

# Estimated Impact on Hawaii's Economy of Replacing Selected Fresh Vegetable and Fruit Imports

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## INTRODUCTION

Agriculture in Hawaii is often categorized as the sugar industry, the pineapple industry, and diversified agriculture, which includes any crop (including livestock) besides sugarcane and pineapple. Within diversified agriculture are crops sold as fresh produce and crops that are processed. Diversified agriculture also consists of crops that are consumed in Hawaii and crops whose final products are exported (e.g., macadamia nuts, coffee, and guava).

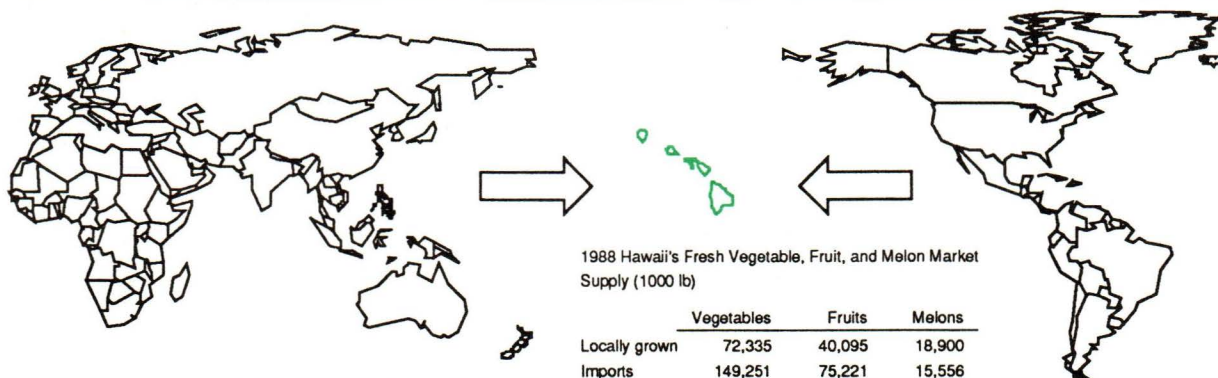
This analysis focuses on Hawaii's market for fresh vegetables and fruits. Hawaii farmers face strong competition for their own local market, as the state imports a relatively large quantity of vegetables and fruits from the U.S. mainland and foreign countries. In 1988, the supply of fresh vegetables in Hawaii was 221,586,000 pounds, of which 149,251,000 pounds, or 67%, were imported. During the same year, the fresh market supply of fruits and melons amounted to 149,772,000 pounds, of which 90,777,000 pounds, or 61%, were imported (Statistics of Hawaiian Agriculture, 1988). The objective of this study is to estimate the maximum potential impact on Hawaii's economy if local producers were to replace imports of selected fresh vegetables and fruits.

## INPUT-OUTPUT ANALYSIS

An economy consists of various industry sectors such as agriculture, food processing, and transportation. Growth in any industry results in an increase in output, income, and employment for that industry. This is the direct impact of industry growth. There is an interdependent phenomenon, however, whereby growth in any single industry will also affect the output, income, and employment in other industries. This is referred to as the indirect impact. Input-output (I-O) models<sup>1</sup> specify the interdependencies among industry sectors, and I-O analysis is an appropriate tool to estimate the effects of industry changes. The 1982 State of Hawaii input-output model was used to estimate the impact on Hawaii's economy of replacing imports of selected fresh vegetables and fruits. The I-O model was developed by the Hawaii State Department of Business and Economic Development.

Import replacement requires that farmers in Hawaii's diversified agriculture sector increase

<sup>1</sup> There are many publications that explain input-output analysis. One is *The Elements of Input-Output Analysis* by William H. Miernyk, published in 1965 by Random House.



**Table 1. Estimated Changes in Acreage and Farm Value of Selected Fresh Vegetables and Fruits from Import Replacement, 1988**

	Market Supply		Hawaii Share 1988 (%)	State Acreage Harvested <sup>1</sup> (acres)	Yield per Acre <sup>2</sup> (1000 lb)	Farm Price (¢/lb)	Estimated Additional Acreage <sup>3</sup> (acres)	Estimated Increase in Farm Value <sup>4</sup> (\$1000)
	Inshipments (1000 lb)	Hawaii (1000 lb)						
<b>Fresh Vegetables</b>								
Bean, snap	337	950	73.8	160	5.9	78.6	57	265
Bittermelon	21	180	89.6	20	9.0	79.7	2	17
Broccoli	6,024	550	8.4	90	6.1	47.0	988	2,831
Burdock	6	450	98.7	25	18.0	90.0	*	5
Cabbage, Chinese	247	7,000	96.6	450	18.4	17.3	13	43
Cabbage, head	628	15,620	96.1	560	27.9	16.4	23	103
Cabbage, mustard	147	1,260	89.6	120	10.5	40.4	14	59
Carrot	10,607	30	0.3	2	15.0	21.5	707	2,281
Cauliflower	1,944	480	19.8	45	10.7	56.0	182	1,089
Celery	5,553	2,200	28.4	85	25.9	22.9	214	1,272
Corn, sweet	973	660	40.4	185	3.6	40.1	270	390
Cucumber	1,702	3,950	69.9	220	18.0	33.0	95	562
Daikon	41	2,610	98.5	230	14.3	19.4	3	8
Dasheen	43	220	83.7	10	22.0	67.0	2	29
Eggplant	337	1,180	77.8	50	23.6	55.8	14	188
Ginger root	300	8,100	96.4	165	49.1	62.0	6	186
Lettuce	19,925	4,500	18.4	360	12.5	36.4	1,594	7,253
Lotus root	18	190	91.3	30	6.3	117.0	3	21
Onion, dry	17,070	1,420	7.7	150	9.5	78.3	1,797	13,366
Onion, green	307	1,240	80.2	170	7.3	86.1	42	264
Parsley, American	75	280	78.9	25	11.2	83.5	7	63
Pea, Chinese	294	55	15.8	10	5.5	153.0	54	450
Pepper, green	2,634	1,430	35.2	170	8.4	48.5	314	1,277
Potato <sup>5</sup>	42,777	N.D.	N/A	N.D.	16.4	25.0	2,608	10,694
Pumpkin	1,262	95	7.0	8	11.9	22.0	106	278
Radish	2	325	99.4	35	9.3	39.0	*	1
Romaine	2,868	1,680	36.9	150	11.2	33.1	256	949
Squash, Italian	1,200	1,040	46.4	100	10.4	36.7	115	440
Squash, Oriental	121	350	74.3	20	17.5	31.2	7	38
Sweetpotato	823	1,540	65.2	140	11.0	34.4	75	283
Taro <sup>6</sup>	615	600	49.4	420	16.2	28.0	38	172
Tomato	11,997	7,000	36.8	250	28.0	48.5	429	5,819
Watercress <sup>7</sup>	4	1,200	99.7	35	34.3	100.0	*	4
Subtotal				4,490			10,035	50,700
<b>Fresh Fruits &amp; Melons</b>								
Avocado	684	1,200	63.7	290	4.1	36.5	167	250
Banana	8,866	12,900	59.3	1,070	12.1	33.0	733	2,926
Tangerine	420	30	6.7	7	4.3	38.0	98	160
Watermelon	1,616	18,900	92.1	790	23.9	11.7	68	189
Subtotal				2,157			1,066	3,525
Total				6,647			11,101	54,225

Source: Statistics of Hawaiian Agriculture 1988, Hawaii Agricultural Statistics Service (HASS).

<sup>1</sup> As defined by HASS, one acre harvested and planted repeatedly during the year is counted each time toward the total.

<sup>2</sup> Yield is derived by dividing total Hawaii production by harvested acres.

<sup>3</sup> Estimated additional acreage = inshipments ÷ yield per acre. The implicit assumption is one crop per acre per year. The estimate, therefore, is unadjusted for more than one crop cycle per year.

<sup>4</sup> Estimated increase in farm value = inshipments × farmgate price.

<sup>5</sup> Average of Hawaii's yield from 1973 to 1975, Statistics of Hawaiian Agriculture, 1976. The price is assumed to be 25¢/lb. This assumption was based on Hawaii wholesale prices in 1987, adjusted for wholesale and transportation margins.

<sup>6</sup> Price = farm price of all types of taro. Yield = average yield of all types of taro.

<sup>7</sup> Yield per acre = production ÷ acreage in crop.

Note: N.D. = Not disclosed. N/A = Not available. \* = less than one acre.

crop production. This has direct and indirect effects on the economy. Besides the more obvious direct impact on Hawaii's diversified agriculture sector, the increase in crop production has a less obvious indirect impact on the rest of Hawaii's economy. For example, to produce additional crops, more inputs (e.g., fertilizers, farm machinery) are required from nonagricultural industry sectors. As these nonagricultural industries feel the increase in demand for their outputs, they in turn require inputs from other industries in the region. In other words, the economy is stimulated by a chain of repercussions started by the increase in crop production. These repercussions are called the multiplier effect. Although these off-farm activities are not part of diversified agriculture, they are associated with agricultural activity and have an impact on Hawaii's economy.

In addition to the direct and indirect impacts, there is an induced impact that refers to the effect of additional personal household income. The additional output from diversified agriculture results in more personal household income for those within this industry sector, as well as for others in off-farm linked industry sectors. Since it is unlikely that all of this additional income would be saved, taxed, or spent outside Hawaii, the state's economy would be further stimulated as this additional income was spent here. The I-O analysis can estimate these induced effects in terms of changes in output, employment, and income.

## RESULTS

More land will be required to produce additional crops to replace imports. A maximum of about 11,100 additional acres would have been needed to grow the selected vegetables and fruits in 1988 (see Table 1). Crops selected for this analysis include those for which data are available on the fresh market supply in Hawaii.<sup>2</sup> These crops are both grown locally and imported. The crops requiring the most additional acreage are potatoes, dry onions, and lettuce.

The estimated farmgate value of the additional production of fresh vegetables and fruits is \$54,225,000 (Table 2). This represents about 21%

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<sup>2</sup> Data on Hawaii market supply of potatoes were incomplete, but this crop was included in the analysis because more potatoes are imported than any other fresh vegetable.

of the farm value of production in Hawaii's diversified agriculture sector in 1988. In addition, personal household income and employment within the diversified agriculture industry sector would increase by an estimated \$16,902,000 and 1433 jobs, respectively. The additional output (sales), income, and employment are direct contributions to Hawaii's economy from diversified agriculture.

Since off-farm linked industry sectors are also indirectly affected by activity in diversified agriculture, there would be further impacts on Hawaii's economy. The combined direct and indirect impact is an increase in output to \$66,667,000, an increase in personal household income to \$19,772,000, and an increase in employment to 1591 jobs.

For this analysis, it is assumed that import replacement does not alter the total market supply of the selected vegetables and fruits in Hawaii. The additional crops produced will follow the same distribution and marketing channels as previously used by imports. The indirect and induced impacts are the result of only the increase in crop production. They do not reflect an increase in demand for the sectors beyond the point where imports are replaced, e.g., wholesaling and retailing.

Assuming the same consumption pattern as in 1982, the combined direct, indirect, and induced impact on Hawaii's economy is an output of \$95,885,000, an increase in personal household income to \$29,265,000, and an increase in employment to 2113 jobs. It should be noted that the analysis is performed in 1988 dollars for output and income, while employment reflects the situation in 1982. The implicit assumption behind this analysis is that production technologies have remained unchanged from 1982 to 1988.

## SUMMARY

Import replacement has an impact not only on the diversified agriculture industry sector, but on the state's entire economy through indirect and induced effects. The I-O analysis provides a means to estimate these impacts. The analysis was performed using the following assumptions. One is that the state has the necessary resources and the infrastructure to handle the additional crop production. It was also assumed that Hawaii consumers would accept local produce in place of imports. This implies that local produce is com-



**Table 2. Estimated Maximum Impacts on Hawaii's Economy**

Fresh Produce	Estimated Increase in Output (in 1988 dollars)			
	Direct Impact (\$1000)	Indirect Impact (\$1000)	Direct and Indirect Impact (\$1000)	Direct, Indirect, and Induced Impact (\$1000)
Selected vegetables	50,700	11,633	62,333	89,652
Selected fruits and melons	3,525	809	4,334	6,233
<b>Total</b>	<b>54,225</b>	<b>12,442</b>	<b>66,667</b>	<b>95,885</b>
Fresh Produce	Estimated Increase in Income (in 1988 dollars)			
	Direct Impact (\$1000)	Indirect Impact (\$1000)	Direct and Indirect Impact (\$1000)	Direct, Indirect, and Induced Impact (\$1000)
Selected vegetables	15,803	2,684	18,487	27,363
Selected fruits and melons	1,099	186	1,285	1,902
<b>Total</b>	<b>16,902</b>	<b>2,870</b>	<b>19,772</b>	<b>29,265</b>
Fresh Produce	Estimated Increase in Employment (in 1988)			
	Direct Impact (jobs)	Indirect Impact (jobs)	Direct and Indirect Impact (jobs)	Direct, Indirect, and Induced Impact (jobs)
Selected vegetables	1,340	148	1,488	1,976
Selected fruits and melons	93	10	103	137
<b>Total</b>	<b>1,433</b>	<b>158</b>	<b>1,591</b>	<b>2,113</b>

petitive with imports in terms of price, quality, timing of supply, and other service-related factors. With Hawaii's limited resources (e.g., labor) and relatively high production costs, however, it is unlikely that the maximum impacts could be realized, as it would be difficult to replace all of the imports. This analysis also does not take into account differences in crop varieties that may affect the results, such as the difference between imported dry onions and those produced on the island of Maui.

It should also be recognized that a few crops account for most of the impacts that are generated. For example, dry onions, potatoes, and

lettuce are imported in relatively large quantities compared to other crops. If Hawaii were unable to expand production of these crops, the impacts would be substantially reduced.

The analysis estimates the *maximum* potential economic impacts of import replacement of selected vegetables and fruits. To assess whether particular crops are economically feasible or whether Hawaii has the necessary resources and the infrastructure to expand crop production requires further study. Factors such as limited resources and strong overseas competition would make it difficult to achieve the maximum impacts.