low density. The total logistic costs for fresh fruits and vegetables are also large relative to transportation costs. The costs of cooling and packaging are significant for fruits and vegetables and the cost per pound of shipping them between islands is low.

TABLE 3

Estimated Transshipments in 1980: Quantities and Costs

Commodity and Mode	Quantity (1,000 pounds)	Average Cost Per Pound (cents)	Total Transport Costs (1,000 dollars)
Papayas			
Via Air	13,266	6.7	888.8
Via Sea	5,985	1.2	71.8
Cut Flowers			
Via Air	457	14.1	64.5
Nursery Products			
Via Air	214	14.6	31.2
Total	19,922	5.3	1,056.3

TABLE 4

Total Transport and Logistic Costs

	To Local Markets		To Overseas Markets	
	Transport	Logistic	Transport	Logistic
	(1,000 dollars)			
Papayas	201.9	297.1	7,349.9	8,451.5
Pineapple	14.3	29.3	6,302.2	7,664.7
Cut Flowers	291.1	746.6	1,561.3	3,562.3
Nursery	77.1	146.7	457.2	645.2
Fruits and Vegetables	568.5	2,235.5		
Livestock	324.5	569.9		
Total	1,478.2	4,025.1	15,670.6	20,322.7

1.5 GENERAL TRENDS IN TRANSPORT COSTS

Transport costs are increasing. The increases are apparently due to both the energy crisis and the overall rate of inflation. From the perspective of Hawaii's agricultural sector, the largest increases were in the overseas air freight costs. The cost of exporting papaya from the Big Island increased 50 percent in 1980. The cost of air services within the State also increased. The exact rate of increase is unknown, but it is in the range of 25 to 30 percent.

Surface freight costs to the mainland are also increasing, but the special commodity rates have not increased at the same rate. The tariffs for fresh pineapples and papayas increased only 5 percent in 1980. Interisland surface rates increased the least. The difference in tariffs between 1979 and 1980 was only 2.7 percent.

The decrease in air service to Hilo has also increased the costs of transporting the Big Islands' products. The shortage of air freight capacity is the principal reason for the increase in transshipments in 1980. Another result of the shortage of air freight service to Hilo has been a shift towards more surface shipments of papayas. The increased use of surface shipments will tend to lower transportation costs but the increased time in transit may also decrease the value of the commodity by shortening the shelf-life and inducing higher spoilage.

1.6 RECOMMENDATIONS

There are several alternatives available which may improve the transport situation facing Hawaii's agricultural sector. Some of the proposals will require that direct action be taken by the State, others require the cooperation and support of State agencies, and some are programs that can be undertaken by the shippers and growers without direct government support.

Proposals that require direct State action include lessening State imposed taxation on the transport of agricultural products and giving priority to the development of infrastructure facilities for the efficient movement of air freight. The largest potential benefit may result from State supported research and development programs relating to new products and markets.

The small shippers could significantly reduce their transport costs if they could consolidate their shipments. This is a program they could undertake on their own or with support from the State. The formation of a shippers' cooperative is another alternative that does not necessitate direct State support but that might be facilitated by taking advantage of available programs. A shippers' cooperative is an attractive alternative that has the potential of overcoming or bypassing many of the bottlenecks in the existing system.

It must be recognized that transportation will always be a major cost to Hawaii's producers. It is important that the State institute programs and policies that will minimize the impact of transport costs if agriculture is to continue to develop and continue to be a viable use of the land in the State of Hawaii.

2. TRANSPORT COSTS

2.1 INTRODUCTION

Transport costs have always been important in determining the location and intensity of agricultural activities. The structure of the transport sector is particularly important to the agricultural economy of the State of Hawaii because of its geographical nature. Products destined for the local markets often must be produced on islands other than where they are consumed and products destined for overseas markets must be transported several thousand miles.

In order to facilitate the collection of data and their analysis and presentation, Hawaii's agricultural output is di-

vided into two parts. The first part includes all products for which a significant portion of total production was destined for overseas markets. Included in this group are papayas, fresh pineapples, cut flowers, and nursery products. The second group includes commodities primarily destined for the local or in-state markets. This group includes commodities such as livestock and fruits and vegetables (except fresh pineapple and papaya). The two broad groups of commodities are subdivided into groups based on how they are commonly transported, either by air or by sea. When appropriate, the groups are further subdivided into classes based on whether they are shipped on pallets, in loose boxes or in containers. Generally, 1979 data on the quantities marketed and where they were sold were available from either published documents, unpublished information or the shippers. Data on costs, however, were only available for all transport modes for 1980. The estimates of costs presented are therefore for the quantities marketed in 1979 and the transport costs incurred in 1980. Thus the resulting figures are estimates of the costs in 1980, inasmuch as total marketing and the distribution of sales in 1980 are the same as they were in 1979. The one exception is papaya. Data for the production and marketing of papayas was available for the first three quarters of 1980. Because of the importance of papayas as an agricultural export from the State, the current data were used. To obtain an estimate of total sales in 1980, the first nine months' sales were increased by a factor of 100/72 as the last three months sales of papayas represent on the average 28 percent of annual sales.

During October and the first part of November 1980, over one hundred producers were contacted. An attempt was made to contact all the major producers in each of the broad categories of commodities. Each producer contacted was surveyed to determine the commodities shipped to each market by each mode and the associated costs. No attempt was made to draw a sample. In a study of this nature, it is much more important that the situation facing the majority of the industry be accurately determined than it is that the results apply equally to all producers, both large and small.

During this same period, all the carriers, both sea and air, were contacted and information on the products carried and the applicable tariffs and other charges was collected.

Commodities destined for overseas markets generally moved by more than one route. For example, papayas produced on the Big Island destined for the West Coast followed four general routes: (1) by sea directly from Hilo; (2) by air directly from Hilo; (3) by air to Honolulu and air to the mainland; and (4) by sea to Honolulu and air to the mainland. When more than one routing was used, the quantities and costs associated with each route were defined.

The major disadvantage of surface shipments, from the viewpoint of agricultural producers, is the transit time. The difference in transit time between air and sea freight for interisland shipments is small; usually between one and two days. For overseas shipments, the difference in transit times is quite large. Air freight shipments usually arrive the next morning while surface shipments may take as long as a week.

Air freight costs are generally substantially higher than surface freight costs. The difference in cost will depend on the type of commodity being shipped, the size of the shipment and the density of the item. The less dense the item and the smaller the shipment, the less expensive air freight is relative to surface freight. In fact, for very small shipments, air freight may be cheaper than surface freight. The ratio of air freight costs to surface freight costs for general merchandise shipped from Maui to Oahu for four shipment sizes and three densities is given in Table 5. The ratio given for shipments of 1,000 pounds will apply to all shipments greater than 1,000 pounds.

TABLE 5

Ratio of Air to Surface Freight Costs for Shipments between Maui and Oahu: Fall 1980

Size of Shipment (pounds)	Density (pounds per cubic foot) 10	25	50
50	0.86	0.86	0.86
100	1.67	1.67	1.67
500	2.89	8.37	8.37
1000	2.02	5.05	10.09

The remainder of this report details the methods and sources used in arriving at the transport costs for each of the broad commodity groups. Sections 2 and 3 are the only sections pertaining to specific commodities (papayas and fresh pineapples). Other sections give information for broad commodity groups. Section 4 describes the transport situation facing the cut-flower industry; Section 5 the nursery industry; Section 6 the general grouping of fruits and vegetables (except papayas and pineapples); and Section 7 the transport situation facing the livestock industry.

2.2 PAPAYAS

Papaya production in Hawaii is concentrated on two islands, Hawaii and Kauai. In 1979, over 25 million pounds of papayas produced primarily in the Puna District, were marketed from the Big Island and 4.5 million pounds were marketed from Kauai.

The industry has been expanding during the past decade. Production in 1979 was 68 percent greater than in 1975 despite severe weather and drought damage. Expansion is expected to continue with increased new planting in the Puna District and in the Moloaa area on Kauai. Kauai which was responsible for 14 percent of the State's production in 1979 is expected to produce 20 percent of the State's papayas in 1981.(1)

There is no major papaya production either on the Island of Maui or the Island of Oahu. The production of the existing small scale operations on Maui is typically destined for consumption on the Island of Maui. On the Island of Oahu, the mosaic virus infestation has made large scale commercial production infeasible.

2.2.1 Markets

Fresh Hawaii grown papayas are sold in three principal markets; the U.S. mainland, foreign and local markets. The foreign markets include Japan, Canada and European destinations. In 1979, 62 percent of the fresh papayas were marketed on the mainland, 19 percent were shipped to foreign destinations, and the remaining 19 percent were sent to local markets. These market shares appear to be the same in 1980, based on the first three quarters' production.

The five largest papaya shippers account for over 90 percent of the papaya shipments leaving the Islands of Hawaii and Kauai. During the past decade, industry practices and packaging standards have evolved and there is very little difference between the major processors. Fresh papayas intended for overseas shipment are packed in 10 pound cardboard cartons. The number of papayas per carton will vary between 6 to 13 depending on size. Fresh papayas intended for interisland shipment are packed in 20 or 25 pound cartons. The fruit is usually picked in the mature green stage so that it will be one quarter ripe when it arrives at its destination.

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(1) Souza, R. A., Report given to Hawaii Papaya Industry Association Annual Convention, September 25-27, 1980, Kauai.

Shipments destined for Japan require more costly preparation than others. The required inspection, packing standards and documentation all increase the cost of preparing a shipment.

2.2.2 Transport Modes and Routes Utilized

In the recent past, the great majority of fresh papayas moved via air transport. In 1979, only 8 percent of the total papaya shipments went via surface.

Of all the crops grown in the State, papayas may have been affected the most by recent changes in tariffs and air lift capacity.[2] The decline in air service between Hilo and the mainland has had particularly adverse effects. In 1980, the amount of fresh papaya shipped via surface modes increased from 8 to 23 percent of the total. In 1979, less than 15 percent of the papaya shipped from the Neighbor Islands was transshipped via Honolulu (HNL). This increased to nearly 52 percent during the first three quarters of 1980. Table 6 presents the shipment figures for 1979 and for the first three quarters of 1980. Table 7 presents the shipment data for the Islands of Hawaii, Kauai and Maui. It is apparent that the major changes in modal use and choice of routes occurred on the Big Island, where there was a major shift from direct air shipments to the mainland to transshipping via Honolulu. The major shift was to an air shipment to Honolulu and then transshipment to a mainland bound air carrier. Some fresh papayas were even shipped surface freight to Honolulu and then transferred to an air carrier for shipment to the mainland.

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[2] Department of Agriculture, Division of Marketing and Consumer services. Hawaiin Agricultural Products, Air Transport Study, September 1980.

TABLE 6

Fresh Papaya Shipments by Destination and Mode: 1979 and 1980.

Destination and Mode	Shipments 1979 (1,000 pounds)	Shipments 1980[1] (1,000 pounds)	Percent of Total 1979	Percent of Total 1980[1]
Local				
Air	4,645	1,547	14.4	5.8
Sea	1,381	3,473	4.3	12.9
Sub-total	6,026	5,020	18.7	18.7
Mainland				
Direct				
Air	14,396	2,143	44.6	8.0
Sea	869	1,211	2.7	4.5
Transhipment				
Air-HNL-Air	4,430	9,566	13.7	35.6
Sea-HNL-Sea	290	1,442	0.9	5.4
Sea-HNL-Air	0	2,867	0	10.7
Sub-total	19,985	17,229	62.0	64.1
Foreign				
Canada and Europe				
Direct-Air	481	128	1.5	0.5
Transshipments				
Air-HNL-Air	158	146	0.5	0.5
Sea-HNL-Air	0	43	0	0.1
Japan				
Air-HNL-Air	5,600	4,300	17.4	16.0
Sub-Total	6,239	4,617	19.3	17.2
Total	32,250	26,866	100.0	100.0

[1]Data are for the first nine months of 1980.

TABLE 7

Papaya Shipments from the Neighbor Islands, 1979 and 1980[1]

Mode and Destination	Production Areas: Hawaii 1979	Hawaii 1980	Kauai 1979	Kauai 1980	Maui 1979	Maui 1980
	(1,000 pounds)					
Local						
Air	2,746	1,096	131	444	1,768	7
Sea	446	3,395	935	78	0	0
Sub-total	3,192	4,491	1,066	522	1,768	7
Mainland						
Direct						
Air	14,396	2,143	0	0	0	0
Sea	869	1,211	0	0	0	0
Transshipment						
Air-HNL-Air	851	6,643	3,483	2,923	96	0
Sea-HNL-Sea	290	1,442	0	0	0	0
Sea-HNL-Air	0	2,867	0	0	0	0
Sub-total	16,406	14,306	3,483	2,923	96	0
Foreign						
Canada and Europe						
Direct - Air	481	128	0	0	0	0
Transshipment						
Air-HNL-Air	0	146	0	0	158	0
Sea-HNL-Air	0	43	0	0	0	0
Japan						
Air-HNL-Air	5,600	4,300	0	0	0	0
Sub-total	6,081	4,617	0	0	158	0
Total	25,679	23,414	4,549	3,445	2,022	7

[1] Data for the first nine months only.

2.2.3 Transit Times

Papayas sold to local markets reach their destination within twenty-four hours when air shipped and within two days when shipped by sea. Direct air shipments from the Big Island typically reach their consignee on the West Coast within twenty-four hours. Regardless of the final destination, transshipments of papayas through Honolulu typically take an extra day. Surface shipments from Hilo can reach Oakland in five days using the roll-on-roll-off service if the boat does not return to Honolulu before departing to the mainland. Transit time to Los Angeles is longer, typically taking seven days.

Fresh papayas destined for the local market (Honolulu) are typically shipped in cartons on pallets for air and surface modes. Papayas destined for the mainland market are loaded into LD-3 containers if air freight is to be used or into 24 foot reefer containers if surface freight is to be used. If the route involves transshipment with change in mode at Honolulu, for example the Sea-HNL-Air routing, the fruit is first loaded into 20 foot reefer containers which then are unloaded in Honolulu and restuffed into LD-3 containers for the air leg to the mainland.

2.2.4 Cost of Transportation

The cost of transporting fresh papayas was computed based on the tariffs in effect on October 1 of 1979 and 1980 respectively. It is necessary to use the tariffs in effect on a specific date because the tarrifs of the air carriers are constantly changing. Matson also has had several rate increases during the period under study.

The cost per pound of shipping fresh papayas to local and overseas markets was estimated for each route from all the producing Islands. The estimates, given in Table 8 for 1979 and 1980, include all charges incurred by the shipper such as wharfage, taxes, fuel surcharges, additional stuffing costs for transshipments as well as the tariff fees. A detailed description of how these costs were derived is given in Appendix A.

Table 8 clearly illustrates the dramatic increase in air freight costs between 1979 and 1980. For direct air shipment to the mainland costs increased 51 percent. The average transportion cost per pound for papayas moving to the mainland irrespective of mode was 11.2 cents in 1979 compared with 14.55 cents for the first nine months of 1980; an increase of 30 percent.

2.2.5 Other Logistic Costs Incurred Shipping Papayas

The process of shipping fresh papayas incurs costs other than transport fees. Papayas shipped to off-island markets require better packing, labelling and grading than those marketed locally. Overseas shipments must be fumigated and international shipments may require special inspection and documentation.

The cost of packing papayas was estimated to be 0.07 cents per pound for papayas to be marketed within the State, 0.16 cents a pound for papayas destined for mainland markets, and 0.32 cents per pound for papayas destined for Japan. These estimates are based on interviews with papaya packers. Approxi-

TABLE 8

Transport Cost Per Pound For Fresh Papayas

Destination	Mode	Hawaii 1979	Hawaii 1980	Kauai 1979	Kauai 1980	Maui 1979	Maui 1980
		(Cents per pound)					
Local	Air	5.6	7.0	4.6	5.8	4.6	5.8
	Sea	1.2	1.2	1.2	1.2		
Mainland	Air	11.2	16.9				
	Sea	2.7	2.8				
Transshipment							
	Air-HNL-Air	16.8	18.0	15.9	16.8	15.9	
	Sea-HNL-Sea	2.7	2.8				
	Sea-HNL-Air		13.4				
Japan							
	Air-HNL-Air	40.3	63.0				

mately 40 percent of the cost of packaging for mainland destinations consists of packaging materials and the remainder for labor and overhead.

Another cost incurred by producers is that of moving the fruit from the farm to the processing plant and then to the port. On Kauai, it is estimated that this movement costs an average of 5.7 cents per pound between the growing regions and the airport and 6.8 cents between the farm and the harbor. On Hawaii, the average cost of transporting papayas from the farm to the airport is estimated at 13.4 cents and from the farm to the sea port at 13.8 cents. Details on how these estimates were obtained are given in Appendix B.

Spoilage in transit is another factor which increases the total logistic cost involved in transporting papayas. With the recent shift toward more use of surface modes and their corresponding longer transit times, spoilage costs may become more significant. Interviews with producers and processors indicate that the current level of spoilage on a mainland shipment is typically about 5 percent. A recent and yet unpublished study undertaken by the University of Hawaii[3] indicates that the major impact of increased time in cold storage (such as in a reefer container) may be decreased shelf life rather than the occurrence of more damaged fruit on arrival.

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[3] Conversation with Dr. A. Alvarez.

The degree to which consumer satisfaction has declined due to decreased shelf life is unknown, but may warrant further study if the shift to surface modes continues.

If the loss due to deterioration and damage in transit is 5 percent, the logistic costs should be increased accordingly. The current f.o.b. Hilo prices and the West Coast prices, however, reflect the costs of spoilage and no attempt was made to estimate these costs.

2.2.6 Total Logistic Costs

The total logistic cost is the sum of all the costs incurred in moving the fruit from the farm gate to the final market. These costs are summarized in Table 9 for each of the primary production areas and market routes. An idea of the relative importance of the different logistic costs can be obtained by comparing them to the value of the fruit. This comparison is given in Table 10. The value is the average sales price received by the processors.[4]

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[4] Papaya Administrative Committee, Preliminary Farm Income, Prices and Parity for Fresh Sales, November 18, 1980.

TABLE 9

Logistic Costs for Papayas

Destination, Origin and Mode	Packing	Intraisland Transport	Island to Market Transport	Total
		(cents per pound)		
To Oahu				
From Hawaii				
Via Air	0.07	1.34	7.00	8.41
Via Sea	0.07	1.38	1.24	2.69
From Kauai				
Via Air	0.07	0.57	5.83	6.43
Via Sea	0.07	0.68	1.24	1.99
To Mainland				
From Hawaii				
Via Air	0.16	1.34	16.93	18.43
Via Sea	0.16	1.38	2.83	4.37
Air-HNL-Air	0.16	1.34	18.00	19.50
Sea-HNL-Sea	0.16	1.38	2.70	4.24
Sea-HNL-Air	0.16	1.38	12.69	14.23
From Kauai				
Air-HNL-Air	0.15	0.57	16.83	17.55
To Japan				
From Hawaii				
Air-HNL-Air	0.32	1.34	63.00	64.66

TABLE 10

Logistic Costs Incurred in Marketing Fresh Papayas in 1980 as a Percentage of Processor Price

Destination, Origin and Mode	Processor Price (cents per pound)	Logistic Costs as a Percentage of Price
To Oahu		
From Hawaii		
Via Air	37.2	22.6
Via Sea	37.2	7.2
From Kauai		
Via Air	37.2	17.3
Via Sea	37.2	5.4
To Mainland		
From Hawaii		
Via Air	28.9	63.8
Via Sea	28.9	15.1
Air-HNL-Air	28.9	67.5
Sea-HNL-Sea	28.9	14.7
Sea-HNL-Air	28.9	49.2
From Kauai		
Air-HNL-Air	28.9	60.2
To Japan		
From Hawaii		
Air-HNL-Air	22.8	283.6

2.3 PINEAPPLES

Pineapple is the second most important agricultural product in the State. The value of the 1979 harvest is reported to be 69.5 million dollars.(5) Fresh pineapples accounted for 13.8 percent of all pineapple sales and provided 44 percent of all pineapple revenues or 30.08 million dollars in 1979. Over the past five years, fresh pineapple sales have increased almost 50 percent even though total acreage under production has declined.

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(5) Statistics of Hawaiian Agriculture, 1979.

2.3.1 Production Areas

Production of pineapple for the fresh market is concentrated on the Island of Oahu. Both Del Monte Corporation and the Dole Company have their major fields of pineapple destined for fresh market on Oahu and together account for the great majority of all fresh pineapple sales. Other producers, although much smaller in scale, generally follow the packaging policies and shipping channels used by the above mentioned producers.

2.3.2 Where and How Pineapples are Marketed

Fresh pineapples are marketed in two principal markets; the mainland including Canada and local markets on all islands. Local interisland shipments are generally confined to barge movements except when emergency stock-out situations arise. Local movements consist of 40 pound cartons, palletized and shipped as general deck cargo. The transit time is from 24 to 48 hours depending upon the destination.

Fruit for the out-of-state or export market may be moved by air freight or in Matson 24-foot refrigerated containers. Refrigerated containers hold 504 forty-pound cartons and reach the West Coast in approximately seven days (from the time the container door is closed to the time it is delivered to the consignee). Air freight shipments generally reach the consignee in less than 48 hours from time of loading.

For air freight shipments, 20-pound boxes are loaded into unit load devices (for example, an LD-3, LD-7, etc.), at the staging or processing area and trucked to the airport. Unit load devices are superior to palletized shipments because they reduce the amount of pilferage, allow faster ground handling time, can be insulated against both hot and cold and need not be returned to the producer. An LD-3, the most commonly used type of unit load device, will hold 134 cartons at 20 pounds each.

2.3.3 The Modal Split for 1979

Almost 75 percent of the fresh pineapple sales in 1979 were in overseas markets.(6) Overseas shipments of approximately 139.9 million pounds were split between sea and air with approximately 20 percent being shipped via air.

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(6) Statistics of Hawaiian Agriculture, 1979.

The volume of interisland fresh pineapple shipments is not large. Approximately 49.3 million pounds or 25 percent of all pineapples marketed fresh remain in the State. However, 45.5 million pounds were grown and consumed on Oahu.(7) This leaves a balance of 3.8 million pounds. Of this amount, at least 1.3 million pounds were shipped between islands. The remaining 2.5 million pounds is the amount grown and consumed on the Neighbor Islands. The volume of shipments to North America totaled 139.9 million pounds in 1979. Over 90 percent of this fruit was packaged and shipped from Oahu. Approximately 80 percent of the shipments went by sea and the balance went by air.

2.3.4 Cost of Moving Pineapples from Port to Port

The per pound cost of moving pineapples from port to port varies from 1.05 cents for interisland sea transport to 10.5 cents for air shipment to Los Angeles. These costs were generated utilizing the basic outline provided in Appendix A and are based on tariffs in existence October 1, 1980.

The per pound interisland surface cost of 1.05 cents is based on the assumption that 28 cartons at 1.7 cubic feet per carton are palletized and moved on the Honolulu to Hilo trip. Surface shipment to the mainland with a cost of 2.8 cents per pound is premised on the use of 24-foot Matson refrigerated containers holding 504 cartons at forty pounds each.

The cost of air shipment to Los Angeles is 10.5 cents per pound. The LD-3 tariffs range from a low of 205 to a high of 309 dollars. Most LD-3 containers will hold 134 twenty-pound cartons. The tariff of 281 was used to estimate costs because it is typical of the airlines with the most tonnage into Los Angeles.

2.3.5 Transit Times

Pineapples shipped from Oahu to the mainland will reach the West Coast in six days when sent by sea and in less than 24 hours when sent by air. Surface shipment between islands requires not more than 48 hours when sent by sea.

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(7) Honolulu Unloads, Fresh Fruits and Vegetables, 1979.

2.3.6 Other Logistic Costs

The per pound cost of moving packaged fresh pineapples from the processing area to either the airport or harbor depends upon the distance, the loading and packing procedures and ownership of the motor vehicles required. Moving Matson containers to the harbor costs between 0.5 and 0.7 cents per pound. These costs are based on the 1980 Oahu motor tariffs for spotting trailers. The movement of pallets and unit load devices to either the harbor or airport is more costly. Flatbed trucks or trailers cannot be loaded as densely as when containers are used. Processors moving LD-3 containers to the airport in Honolulu try to move at least 6 LD-3 equivalents per trip. Palletized shipments within the State are usually small in size because wholesalers and retailers are not able to handle exceedingly large volumes.

Spoilage, packaging problems, packing and cooling costs are additional logistic issues facing the shippers of fresh pineapples. Although these issues are not addressed in this study, they do enter into processor decision-making.

2.3.7 Total Logistic Costs

Total logistic costs are summarized in Table 11 by market and mode. Table 12 presents a comparison of total logistic cost as a percentage of processor price. This allows the relative importance of transportation costs to be examined by mode.

TABLE 11

Fresh Pineapple Logistic Costs

Market and Mode	Inland Transport	Island to Market Transport	Total Costs
		(cents per pound)	
Local			
Via Sea	1.0	1.1	2.1
Mainland			
Via Air	1.2	10.5	11.7
Via Sea	.6	2.8	3.4

TABLE 12

Logistic Costs as a Percent of Processor Price

Market and Mode	Processor Price (cents)	Logistic Costs as a Percentage of Price
Local		
Via Sea	16	13.1
Mainland		
Via Air	16	73.1
Via Sea	16	21.3

2.3.8 Trends

Total pineapple production statistics for 1980 are not yet available. Preliminary indications are that there was a slight decrease in the volume of fresh pineapples shipped by surface and a 30 percent increase in volume shipped by air. The 1979 air volume was lower than normal because of the DC-10 groundings and the United Airlines strike. Reportedly some pineapple shippers have increased their use of air shipments, especially for markets east of the Rocky Mountains.

2.4 CUT FLOWERS

The production of flowers is recorded in either dozens of flowers, dozens of stems or by numbers of flowers. To define industry aggregates, it was necessary to use a common unit to combine the different measures and the only appropriate measure available was wholesale value.

Lei flowers, cut flowers and foliage comprise the floral production of the State. Total State floral production in 1979 was valued at 11 million dollars (Table 13). The Island of Hawaii provided 58 percent of the State's total floral production with 49 percent represented by anthuriums alone. Oahu, which produces the widest variety of flowers, provided 16 percent of total production while 10 percent was comprised of lei carnations from Maui.

TABLE 13

Wholesale Value of Flowers Produced in 1979

Type of Flower	Production Areas				
	Hawaii	Kauai	Maui	Oahu	State1
		(1000 Dollars)			
Cut Flowers:					
Anthuriums	5,371	20	2	176	5,568
Birds of Paradise	10			21	33
Carnations			50		74
Chrysanthemums			64	218	325
Gingers	25			87	113
Roses					726
Proteas			264		281
Others					385
Cut Orchids:					
Cattleyas	14		5	16	30
Cymbidiums	245				245
Dendrobium sprays				132	192
Others	65			25	45
Lei Flowers:					
Carnations			1,137		1,140
Vandas	398			34	441
Plumerias				246	418
Tuberoses				401	401
Dendrobiums				72	73
Pikake				81	81
Cut foliage:					
Ti Leaves	135			150	285
Other Greens	87			62	149
Total	6,350	20	1,522	1,721	11,005

a State totals may differ from the sum of production of each island as the system of classification and reporting differ from island to island.

Source: Statistics of Hawaiian Agriculture, 1979.

2.4.1 Markets

In 1979, the State exported 7 million dollars worth of flowers. Table 14 lists the type of flowers exported to overseas markets. Eighty percent of floral shipments were anthuriums, primarily from the Big Island.

The distribution of anthuriums by market is given in Table 15. There were 2 million dozen anthuriums marketed in 1979. Data for the first eleven months of 1980 indicate that produc-

tion has increased. In 1979, 64 percent of anthuriums were shipped to foreign markets, while 20 percent went to the mainland and 16 percent to local markets. The distribution for the 1980 anthurium production appears to be the same.

Protea producers surveyed on Maui, representing 70 percent of the State's protea production, shipped 75 percent of their products to the mainland with the remainder going to Canada, Japan and Europe. Between 80 and 90 percent of Maui's cut carnations were marketed on Oahu.

TABLE 14

Wholesale Value of Overseas Shipments of Foliage and Flowers: 1979

Type of Flowers	Value (1,000 dollars)
Cut Flowers:	
Anthuriums	5,696
Birds of Paradise	64
Gingers	85
Proteas	207
Wood Roses	50
Others	152
Orchids:	
Cattleyas	20
Cymbidiums	170
Dendrobiums	185
Lei Flowers:	
Vandas	104
Others	14
Foliage:	
Ti Leaves	198
Other Cut Greens	146
Total	7,091

Source: Statistics of Hawaiian Agriculture, 1979.

TABLE 15

Anthurium Shipments from the Island of Hawaii

Market and Shipment Mode	1979	1980[a]
	(1,000 dozen)	
Local	337,300	309,192
Mainland		
Direct	219,675	138,108
Via Honolulu	132,125	216,476
Parcel Post	61,900	75,416
Subtotal	413,700	430,000
Foreign		
Europe Direct	353,075	75,872
Europe Via Honolulu	692,046	962,115
Subtotal	1,045,121	1,037,987
Canada Direct	10,372	10,426
Canada Via Honolulu	12,141	12,140
Subtotal	22,513	22,566
Japan Via Honolulu	189,076	187,955
Australia Via Honolulu	42,290	48,492
Subtotal	1,299,000	1,297,000
Total	2,050,000	2,036,192

[a] Data for 1980 are for the first eleven months only.

Source: Shipper and grower interviews.

2.4.2 Transportation Modes and Routes Utilized

All cut flowers are shipped either by air or by parcel post. Anthuriums intended for mainland markets go by one of three ways: air direct, air via Honolulu and parcel post. Table 15 shows that in 1979, fifty-three percent of anthurium shipments to the mainland went by air direct, 32 percent were shipped via Honolulu and 15 percent by parcel post. However, for the first eleven months of 1980, only 32 percent went air direct, 50 percent were transshipped via Honolulu and 18 percent were moved by parcel post. The latter figure indicates a growing preference for use of parcel post. Flower shippers indicate that there are more shipments by parcel post because consignees are not willing to pay the rising air fare. Other advantages of using parcel post are the single rate, based on weight, for all destinations and the fact that the shipment is delivered to the consignee's door. However, there is no guarantee that the product will arrive in good condition.

The typical route for shipments to Europe also changed in 1980. In 1979, 34 percent of anthuriums went air direct to Europe, while 66 percent went via Honolulu. In 1980, only 7 percent went air direct, while 93 percent were transshipped through Honolulu. Modes of shipment to Canadian, Japanese and Australian markets, however, remained unchanged.

Major shippers of protea reported that in 1979, 15 to 25 percent of their products were shipped to the mainland via air. In 1980, a major shift to parcel post was reported.

2.4.3 Transit Times

Cut flowers marketed within the State typically reach their destination within a day. Shipments to the West Coast also usually take no longer than twenty-four hours provided that they are shipped directly and do not have to be transshipped. Flowers being sent to Japan from the Big Island must be transshipped via Honolulu and generally spend two to three days in transit. Shipments to Europe which are routed directly to the mainland and then transshipped can reach their destination in two days, but three days is typical.

2.4.4 Cost of Transportation

The cost of transporting flowers such as anthuriums, proteas and carnations is presented in Table 16. Flowers and nursery products fall in one commodity rate classification. Air carrier personnel note that in the case of small shipments of flowers (less than 20 cartons), it is usually cheaper to ship the cartons loose than in a container. Anthuriums are the only cut flowers that typically use LD-3 containers.

TABLE 16

Cost of Transporting Cut Flowers from Port to Port

Origin, Destination, Flower and Mode	Unit Shipped	Weight[a] (pounds)	Rate (dollars)	Cost per Unit (dollars)
From Hawaii				
To Oahu				
Anthurium				
Air	bulk pack	37.5	14.8/pd	5.70/mc
From Hawaii				
To Mainland				
Anthurium				
Air Direct	mc	37.5	41.0/pd	15.38/mc
Air Direct	mc	37.5	296.3/LD	11.39/mc
Air (HNL)	mc	37.5	55.0/pd	20.63/mc
Air (HNL)	mc	37.5	423.3/LD	16.38/mc
From Hawaii				
To Mainland				
All Cut Flowers				
Parcel Post	bx	37.5	Variable	26.81/bx
From Maui				
To Oahu				
Carnation				
Air	200 heads/bx	6.8	14.0/pd	0.48/hd
Protea				
Air	220 stems/bx	35.0	14.0/pd	2.22/st
To Mainland				
Air (via HNL)	220 stems/bx	35.0	55.0/pd	8.75/st
Parcel Post	158 stems/bx	25.0	Variable	11.48/st
From Oahu				
To Mainland				
Orchids				
Air	10 dz/bx	15.0	46.0/pd	6.90/bx

Legend: mc = master carton; LD = LD-3 container; bx = box; pd = 100 pounds; hd = 100 heads; st = 100 stems; dz = dozen

[a] Dimension weight or actual weight, whichever is greater.

2.4.5 Other Logistic Costs Incurred in Shipping Cut Flowers

Logistic costs for cut flowers include packing and intraisland transportation costs. Anthuriums are packed either in master cartons or in a bulk pack. Master cartons contain 20 to 40 dozen anthuriums depending on size and have 6 to 12 trays per carton. Bulk packs have no trays and can hold 16 to 30 dozens of anthuriums. Proteas are shipped in boxes with 250 to 300 flowers each. Carnation boxes contain 200 to 300 pieces.

Table 17 gives the packing cost for anthuriums, proteas and carnations. It takes about 2 hours to prepare, grade and pack 25 to 30 dozen cut anthuriums. Approximately 13 minutes are required to grade and pack 200 to 300 carnation heads. Proteas require a little over 2 hours to grade, wrap and pack each box.

Intraisland transport involves a trip from the farm to the airport or the post office. Table 18 gives the transport costs for specific types of flowers. As the flowers are counted differently, the unit cost is different for each type of flower.

TABLE 17

Costs of Packing Cut Flowers

Type of Flower	Production Area	Cost of Material	Cost of Labor (dollars)	Total Cost
Anthurium-Master Carton	Hawaii	9.00	10.00	19.00
Protea-Box	Maui	3.70	9.66	13.36
Carnation-Box	Maui	6.70	1.05	7.75

Source: Shipper interviews.

TABLE 18

Cut Flower Intraisland Transport Costs

Production Area and Commodity	Round-Trip Distance to Airport[a]	Cost per Unit[b] (Dollars)
Maui: Carnations (Kula)		
Low Cost	30 miles	0.039/hd
Average Cost	35 miles	0.143/hd
High Cost	40 miles	0.316/hd
Protea and Others[c]	35 miles	1.380/bx
	4 miles	0.310/bx
Hawaii: Anthurium	24 miles	0.474/bx
Oahu: All Cut Flowers	45 miles	0.890/bx

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a Based on weighted average distance from packer to airport.
b See legend at bottom of Table 16.
c Others includes: chrysanthemums, orchids and anthuriums.

Source: Shipper and grower interviews.

2.4.6 Total Logistic Cost

The sum of logistic costs is contained in Table 19. Total costs are for particular observations. The costs for shipments of similiar nature will be approximately the same as those given in Table 19.

TABLE 19

Total Costs of Moving Cut Flowers in Loose Boxes

Production, Destination, Mode and Flower	Packing Cost	Intra-island Transport Cost	Transport Cost from Islands to Markets	Total Cost
		(dollars per carton)		
From Hawaii To Los Angeles Via Air Direct for Anthurium	19.00	0.47	15.38	34.85
From Hawaii To Los Angeles Air Via Honolulu for Anthurium	19.00	0.47	20.63	40.10
From Hawaii To Oahu Via Air Direct for Anthurium	19.00	0.47	5.70	25.17
From Maui To Los Angeles Air via Honolulu for Protea	13.36	1.38	19.25	33.99
From Maui To Oahu Via Air Direct for Carnations	7.75	0.36	0.95	9.06

2.5 NURSERY PRODUCTS

The nursery industry is fairly new and encompasses a tremendous variety of products. Because of this variation, it was difficult to arrive at any representative average for the industry. Estimating the average cost of inland transportation, packing and overseas transportation for nursery products on a per unit basis is practically impossible. Quantities correspond only to a particular description of plants. Consequently, quantities in terms of units of plants is a poor indicator of the industry's activities. An established and perhaps a better gauge of the industry is the wholesale value. For this section, discussion will be based on wholesale value.

The major production areas of the State are given by product type in Table 20. The State's nursery products had a whole-

sale value of 9 million dollars in 1979 (excluding revenues from bedding plants and plant rentals), of which 54 and 31 percent were generated on the Islands of Oahu and Hawaii respectively. These nursery products include potted plants, trees and other ornamentals, unfinished flowers and foliage stock. Potted foliage produced on the Islands of Oahu and Hawaii accounts for 43 percent of wholesale value. A tremendous variety of nursery products are grown in the State, but only those listed in Table 20 are traded in significant volumes.

2.5.1 Markets

There are three broad groups of potted plants that are shipped out of the State: potted foliage, orchids, ornamentals and trees (see Table 21). Of the 9 million dollars worth of nursery products produced in the State, 47 percent are sold locally. The other 53 percent are marketed overseas and are composed mainly of potted orchids and foliage.

No information is available on the precise quantitites or destinations of exports of nursery products. However, the survey results indicate that most of the orchids are exported to foreign markets, generally Europe and Japan. Foliage plants are normally routed to the mainland; primarily to the West Coast.

2.5.2 Transport Modes and Routes Utilized

The mode used in transporting nursery products depends upon a number of factors including destination, size of shipment, and consignee's request. Potted orchids destined for foreign markets such as Japan, Europe and Canada go either by air freight or parcel post. Orchid shipments to the mainland also utilize either air parcel post or air carriers.

Small shipments of foliage plants to the mainland generally use either air freight or air parcel post. However, for large orders (more than 700 plants) the producer will generally utilize a 24-foot refrigerated container. Foliage plants grown on the Island of Hawaii are shipped directly to the mainland or transshipped via Honolulu. Oahu's foliage plants are shipped directly to the mainland by either air or surface modes. Industry sources estimate that the State ships approximately 50 percent of all foliage plants destined for the mainland via surface modes.

Ornamentals and trees destined for mainland markets generally move via surface modes. The size and weight of these products limit the feasibility of air freight unless orders are from the east or central regions of the mainland.

TABLE 20

Wholesale Value of Nursery Products Sold in 1979

	Production Areas				State Total[a]
	Hawaii	Kauai	Maui	Oahu	
			(1,000 dollars)		
Potted Plants:[b]					
Chrysanthemums				109	523
Orchids	381		138	975	1,508
Poinsettias				202	323
Potted Foliage	1,960			2,034	4,052
Others				515	914
Ornamentals	196			587	1,027
Green Stock	326			576	919
Total	2,863	0	138	4,998	9,266
Other Nursery[c] products	567	133	1,239	1,227	507

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[a] The overall total for the State will not match the sum of the totals for the individual Islands as the method of classification differs from island to island.

[b] Hawaii's potted foliage includes other potted plants.

[c] Figures for this classification may include above items not shown by island to avoid disclosing individual firm's operations. Figures also may include cut-flowers not listed separately. Revenues from plant rentals are also included. Rentals could not be separated due to insufficient data.

Source: Statistics of Hawaiian Agriculture, 1979.

Unfinished plants are generally either unrooted or rooted cuttings and because of their small size can be economically shipped by air. Additionally, the longer time period required to move via surface modes to the West Coast causes water stress in cuttings. Interisland shipments are generally by surface except in the case of orchids, potted chrysanthemuns and poinsettias (Table 21).

TABLE 21

Overseas and Local Wholesale Value of Nursery Products

	Overseas	Local
	(1,000 dollars)	
Potted Plants		
Orchids	1,020	488
Foliage	2,675	1,377
Ornamentals and Trees	185	842
Others	1,010	823
Chrysanthemums and Poinsettias		846
Total	4,890	4,376

Source: Statistics of Hawaiian Agriculture, 1979.

2.5.3 Modal Split for Nursery Products: 1979

There is no readily available information, in published or unpublished form, on either the final markets for nursery products or on the transport modes used to reach the markets. The information presented in this section on the modes utilized is derived entirely from interviews with the major shippers of nursery products in the State.

The shippers contacted reported that all overseas shipments of orchids move via air carriers and all ornamentals and trees are shipped via surface modes, regardless of the market destination. When nursery production is destined for local markets, typically about 20 percent of production is marketed on the island where produced and the remainder is marketed on Oahu.

Nursery operators on the Island of Hawaii reported that 80 percent of the foliage plants destined for overseas markets was shipped in containers via surface. The remaining 20 percent was sent via air freight, with approximately half of this being sent direct from the Big Island to the mainland, and the other half being sent via air to Honolulu where it was transshipped to the mainland. Reportedly, 60 percent of the orchids shipped out of the State from the Big Island are sent directly by air with the remainder being transshipped via Honolulu. Unfinished nursery stock is divided equally between surface shipments, direct air shipments and air shipments via Honolulu. The growers and shippers contacted reported that 60 percent of the unfinished nursery stock went via sea with the remainder being split approximately equally between direct air and air transshipment routes. There is also a significant amount of foliage plants shipped to the mainland from Maui via surface freight.

The nursery operators and shippers interviewed on Oahu reported that their shipments of foliage plants, trees and ornamentals were split evenly between surface air routes and that three-fifths of the unfinished nursery stock is shipped via surface and the remainder via air. The majority of other potted plants exported from Oahu go via air, with approximately 60 percent going by air and 40 percent via surface routes.

The majority of interisland shipments of nursery products is from the Neighbor Islands to Oahu. Shipments of potted foliage plants from the Island of Hawaii generally move by sea, with only a third of the shipments moving via air freight. All trees and ornamentals shipped between the Islands are sent by sea.

The results of interviews with the growers and shippers of nursery products are summarized in Tables 22 and 23. The weight figures were obtained by converting the published statistics on nursery production into weight units.(8) These figures were then used in combination with information on tariffs and other charges to estimate the cost of transporting nursery products.

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(8) Statistics of Hawaiian Agriculture, 1979. The conversion factors were taken from W.S. Kutner, A Disaggregate File of Commodity Attributes, Center for Transportation Studies, Massachusetts Institute of Technology, 1979.

TABLE 22

Overseas Shipments of Nursery Products in 1979: Origin, Destination and Mode

Origin, Destination and Mode	Potted Foliage	Orchids	Ornamentals and Trees	Other Nursery Products	State Total
			(1,000 pounds)		
From Hawaii					
To Mainland					
Via Air	70	81	0	36	187
Via Sea	560	0	20	109	689
Air Via HNL	70	53	0	37	160
From Maui					
To Mainland					
Air Via HNL		54	0	0	54
From Oahu					
To Mainland					
Via Air	353	349	39	155	896
Via Sea	354	0	39	194	587
Total Overseas Export:					2,573

TABLE 23

Estimated Modal Split for Local Shipments of Nursery Products to Oahu for 1979 by Island of Origin and Mode

Origin and Mode	Potted Foliage	Orchids	Ornamentals and Trees	Chrysanthemum and Poinsettias	Other Nursery Products	State Total
			(1,000 pounds)			
Hawaii						
Via Air	94.7	52.4	0.0	112.6	79.9	339.6
Via Sea	189.5	0.0	88.7	0.0	0.0	278.2
Maui						
Via Air	0.0	19.0	0.0	112.6	0.0	131.6
Oahu	369.1	167.6	332.2	163.7	333.5	1366.1

2.5.4 Cost of Transportation

In view of the tremendous number of plant type and quantity combinations that may be shipped either by the air or sea mode, port to port costs have been identified for the typical recurring shipment patterns and the corresponding quantities from each area of production. See Table 24. Total cost per shipment is stated in terms of 100 plants. See Appendix C for a detailed description of the nursery products used in estimating the transport costs.

TABLE 24

Cost of Transportation for Nursery Products

Production Area, Destination and Mode	Type of Nursery Product	Plants Per Trip	Total Shipment Cost (dollars)	Total Cost Per 100 Plants
From Oahu				
To Mainland Via Surface	Aglaonema, Dracaena and Brassaia	4,800	949.92	19.79
	Areca Palm	1,200	968.81	80.73
Via Air	Dracaena	550	296.25	53.86
Via Air	Brassaia	10,000	296.25	2.96
Via Air	Silver Queen	610	296.25	48.57
From Maui To Mainland Via Surface	Fasciatas, Aglaonema, and Neanthebella Palm	19,670	807.42	4.10
To Oahu Via Air	Flowering Plants	200	205.00	102.50
To Oahu Via Air	Chrysanthemum	1,050	1,368.99	130.38
From Hawaii To Mainland Via Surface	Ficus Benjamina	800	736.18	92.02
To Mainland Air Via HNL	Ficus Benjamina	500	470.25	94.05

2.5.5 Other Logistic Costs Incurred in Shipping Nursery Products

Like other agricultural products, nursery products must be packed and transported from the farm to port. Packing requirements of nursery products vary with the size and type of plant. An 8-inch aglaonema is packed differently from a 34-inch aglaonema. Foliage plants between 6 and 8 inches tall in 2-inch rose pots are shipped in cardboard cartons. These cartons are then stacked in LD-3 containers. Larger plants, between 16 and 22 inches tall are sleeved and shelved in LD-3 containers or in 24 foot reefer containers. Packing materials may include cartons, sleeving material, wood for shelves and foil wrappers for some plants. Labor costs involve grading, wrapping, sleeving and packing. Packing methods for nursery products are treated at length in a publication by the Department of Agriculture. (9) Packing costs are summarized in Table 25. The estimated inland transport costs for nursery products are given in Table 26. There is a wide range in the cost of transporting nursery products. The variation arises from the different packing densities used. The denser the plants are packed, the lower the transportation costs but the higher the packing costs.

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(9) Report on Nursery Products, Packaging and Standards, Division of Marketing and Consumer Services, Department of Agriculture, State of Hawaii, 1980.

TABLE 25

Cost of Packing Nursery Products

Production Area and Mode	Nursery Plants	Plant Count Per trip	Material Cost Per 100 Plants	Labor Cost Per 100 Plants	Total Cost Per 100 Plants
				(dollars)	
Oahu					
Via Air	Dracaena	550	6.35	14.05	20.40
Via Air	Brassaia	10,000	0.57	3.09	3.66
Via Air	Silver Queen	610	2.45	8.70	11.15
Via Sea	Aglaonema	4,800	4.16	8.25	12.41
	Dracaena Brassaia and Areca Palms	1,200	8.33	15.70	24.03
Maui					
Via Air	Flowering Plants	200	31.25	7.50	38.75
Via Air	Chrysanthemums	1,050	4.83	13.80	18.63
Via Sea	Fasciatas, Aglaomena, and Neanthebella Palm	19,670	0.25	1.57	1.82
Hawaii					
Via Air	Ficus Benjamina	500	2.00	15.45	17.45
Via Air	Ficus Benjamina, Dracaena	500	5.00	15.45	20.45
Via Sea	Ficus Benjamina, Dracaena	800	18.75	15.69	34.44

TABLE 26

Inland Transport Costs for Nursery Products

Production Area and Destination	Nursery Plants	Roundtrip Distance (miles)	Cost Per Mile (cents)	Plants Per Trip	Total Cost (dollars)	Cost Per Plant (cents)
Oahu						
Airport	Dracaena	40	0.79	1,100	31.60	2.87
Airport	Brassaia	40	0.79	20,000	31.60	0.16
Airport	Silver Queen	40	0.79	610	31.60	5.18
Seaport	Aglaonema, Dracaena and Brassaia	30	0.79	4,800	23.70	0.49
Seaport	Areca Palms	30	0.79	1,200	120.00	0.10
Maui						
Airport	Flowering Plants	26	1.16	200	30.16	15.08
Airport	Chrysanthemum	35	1.16	1,050	40.60	3.87
Seaport	Fasciatas, Neanthebella Palm and Agloanema	28	1.16	19,670	82.00	0.42
Hawaii						
Airport	Ficus Benjamina	6	1.16	500	6.96	1.39
Airport	Ficus Benjamina and Dracaena	18	1.16	500	20.88	4.18
Seaport	Ficus Benjamina	22	1.16	800	25.52	3.19

2.5.6 Total Logistic Costs

The sum of all the costs of moving nursery products is contained in Table 27. Again, the costs of packing, movement to the port and to the markets are for particular observations only and may not be true for succeeding shipments. There is no available information on the farmgate values of these products. Hence, determination of the relative importance of logistic costs to price cannot be obtained.

TABLE 27

Logistic Costs Incurred in Marketing Nursery Products in 1980

Origin, Destination and Mode	Nursery Plants	Packing Cost	Intraisland Transport	Transport from Islands to Market	Total
		(dollars per 100 plants)			
From Oahu					
To Mainland					
Via Air	Dracaena	20.40	2.87	53.86	77.13
Via Air	Brassaia	3.66	0.16	2.96	6.78
Via Air	Silver Queen	11.15	5.18	48.57	64.90
Via Sea	Aglaonema, Dracaena and Brassaia	12.41	0.49	19.79	32.69
Via Sea	Areca Palms	24.03	0.10	80.73	104.86
From Maui					
To Mainland					
Via Sea	Fasciatas, Neathebella Palms and Aglaonema	1.82	0.42	4.10	6.34
To Honolulu					
Via Air	Flowering Plants	38.75	15.08	102.50	156.33
Via Air	Chrysanthemum	18.63	3.87	130.38	152.88
From Hawaii					
To Mainland					
Via Air	Ficus Benjamina	17.45	1.39	94.05	112.89
Via Sea	Ficus Benjamina and Dracaena	34.44	3.19	92.02	129.65

2.5.7 Trends

The cost of moving nursery products to the mainland has increased about 30 percent for air and 6 percent for sea transport from October 1, 1979 to October 1980. This has resulted, according to industry sources, in a shift to surface containers, a greater concentration of shipments to the Western States and a decrease in the number of product types being exported. There is a trend toward growing more of the unfinished product allowing for very dense packing of containers and, on the extreme, the holding of plants longer so that the wholesale value of the product is increased before shipment. As a general rule of thumb, shippers try to market a combination of nursery stock in each unit device whose wholesale value is at least ten times the total cost of transportation.

Lastly, although shipments intrastate are moving predominantly by sea, the problems of palletized cargo being damaged (crushed) and pilfered have caused more and more local distributors to consider air freight even though cost per pound is much higher.

2.6 FRESH FRUITS AND VEGETABLES

This section focuses on the costs associated with the intrastate transport of fresh fruits and vegetables, excluding pineapples and papayas which are discussed in their respective sections.

The 1979 issue of the Statistics of Hawaiian Agriculture lists 42 broad categories of fresh fruits, vegetables and melons produced within the State of Hawaii. If the numbers of types of products included in each category are considered, it is clear that there is a very wide range of products included under the heading of fruits and vegetables. In the sections following, the costs of transporting some general groups of fruits and vegetables will be discussed. The reader must bear in mind that these are generalizations and while accurate for the industry as a whole may not reflect the situation facing a specific crop or producer.

2.6.1 Intrastate Shipment Patterns

Fruits and vegetables produced on the Neighbor Islands and destined for the Honolulu market are transported both by air and surface freight. Commodities moving by barge are shipped as either deck cargo or in refrigerated containers. Deck cargo is usually palletized while the refrigerated shipments are generally cartons stacked in reefer vans. For deck cargo, the tar-

iff will depend on the type and quantity of the good. Air freight shipments are also generally palletized. A list of commodities that are generally transported on pallets is given in Table 28.

TABLE 28

Fruits and Vegetables Commonly Palletized

For Air Shipments	For Surface Shipment as Deck Cargo
Avocados	Avocados
Beans, green	Bananas
Cabbage, Chinese	Cabbage, green
Cabbage, green	Carrots
Cauliflower	Cucumbers
Celery	Dasheens
Daikon	Onions, dry
Ginger root	Pumpkins
Lettuce, head	Sweet peppers
Parsley, American	Sweet potatoes
Peas, Chinese	Tangerines
Sweet peppers	Taro
Romaine	Tomatoes
Squash, Italian	

Palletized cargo either for air or sea freight is not at all standardized. The pallets vary greatly in size. The height to which a pallet is loaded will depend upon the commodity being shipped, the size of the order, etc. Pallets often will have an assortment of vegetables and may be loaded with various-sized cartons, burlap sacks, or wooden boxes. In such a situation it is difficult to determine transport costs based on the weight of the commodities shipped. A more accurate approach is to first determine the volume-to-weight ratio for each category of the commodities and then to use this conversion factor to determine how many units were shipped.

Fruits and vegetables to be transported in refrigerated containers (reefers) are generally first packed in cardboard cartons. Leafy vegetables and high value products are generally more likely to be shipped in reefers than as deck cargo. Estimates of the shipments of fruits and vegetables from the Neighbor Islands moved on either pallets or in containers are given in Table 29.

TABLE 29

Surface Shipments of Fruits and Vegetables in Pallets and Containers

Production Area	Pallet	Container (1,000 pounds)	Total
Hawaii			
Hilo	1,111	537	1,648
Kawaihae	2,597	6,758	9,355
Kauai			
Nawiliwili	1,417	118	1,535
Port Allen	69		69
Maui	11,669	3,243	14,912
Molokai	465	318	783
Total	17,328	10,974	28,302

Sources: Statistics of Hawaiian Agriculture, 1979.
Unpublished data from the Market News Service, Hawaii Department of Agriculture.
Interviews with shippers and Young Brothers, Ltd.

2.6.2 Production

Fruits and vegetables are grown and consumed on all the principal islands in Hawaii. The great majority of the fruits and vegetables destined for local consumption moves into the Honolulu metropolitan area. Fruits and vegetables move between the Neighbor Islands and from Oahu to the Neighbor Islands. These flows, however, are quite small relative to the movement into the Honolulu market and will not be considered further here. The State Department of Agriculture collects and publishes(10) information on the flow of vegetables into the Honolulu market from all sources and is the primary source of information on quantities used in this section.

The great majority of the fruits and vegetables transported between islands in Hawaii moves via surface. The volume and relative percentage from each of the major points of embarkation are given in Table 30. Shipments originating in Kawaihae and Kahului account for the great majority (78.8 percent) of all shipments of fruits and vegetables destined for Honolulu. The producers in Kona and Waimea on the Big Island use Kawaihae as their major port of embarkation while the farmers on Maui utilize Kahului.

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(10) Honolulu Unloads, published annually.

TABLE 30

Shipments of Fruits and Vegetables to Oahu

Origin	Mode: Air Quanity	Air percent	Surface Quanity	Surface percent	Total Quanity	Total percent
			(1,000 pounds)			
Hawaii						
Hilo	1,212	3.9	1,648	5.3	2,860	9.3
Kamuela	71	0.2	-	-	71	0.2
Kawaihae	-	-	9,355	30.3	9,355	30.3
Kona	448	1.5	-	-	448	1.5
Kauai						
Lihue	99	0.3	-	-	99	0.3
Nawiliwili	-	-	1,535	5.0	1,535	5.0
Port Allen	-	-	69	0.2	69	0.2
Maui	416	1.3	14,912	48.3	15,328	49.7
Molokai	296	1.0	783	2.5	1,059	3.5
Total	2,542	8.2	28,302	91.8	30,824	100.0

Source: Honolulu Unloads, Market News Service, Hawaii Department of Agriculture.

2.6.3 Cost of Transportation

The costs of interisland transportation were determined as follows:

1. The reported tonnage leaving each port was converted into volume measures.

2. The typical volume per pallet or container was determined.

3. The results of 1 were divided by the value of 2 yielding the number of pallets or containers moving to Honolulu.

4. The number of pallets or containers was next multiplied by the appropriate rate.

5. All surcharges, taxes, wharfage fees, and insurance, were added, yielding an estimate of total cost.

6. Total cost was divided by number of pounds shipped to obtain the cost per pound for interisland shipment.

Table 31 presents the results of these calculations, giving the cost of shipment from the Neighbor Island production areas to Honolulu by mode of shipment. These estimates are based on the quantity shipped in 1979 and the 1980 freight rates. The cost of surface shipments in 1979 is therefore slightly overstated. (Surface rates were 2.7 percent higher in 1980 than 1979). The rates in effect in 1980 were used because it was not possible to identify what the interisland air tariff rates were in 1979. It is known that the rate for papayas increased about 30 percent between October 1, 1979 to October 1, 1980. However, because papayas have specialized rates, it was not possible to generalize this increase in costs to all fruit and vegetable shipments.

TABLE 31

Cost per Pound of Interisland Transport of Fruits and Vegetables[a]

Production Areas	Surface	Air
	(cents per pound)	
Hawaii		
Hilo		
Pallet	1.07	6.90
Container	2.00	
Kamuela		
Pallet		6.30
Kawaihae		
Pallet	1.20	
Container	2.03	
Kona		
Pallet		6.72
Kauai		
Lihue		
Pallet		5.67
Nawiliwili		
Pallet	1.03	
Container	1.69	
Port Allen		
Pallet	1.08	
Maui		
Kahului		
Pallet	0.92	5.46
Container	1.68	
Molokai		
Kaunakakai		
Pallet	1.00	
Container	1.34	
Molokai Airport		
Pallet		18.48

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[a] Excluding Pineapples and Papayas.

2.6.4 Other Logistic Costs

Shipments of fruits and vegetables require special packing and handling. Containers should be designed to minimize spoilage, allow for rapid and efficient handling, and be sturdy enough to prevent crushing. Growers report that refrigeration becomes necessary when commodities are in transit for more than 24 hours. Costs of packing range from 2 cents per pound to 6 cents depending upon vegetable type, size of operations, and cooling plant costs.

The cost of packing is composed of material and labor cost. Packing costs differ between islands depending on the type of vegetable produced. Some vegetables can be bagged or boxed in old cartons, while others require new cartons. In the case of Kauai, the price of cartons is approximately one dollar for new cartons and 60 cents for used cartons. It takes approximately 12 minutes to grade and pack a 40-pound carton of vegetables. At $4.83 per hour,(11) packing incurs labor costs of 2 cents per pound.

The vacuum cooling plant in Maui charges a flat rate of 1 cent per pound for all types of vegetables. In Hawaii, it costs 0.6 cents per pound for all vegetables. A privately operated cooling plant on Kauai charges 3 cents per pound for all vegetable types. Packing and cooling costs are summarized in Table 32.

TABLE 32

Cost of Packing and Cooling

Production Area	Material Costs	Labor Costs	Cooling Costs	Total Cost Per Pound
		(cents per pound)		
Hawaii (Kamuela)				
New Box	4	2	0.6	6.6
Kauai				
Used Box	2	2	3.0	7.0
New Box	3	2	3.0	8.0
Maui				
Boxed or Bagged	1	1	1.0	3.0

The products must be transported from the farm either to the airport or the harbor for shipment to Honolulu. Estimates of these costs for the major producing regions are given in Table 33.

The total costs incurred by farmers in moving their products to markets in Honolulu are summarized in Table 33. Air freight costs range from a low of 8.3 cents per pound on Maui to a high of 20.6 cents a pound for Molokai. The air freight costs on Molokai relect the fact that there is no all cargo air carrier service to Molokai and all air freight must move on passenger carriers. Surface costs are lower, ranging from a low of 3.4

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(11) Hourly wage rate in 1979. Statistics of Hawaiian Agriculture, 1979.

cents a pound on Molokai for palletized cargo to a high of 11.3 cents for containerized cargo from Nawiliwili on Kauai.

When compared to the farmgate values of the fruits and vegetables, the logistic costs always represent a very significant amount, typically about 60 percent for air freight and between 20 and 40 percent for surface. The ratio of logistic costs to farmgate value is given as a percentage in Table 34.

TABLE 33

Fruits and Vegetables - Total Logistic Costs: 1979

Production Area	Packing	Cooling	Inland Transportation	Interisland Transportation	Total
			(Cents per pound)		
Hawaii					
Hilo					
Air	6	0.6	0.84	6.90	14.34
Surface-Pallet	6	0.6	0.84	1.07	8.51
Surface-Container	6	0.6	0.84	2.00	9.44
Kamuela					
Air	6	0.6	0.23	6.30	13.13
Kawaihae					
Surface-Pallet	6	0.6	0.58	1.20	8.38
Surface-Container	6	0.6	0.58	2.96	10.14
Kona					
Air	6	0.6	0.73	6.72	14.05
Kauai					
Lihue					
Air	5	3.0	0.55	5.67	14.22
Nawiliwili					
Surface-Pallet	5	3.0	0.70	1.03	9.73
Surface-Container	5	3.0	0.70	1.69	10.39
Port Allen					
Surface-Pallet	5	3.0	0.17	1.08	9.25
Maui					
Kahului					
Air	2	0.1	0.75	5.46	8.31
Surface-Pallet	2	0.1	0.89	0.92	3.91
Surface-Container	2	0.1	0.89	1.68	4.67
Kaunakakai					
Air	2	uk	0.00	18.48	20.48
Molokai					
Surface-Pallet	2	uk	0.44	1.00	3.44
Surface-Container	2	uk	0.44	1.24	3.68

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uk = unknown.

TABLE 34

Logistic Costs as a Percentage of Farmgate Price

Production Area	Farmgate Price (cents)	Logistic Costs as a Percent
Hawaii		
Hilo		
Air	21.93	65.4
Surface-Pallet	21.93	38.8
Surface-Container	21.93	46.1
Kamuela		
Air	21.93	60.0
Kawaihae		
Surface-Pallet	21.93	38.2
Surface-Container	21.93	46.2
Kona		
Air	21.93	64.1
Kauai		
Lihue		
Air	32.74	43.4
Nawiliwili		
Surface-Pallet	32.74	29.7
Surface-Container	32.74	34.4
Port Allen		
Surface-Pallet	32.74	28.2
Maui		
Kahului		
Air	19.29	43.1
Surface-Pallet	19.29	20.3
Surface-Container	19.29	24.2
Molokai		
Air	19.29	106.2
Kaunakakai		
Surface-Pallet	19.29	17.8
Surface-Container	19.29	19.1

2.6.5 Trends

Unlike some of the other commodity groups, the methods used in shipping fresh fruits and vegetables between islands have not changed appreciably over the past two years. This is because the Neighbor Island producers have traditionally used surface transportation (the least-cost mode) for moving the great bulk of vegetables and fruits. The cost of moving these products has increased although the rate of increase has been slower than it has been for some of the other commodity groups. Young Brothers Ltd. must receive approval for all rate increases and

surcharges from the Public Utilities Commission while air carriers are no longer required to request approval for tariff increases.

Vegetable farmers have recently experienced some problems in obtaining refrigerated containers from Young Brothers. This was probably due to the large increase in demand for containers by the papaya industry. Young Brothers reportedly anticipates the purchase in 1981 of 30 additional reefers (they have 75 now). However, it is uncertain how many containers in the existing fleet will be replaced with the arrival of the new containers.

Kamuela farmers in the past have shipped Chinese cabbage in Matson reefers to the mainland in the high production months of March, April and early May. Growers have indicated that this practice slowed substantially in 1979 due to increased shipment costs and may not be feasible this spring at all. In the past there have also been limited quantites of avocados, mangos, tomatoes, cucumbers and ginger shipped to mainland markets via air. Ginger is also shipped via surface modes.

2.7 LIVESTOCK

Several different categories of livestock are transported between islands in Hawaii. Available data indicate that cattle, horses, hogs and goats are all being shipped. The great bulk of the shipments, however, are cattle destined either to feedlots or slaughter houses on Oahu. The second largest category is that of hogs destined for markets in Honolulu.

In this section of the report, the focus will be on the transport of live animals. Dressed-out or otherwise processed carcasses do move between the islands, but this aspect of the transport of livestock is beyond the scope of this study.

2.7.1 The Transport of Livestock

Estimates of the cost of transporting livestock were obtained using current (1980) costs and 1979 quantites. This approach was followed because the quantities shipped in 1980 are not yet available. The resulting values do, however, provide a good estimate of what the costs were in 1980.

In Hawaii, livestock is transported primarily via surface modes. Some animals do move via air, but these are primarily horses. The shipment of horses via air is primarily for recreational purposes and will not be considered further in this study.

The surface shipment of livestock between islands requires that the animals be carried in trailers. The trailers may belong to either the shipper or the carrier. The tariffs for shipping livestock are based on the size of the trailer, i.e., the tariffs are given in dollars per 40 cubic feet. Thus, the more animals the shipper can place in a trailer, the lower will be the cost per animal or per pound.

2.7.2 Quantities Shipped

The great majority of all livestock shipments are from the Neighbor Islands to Oahu. There are shipments between the Neighbor Islands and from Oahu to the Neighbor Islands, however, the only readily available data was for shipments to Oahu and these shipments were used to determine the costs of transporting livestock.

The Big Island is the source of almost three-quarters of the livestock shipped to Oahu, followed in importance by Maui, Kauai and Molokai. The number of cattle and hogs shipped to Oahu from each of the Neighbor Islands is given in Tables 35 and 36.

TABLE 35

Cattle Shipments to Honolulu in 1979

From	To Feedlot	For Immediate Slaughter
	(number of head)	
Hawaii	15,900	3,300
Kauai	1,400	100
Maui	3,700	100
Molokai	1,100	500
Total	22,100	4,000

Source: Hawaii Agricultural Reporting Service.

TABLE 36

Live Hog Shipments for Immediate Slaughter

Origin	Head
Hawaii	500
Kauai	100
Maui	2,400
Total	3,000

Source: Hawaii Agricultural Reporting Service.

2.7.3 Costs of Transport

There is one tariff for moving livestock between any two specified harbors in the State of Hawaii, regardless of the type of livestock. The following discussion refers to cattle shipments, but the per unit costs determined will apply to other livestock such as hogs and goats, assuming that they are loaded to a density equal to that for cattle.

The cost per pound of transporting livestock was determined based on an estimated density of 12 pounds per cubic foot. This conversion factor was derived from conversations with industry personnel and published sources.(12) Given these assumptions the cost per pound in 1980 was about one cent for all the Neighbor Islands (Table 37). If the trailers are less than fully loaded, the cost would be higher. For example, if the trailers were only half full, the cost would double.

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(12) Kuttner, W.S., A Disaggregate File of Commodity Attributes, Center for Transportation Studies, Massachusetts Institute of Technology, 1979.

TABLE 37

Tariffs and Cost per Pound of Transporting Livestock: 1980

Island of Origin	Rate Per 40 Cubic Feet (dollars)	Cost Per Pound (cents)
Hawaii	5.20	1.08
Kauai	5.00	1.01
Maui	5.00	1.01
Molokai	4.78	0.99

2.7.4 Other Logistic Costs

The costs incurred by ranchers to move their livestock from the staging area to the harbor for shipment to Honolulu and then from the Port of Honolulu to the feedlot or slaughter-house are given in Table 38. These costs reflect the situation existing on October 1, 1980 and include the cost of spotting a 30-foot or longer trailer. On the Big Island, these costs are 10.25 percent higher than they were in 1979; on Kauai the increase was 14 percent; for the County of Maui the increase was 13.6 percent; and on Oahu the increase was only 2 percent. The calculations underlying Table 38 assume that each trailer contained 40,850 pounds of livestock.

TABLE 38

Costs of Trucking Cattle from Inland Points to the Harbor and from Honolulu Harbor to the Slaughterhouse or Feedlot: 1980

Production Areas	From	To	Cost (Dollars)	Cost Per Pound (Dollars)
Hawaii	Kamuela	Kawaihae	52.51	0.0013
Kauai	Waimea	Nawiliwili	134.84	0.0033
Maui	Haleakula	Kahului	115.43	0.0028
Molokai	Maunaloa	Kaunakakai	67.40	0.0017
Oahu	Honolulu Harbor	Feedlot or Slaughter-house	131.00	0.0032

Source: Motor Tariff Schedules, Western Motor Tariff Bureau, Inc.

All the transportation costs involved in shipping livestock are summarized in Table 39. Because of the rate structure and the value of cattle, transportation costs do not represent a large portion of the value of the animals. The largest percentage is 3 percent for Kauai and the lowest is 2.6 percent for both Molokai and the Big Island. These figures are based on 1979 prices for cattle and the transport costs occurring in 1980.

TABLE 39

Cattle Transport Costs: 1980

	Production Areas			
	Hawaii	Kauai	Maui	Molokai
		(cents per pound)		
Farmgate Value	56.50	53.80	56.60	56.20
Cost of Inland Transport	0.13	0.33	0.28	0.17
Cost of Interisland Transport	1.08	1.01	1.01	0.99
Cost of Transport on Oahu	0.32	0.32	0.32	0.32
Total Transport Costs	1.53	1.66	1.61	1.48
Transport Costs as a Percent of Farmgate Value	2.71	3.09	2.84	2.63

2.7.5 Trends and Summary

When compared to previous years, the number of head of livestock slaughtered on Oahu has been declining. The slaughterhouses on the Neighbor Islands have increased their capacity and more processed carcasses are now being shipped to Oahu than in the past. This trend is probably partly due to the rising costs of transport and to the increased costs of fattening animals on Oahu.

Examination of the receipts of Young Brothers, Ltd., and the estimates of the number of head shipped indicate that the trailers departing from the Big Island and from Molokai are fully loaded while those departing from Maui and Kauai are not. Thus the actual cost of interisland transport as well as the overland legs will be higher , on the average, to shippers on Maui and Kaui.

3. PROBLEMS AND POLICIES

3.1 SHIPPER AND GROWER PERSPECTIVE

The primary sources of much of the information used in preparing this report were interviews with the shippers and growers of Hawaii. In the course of the interviews, the shippers and growers often expressed their opinions on the major transportation problems they face and what they believed might be solutions to some of the problems. Overall, the comments of the shippers and growers relating to their perceptions of the shortcomings of the existing transport system fell into three general categories: (1) dissatisfaction with the quality of service being rendered; (2) problems relating to the small size of individual shipments; and (3), the high costs associated with transport services.

Complaints relating to the quality of service included comments on scheduling, handling, and frequency of service as well as complaints about the lack of requisite infrastructure. The following are some specific comments relating to the quality of service:

1. Some method should be found to minimize the delays occurring while waiting for transshipment in Honolulu.

2. The warehouse, cooling and freezing capacities at all the airports and harbors should be increased and improved.

3. More inter-line agreements between carriers would facilitate the efficient and economic transshipment of commodities.

4. Local air passenger carriers should be encouraged to handle large shipments, particularly of commodities such as anthuriums and other cut flowers.

5. More air carriers should be encouraged to stop in Honolulu.

6. Direct air service to overseas destinations from Neighbor Island airports would eliminate the transshipment costs and reduce the amount of time the product must spend in-transit.

7. Farmers on Kauai report that the new barge schedule is not compatible with their needs.(13) Because of the

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(13) Honolulu Star Bulletin March 5, 1981.

current schedule, produce shipped on a week-end has to spend an extra day in a container before reaching the market.

A common comment from the shippers of flowers and nursery products was that some method should be found to encourage the growers to consolidate their shipments. Consolidation has the potential to substantially reduce transport costs for some shippers.

Almost everyone contacted made some comment about the high costs of transport and the way costs have been increasing. In fact, the common factor in almost all the comments received, was cost. Problems of scheduling, losses due to spoilage, lack of appropriate service, etc., are all actually statements of the general form, "the service I would like costs too much." Comments directed specifically at the cost of transport services included:

1. Better post-harvest handling techniques for cut flowers should be developed. This would reduce losses due to product deteriation while in-transit.

2. Producers should be subsidized until they are large enough to support their own freight service.

3. Intrastate carriers moving agricultural commodities should be extempt from landing fees.

Another comment, which could be included in all of the above, relates to the inconsistent transport policy within the State of Hawaii. Intrastate surface freight is regulated by the Public Utilities Commission (P.U.C.), interstate surface freight by the Federal Maritime Commission (F.M.C.), and air freight, both intra- and interstate is regulated by the Civil Aeronautics Board (C.A.B.) and the Federal Aviation Administration (F.A.A.). Ports and harbors are under the auspices of the Army Corps of Engineers and roads and airports under the auspices of the State Department of Transportation. In such an environment where the infrastructure is under the control of State and Federal agencies and regulated by different State and Federal agencies, it is difficult to conceive of, much less achieve, a consistent transportation policy.

3.2 ANALYSIS OF POLICY ALTERNATIVES

In this section, some of the alternatives which could either alleviate the transportation cost burdern to the agricultural sector or facilitate the movement of agricultural products will be considered. Some of the alternatives would require direct State support, others could be initiated by shippers and growers, and some could be implemented by the commercial carriers. In particular, the impacts of (1) lessening the tax burden on transportation services; (2) the use of differential rate structures; (3) the direct subsidization of agricultural transportation; (4) the reduction of costs through consolidation; and (5) the indirect subsidization of agriculture and agricultural transportation will be examined.

3.2.1 Lessening the Tax Burden

The State currently collects a P.U.C. tax of 4 percent and a wharfage charge on all intrastate surface shipments. For all the surface intrastate shipments and transshipments of agricultural products considered in this report, the total of these fees, based on the quantities shipped in 1979 and current rates, was 49,000 dollars, or approximately 6.35 percent of the total transport costs.

The State recently initiated a wharfage fee for all containerized surface shipments to overseas markets. The fee is 38 cents per lineal foot or 9.12 dollars per 24 foot container. If this charge had been in effect in 1979, over 48,000 dollars would have been collected on shipments of agricultural products In 1981, these wharfage fees are projected to represent approximately 1.5 percent of the total transport costs of overseas surface shipments of non-processed agricultural products.

If the State were to waive the P.U.C. tax and wharfage fees for the intrastate shipment and transshipment of agricultural products, the shippers and consumers would benefit. A small shift to surface shipments from air could be expected as surface shipments would become relatively less expensive.

Shipments of fresh pineapples produce over 96 percent of the wharfage fees collected from the overseas shipments of unprocessed agricultural products. If the wharfage fee for overseas shipments were to be waived for agricultural products, the total reduction in transport costs would be less than 1.5 percent and almost all the benefits would accrue to the pineapple industry.

The only fees collected by the State that directly affect the cost of moving agricultural products by air are the landing fees charged the airline companies. It is difficult to obtain

precise estimates of the portion of the landing fees attributable to agricultural products because cargo and passengers are both carried by some carriers and no carrier moves exclusively agricultural products. Also, Aloha and Hawaiian airlines pay an airport use charge rather than landing fees.

However, by examining the volume of agricultual products shipped by air versus the total volume of air freight shipments, it is possible to estimate the landing fees incurred by agricultural commodities. In 1979, 17 percent of all intraisland air shipments were agricultural products and 51 percent of the shipments into Honolulu from the Neighbor Islands were composed of agricultural goods. Based on these estimates, only slightly more than 8,000 dollars in landing fees were generated by agricultural commodities. Landing fees represented less than 0.5 percent of the transport costs incurred by agricultural commodities moving intrastate by air.

Transport expenses directly related to State taxes and fees do not represent a significant portion of total transportation expenses for air freight. However, the possibility of removing the State taxes on surface shipments, particularly the intrastate shipments, should be considered as one way of lessening the impact of transport costs on agriculture.

3.2.2 Differential Rates

Typically, both in Hawaii and on the Mainland, the transportation rates charged to agricultural products are less than the rates applied to general merchandise. On the mainland, these lower rates reflect both the importance of agricultural products in terms of the total volume shipped and the cost of transporting the products. In Hawaii, the lower rates are based on the fact that most agricultural shipments utilize excess capacity available on the backhaul.

In Hawaii, the State has control over the structure of intrastate surface rates through the P.U.C. The P.U.C. could accentuate the difference between the rates charged to agriculture and the rates applicable to other commodities.

In 1979, agricultural products contributed only 5.4 percent of the total revenues generated for scheduled interisland surface shipments. Young Brothers, Ltd. has submitted a petition to the P.U.C. for an across-the-board rate increase of 16 percent in 1981.(14) The same increase in revenues would be obtained if the rates for all non-agricultural commodites were inceased 17.2 percent and agricultural rates remained the same.

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(14) Honolulu Star-Bulletin, January 31, 1981.

The difference in rates between agricultural commodities and other merchandise should not be allowed to become so large that agricultural items are no longer paying for the service they receive. If the gap between the rates widens much more, the other items will be subsidizing the transport of agricultural goods. This is, in effect, a tax on the residents of the Neighbor Islands and on businesses operating on the Neighbor Islands and a benefit to Neighbor Island agriculture. There would be no significant effect on market prices on Oahu, Neighbor Island producers would become slightly more competitive with their Oahu counterparts and cost of living and doing business on the Neighbor Islands would increase.

3.2.3 Direct Subsidies

The direct subsidization of the shipment of agricultural products is a common proposal whenever the costs of intraisland transportation are discussed. Subsidies can take several forms, including mandated special rates as discussed above, rebates, tax credits, and direct payments. At first glance, such proposals seem to have merit. The total cost of intrastate shipments of unprocessed agricultural products is only 2.5 million dollars including transshipments. Young Brothers, Ltd. reports that in 1979 agricultural products accounted for only 5.4 percent of their revenues. Agricultural products, however, were much more important on the Honolulu bound portion of the route, where they accounted for nearly 21 percent of revenues or approximately 780,000 dollars. The total revenue from the surface shipment of agricultural products in 1979 was only 930,000 dollars.

Direct subsidies, however, are economically inefficient and difficult and expensive to administer. They are inefficient because they can cause gross distortions in production and marketing patterns. For example, suppose that some portion of the intraisland transportation bill were to be paid for by the State. There would be several immediate effects: (1) Air transport would become more attractive to the shippers and there would be an immediate shift from surface to air shipments. This would be a boon to the air freight industry but would result in significant reductions in revenues to the surface carrier, especially on the Honolulu bound portion of the trip; (2) The availability of cheaper transport, from the viewpoint of the shipper and grower, would discourage the processing of agricultural products on the Neighbor Islands; (3) The producers on the Neighbor Islands would initially become more competitive with their Oahu counterparts, but over time, the saving in transport costs would be reflected in increased values of agricultural lands and agricultural leases.

Direct subsidization would require that some agency be responsible for the regulation of rates. If rates are unregulated, it will be possible for carriers to increase their rates without decreasing costs to the shipper and thus capture a portion of the subsidy for themselves without affecting the demand for their services. The P.U.C. already regulates the rates for surface freight, but air freight rates are currently determined by supply and demand conditions and competition between carriers and between modes.

The subsidization of only surface freight would destroy the competitive position of the air freight industry. Agricultural products currently account for more than half the intraisland air freight bound for Honolulu. If surface freight were to be subsidized, the air carriers would have to compete with a service being offered at less than cost.

Direct cash payments to shippers is another possible form of subsidy. However, if the size of the payment is based on the transportation bill, the problems of encouraging a shift to the more expensive mode and distortions in production and marketing patterns will still exist. If the payment is not related to the transport bill, then the subsidy just becomes a subsidization of agriculture. Direct subsidies, either in some form of rebate or in direct cash payments, should be avoided. Such subsidies have the potential of causing major distortions in production, shipping and marketing patterns, are generally economically inefficient, and are expensive to administer.

3.2.4 Consolidation

The transport costs for some shippers of agricultural products could be reduced by the consolidation of their shipments into unit-load-devices. The potential savings for shippers could be substantial; as large as 25 percent of their current transport costs. Given the current structure of the agricultural sector, the shippers most likely to benefit from a program of consolidation are the shippers of small quantities of flowers and nursery products. Pineapple and papaya shippers already make efficient use of unit-load devices and intrastate shipments of fresh fruits and vegetables are largely consolidated. The limited number of livestock shippers on any one island would make consolidation difficult, but perhaps some reduction in costs could be achieved.

A consolidation program could be organized in several ways. One possibility would be for shippers to form an association which then hires someone to coordinate transport services for the members' goods. The association would function like a freight forwarder. A second possibility would be the establishment of a freight forwarding service or the utilization of

an established service. A third would be a central clearinghouse approach. This would be an agency responsible for receiving orders, scheduling deliveries, arranging for transport, handling bills, etc. Such an operation might take the form of a shippers' cooperative.

For a consolidation program to work, it must be in the economic interest of the individual shipper to participate. The gains obtainable must outweigh the costs incurred. Large shippers who already ship sufficient volumes to utilize unit-load devices and pay minimum rates will have no incentive to participate. Therefore, for a consolidation program to succeed, there must be a sufficient number of small shippers willing to participate.

A consolidation program is not without costs. Besides the direct costs incurred in managing such a program, consolidation could affect the marketing programs of the individual shippers, particularly those selling their products in overseas markets. For example, consolidation may only be feasible for shipments to major market centers. It is unlikely that it will be possible to consolidate small shipments going to separate markets. Also, if the consolidated shipment is to be marketed as a single unit, it becomes important that either the product be of a uniform quality or that any difference in quality in different shippers' product be accounted for. If not, the shippers of high quality goods will be penalized whenever goods of lesser quality are consolidated with their shipment.

One alternative that has the potential of alleviating several of the apparent problems with the existing transport system is the creation of one or more shippers' cooperatives. Several relatively small operations would be able to consolidate their demands for transport services, and as a coop, be able to take advantage of the rates, services, and scale economies available to large operations. Such a cooperative could perform several functions: it could consolidate freight, schedule shipments, own or lease containers, charter transport, provide quick cooling and cold storage facilities, etc.

Whether or not such a cooperative would be a viable alternative is not yet known. The feasibility will depend on the transport situation facing each member shipper, the number of member shippers, and the amount and type of transport services demanded by the members. It appears that a good strategy would be to include non-agricultural as well as agricultural shippers in such a cooperative. The larger the volume of freight handled, the greater the bargaining position of the coop vis-a-vis the transport industry and the easier it will be to make efficient use of unit-load devices and available capacities. It also would be a good idea to incorporate as members shippers who are primarily importing goods to their island. The coop would then be able to arrange for fronthaul and backhaul at the same time.

Whatever the organization of such a coop or coops (a separate coop on each island is a possibility) and the composition of its members, the potential for reducing costs and either overcoming or bypassing some of the bottlenecks and shortcomings of the existing system, make the possibility of establishing a shippers' coop an alternative that should be investigated further.

3.2.5 Indirect Subsidies

Indirect subsidies to agriculture and to the transport of agricultural products take on several forms. One of the major indirect subsidies is the provision of the basic transportation infrastructure by county, state and federal agencies. The provision of research and extension services by state and federal agencies is another important indirect subsidy. Other examples include tax advantages such as those under land dedication or green belt laws, programs such as the soil conservation service, promotion and marketing assistance given by governmental agencies, and various regulatory programs that facilitate efficient marketing.

The efficiency of a transport network is contingent on the existence of the appropriate infrastructure; both the requisite physical facilities and the necessary services. In the context of the transport system serving Hawaii, the government provides and maintains harbors, roads, and airports. Important services provided by the government include the weather forecasts, the Coast Guard Service, and the regulation of commercial carriers.

Currently there are only very limited facilities at Honolulu International Airport for the temporary storage of air freight and air freight facilities at Neighbor Island airports are either nonexistant or in very poor condition. The provision of facilities to keep perishable products cool while in-transit or waiting for shipment would diminish the spoilage and would also alleviate some of the problems occurring in trying to schedule the transshipment of perishable products. In the future, the lack of facilities for air freight may be an increasingly important constraint for certain agricultural crops. Limited air cargo space and flight changes, especially on the Neighbor Islands, will force greater use of temporary storage at the port of origin and in Honolulu for staging overseas shipments.

To date, there has been very little emphasis given by the State to the construction of air freight facilities. The current biennial budget request for the construction of facilities at airports is for 130 million dollars. Of this total, only 1.3 million dollars is earmarked for air freight facilities.(15) The State should also consider improving the facilites for handling and storing freight at the harbors, particu-

larly on the Neighbor Islands. For example, the provision of covered storage at Kawaihae would greatly ease one of the problems currently facing vegetable farmers on the Kona Coast.

Improvements in the transport infrastructure serving air freight would not benefit just agricultural shippers. The provision of cool or cold storage facilities would also greatly benefit the shippers of fresh fish. Based on interviews with shippers of fresh fish on Hawaii, it appears that the value of fresh fish shipments from the Big Island will soon surpass the combined value of shipments of nursery products and fresh fruits and vegetables, excluding papayas.

3.2.6 Research and Development

Another form of indirect subsidy to agriculture is the research carried out under government support on such diverse subjects as the development of new products, improved production and handling techniques, new or more efficient methods of processing goods, and the development of marketing strategies and programs. These types of programs have the potential of a tremendous long-run impact on agriculture. In the context of the transportation related problems currently facing Hawaii's agricultural sector, the development of new products or varieties more amenable to transport by least cost means, research on packaging, handling, and shipping techniques that minimize spoilage and increase shelf life, and the creation of new markets could have benefits far outweighing any short-term reductions in the cost of transportation.

When the costs of transport were computed in this report, the cost of spoilage was not explicity included. The current wholesale and retail prices are determined based on an expected rate of deterioration. However, for perishable products, especially those which spend a significant amount of time in transit such as goods destined for overseas markets moving by surface means, the combined costs of the spoilage occurring while in transit and the decreased shelf life upon arrival can be substantial. Rough estimates of the magnitude of these costs can be obtained from data generated by an experiment on shipping papayas from the Big Island carried out during 1977 and 1978.(16) After seven days in a refrigerated container, approximately the transit time between Hawaii and the West Coast by sea, 3 percent of the fruit was spoiled. However, after being removed from the container for two days, that is, on the shelf

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(15) Honolulu Star-Bulletin, February 10, 1981.

(16) Unpublished data made available by A. Alvarez, University of Hawaii, Manoa.

for two days, 15 percent of the fruit was spoiled. After three days the spoilage rate increased to 32 percent. If the typical display duration for papayas in mainland markets is three days, this spoilage rate implies that the price the shipper received was 47 percent lower than it would have been if there were no spoilage. If the rate of spoilage could be reduced by half, the increase in value of the product would more than pay for all the logistic costs incurred in marketing the papayas.

The roles that infrastructure, market research and product development play in developing efficient and responsive agriculture and transportation sectors are extremely important. Investment in facilities and other infrastructure provide short term benefits in the form of increased employment. But more importantly, this type of investment facilitates the development by the private sector of new technologies, new products and new solutions to their problems. Investment in infrastructure and research can lead to significant reductions in transportation costs.

3.3 SUMMARY

An island chain located 2,500 miles from its major export markets will always have a difficult time competing with its closer competitors. Hawaii's agricultural products have always incurred significant transport costs in reaching overseas markets, but because of efficient production and marketing practices combined with a cost effective transport system, were able to compete. However, transportation costs are increasing and because of the world crude oil situation are expected to continue to increase. Hawaii's existing production and transportation systems may no longer be the most effective. For Hawaii's agricultural industries to maintain or better their competative position, they must adapt to the existing situation and develop cost-effective systems to minimize the impact of the rising transport costs.

Growers and shippers in Hawaii may have greater expectations of what government can do to ameliorate transport cost increases than may in fact be either possible or feasible. The chief responsibility for the development of appropriate cost effective production, transportation, and marketing systems lies with the private sector. However, there are actions which can be taken by government which can greatly facilitate and even stimulate improvements in the transport system.

1. The State should place a higher priority on agricultural products in the State airport development plan. Facilities to handle, store, and process air freight are needed.

2. Research and development programs directed towards agriculture should be emphasized. This type of investment has the potential for producing gains that will off-set transport costs and of developing products that can be transported efficiently and cheaply.

3. The feasibility of establishing a shipper's cooperative should be investigated. Such a cooperative has the potential of overcoming or bypassing several of the current transport problems without requiring a major investment by the State.

4. The possibility of lessening or removing the taxes imposed by the State on intrastate and overseas surface shipments should be considered.

5. Direct subsidies, either in the form of rebates or direct cash payments should be avoided. Subsidies will cause distortions in production and marketing patterns and are expensive to administer. Also, subsidies will not lead to a long term solution to the problem.

6. The State should move toward a more integrated, less regulated transportation policy. The current situation with several federal and state agencies reponsible for regulation and planning for different segments of the transport system, makes the development of transport policy and plans almost impossible.

Appendix A

ESTIMATION OF TRANSPORT COSTS FOR PAPAYAS

Interisland air freight costs were estimated using the following assumptions:

1. Tariffs are the weighted average of DHL and ACE tariffs on October 1 of the respective years. The weights give twice as much weight to DHL and are based on interviews with the major papaya shippers.

2. The tarrifs include a 5 percent federal transportation tax as well as any other charges such as fuel surcharges. This tax was cancelled October 1, 1980.

The cost of interisland transport by surface is based on the published tariffs of Young Brothers, Ltd., and include the following:

1. A 2.7 percent fuel surcharge.

2. Insurance charges of $0.69 per revenue ton (40 cubic feet or 2000 pounds).

3. A Public Utilities tax of 4 percent.

4. Assumption that papayas are shipped in 25 pound cartons on pallets with 36 cartons per pallet.

5. A wharfage charge of $0.44 per pallet.

Mainland air freight costs were computed assuming that the papayas were shipped at 10 pounds per carton (gross weight of 11 pounds) in LD-3 containers. It was assumed that 255 cartons were packed into each LD-3.

The cost of surface freight to the mainland includes Matson's rate plus any surcharges plus warfage. The surcharges were 5.6 percent in 1979 and 4.8 percent in 1980. Wharfage charges at Los Angeles Harbor are $3.25 per 1000 kilos.

The costs of transshipments were computed in analogous fashion with the addition of the following assumptions:

1. When papayas moved on pallets via surface, there were 1080 pounds of papayas per pallet.

2. All papayas shipped by air were stuffed into an LD-3 in either Honolulu or Hilo.

3. The cost of stuffing an LD-3 in Honolulu and transporting it to the airport is 15 dollars.

The procedure used to determine the costs for foreign shipments is the same as the above.

Appendix B

ESTIMATION OF LAND TRANSPORT COSTS

The cost calculations assume a 1.5 ton flatbed truck with a small V-8 engine. The following values were assumed:

Purchase Cost	$ 12,000	
Salvage Value	$ 1,200	
Annual Miles of Use	4,000	miles
Years of Use	8	years
Fuel Use (miles/gallon)	7	mpg
Fuel Cost (dollars/gallon)	$ 1.20	
Annual Interest Rate	18	%
Annual License fees	$ 94	
Annual Insurance	$ 225	
Tire Cost (dollars/set)	$ 480	
Tire life (miles)	10,000	miles
Annual Maintenance	$ 200	

Based on the above, the total cost per mile is $0.9837. Labor expenses were estimated assuming the vehicle operates at an average of 30 miles per hour and the driver is earning a wage(17) of $5.70 per hour. Including labor costs, the total cost per mile is $1.16.

Round-trip distance for each island was calculated by taking the weighted average for all major producers. The following quantities per shipment were assumed:

1. From the farm to the processor: 2 tons.

2. From the processor to the airport: 2 LD-3's.

3. From the processor to the harbor: 5 pallets.

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(17) Statistics of Hawaiian Agriculture, 1979.

Appendix C

DESCRIPTION OF NURSERY PRODUCTS USED IN THE ANALYSIS

Production, Area and Mode	Nursery Products	Plant Description	Number of Plants Per Container
Oahu			
Via Air	Dracaena	Pot Size: 4 to 8 inches Plant Size: 18 to 22 inches	550
Via Air	Brassaia	Pot Size: 2 inches	10,000
Via Air	Silver Queen	Pot Size: 6 inches and one gallon	610
Via Sea	Aglaonema, Dracaena and Brassaia	Pot Size: 4 to 8 inches Plant Size: 16 to 22 inches	4,800
Via Sea	Areca Palm	Pot Size: gallon Size: 4 ft. and over	1,200
Maui			
Via Air	Flowering Plants1	Pot Size: 4 to inches Plant Size: 16 to 18 inches	200
Via Air	Chrysanthe-mum	Pot Size: 6 inches Plant Size: 18 to 24 inches	1,050

	Benjamina, Dracaena	10 inches Plant size:16-18 inches	
via Sea	Ficus Benjamina Dracaena	Pot size:8,10,12 inches Plant size:18-24 inches	800

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[1] Shipped loose.

Appendix D

COST OF INTER-ISLAND TRANSPORTATION FOR FRUITS AND VEGETABLES EXCLUDING PINEAPPLES AND PAPAYAS

The following steps were used in determining the cost of transporting fruits and vegetables.

1. Determine the volume in cubic feet needed to move the commodities to market. A different mix of vegetables moves through each port, however, the packing densities (in pounds per cubic foot) have been established for each vegetable and fruit type.[14] dividing the weight of each type of commodity shipped by the appropriate density and then summing provides an estimate of the total volume shipped.

2. For each commodity type, determine if the product moves by pallet or container. (Based on Industry sources and interviews with shippers and growers).

3. Determine the typical volume moved on each pallet or in each container.[15]

   a) Pallet (regular vegetables)= 4' x 5' x 3.5' = 70 cu. ft. and at 90 percent capacity= 63 cu. ft. /pallet.

   b) Pallet (green cabbage) = 4' x 5' x 4'4" = 86.66 cu.ft. and at 90 percent capacity= 78 cu. ft. /pallet.

   c) Containers(reefers) = average of 938.1 cu. ft. and at 90 percent capacity= 844 cu. ft./container.

4. Determine the number of pallets and containers moving between ports. (Total volume divided by volume per unit).

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[14] Kuttner, William S., A Disaggregate File of Commodity Attributes, Center for Transportation Studies, Massachusetts Institute of Technology, August, 1979.

[15] Based on discussions with farmers and wholesalers, a figure of 90 percent was used as loading factor.

5. Multiply the number of units moved by the rate applicable. (Note:Add surcharge of 2.7 percent for Young Brothers).

6. Add insurance for surface shipments at 69 cents per revenue ton. (Note: One revenue ton = 40 cu. ft.)

7. Add tax. Air shippers were charged a 5 percent transportation tax through October 1, 1980. Surface shippers were charged 4 percent P.U.C. tax.

8. Add wharfage fees. The state collects 44 cents per pallet and $7.60 per refrigerated container for shipment from port to port.

9. Add all costs and divide by the number of pounds shipped in each category to determine cost per pound.

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