The Importance of the Hawaiian Commercial & Sugar Company to the Hawaii Economy and Conditions for Its Survival

A consultant paper

by

Leroy O. Laney, Ph.D. *
Professor of Economics and Finance
Hawaii Pacific University

September, 2008

*** Dr. Laney has been Professor of Economics and Finance at Hawaii Pacific University since 1998. He was formerly Chief Economist and Senior Vice President of First Hawaiian Bank in Honolulu, and he continues to consult with the Bank and several other Hawaii institutions. Other career experience includes serving as a Staff Economist on the President's Council of Economic Advisers in the U.S. White House, as an International Economist at the U.S. Treasury, and as a Senior Economist in the Federal Reserve System. He has published widely in refereed professional journals, edited volumes, and bank publications.***

Table of Contents

I. Introduction and Background

This paper is written to explain the importance of Hawaiian Commercial & Sugar (HC&S) to the local economy, and to describe the major conditions for its survival. This needs to be emphasized at the current juncture in light of regulatory proceedings petitioning for the curtailment of water usage by HC&S in East Maui. It is crucially important to HC&S that its current level of water use not be significantly reduced.

Sugar grows best where it gets plenty of two things: sunlight and water. Unfortunately, not that many areas provide both in abundance. At various times in Hawaii's history, most of the northeastern coasts of all of the major Hawaii islands were planted in sugar. But the many overcast days that occurred there made operations uncompetitive. In the long run all failed.

The ideal location is sunny, which usually means the cane will not get adequate rainfall. This places a strong emphasis on irrigation, and it is to irrigation that the Hawaii sugar industry historically has owed its major successes.[1]

Lower irrigation water usage would shrink the size of the HC&S operation, and this would be more detrimental than many realize. This is because one of the major reasons HC&S has been able to survive in an environment of massive sugar plantation closures in Hawaii in the past few decades is that it has managed to remain big enough to achieve significant economies of scale in sugar cultivation.

HC&S already finds itself at an extremely critical point. Management is struggling with shrinking profit margins due to sharply rising costs and the downward pressure on prices from global competition. That, as well as other pitfalls of growing commodity sugar, has caused an *in extremis* situation for Hawaii sugar growers. HC&S is endeavoring to diversify more into specialty sugar products with a higher value added. But the plantation's survival to date is attributable, more than anything else, to the size, configuration, and climate of the acreage that it cultivates on Maui's central plain.

Alexander and Baldwin (A&B), parent company of HC&S, has been engaged in the cultivation of sugar on Maui since 1870. HC&S is the largest component of the Agribusiness group of companies of A&B. (The other components of this group of companies are Kauai Coffee Company and two trucking and commercial services companies that serve A&B as well as third party customers on three islands.)

Of Hawaii's two remaining sugar operations, HC&S is by far the larger, growing about 80% of the state's sugar cane crop. The other sugar operation is Gay & Robinson (G&R), located on Kauai. The HC&S plantation consists of over 43,000 acres of land on Maui, of which about 35,000 acres are under cultivation.

East Maui Irrigation Company (EMI) is an entity affiliated with HC&S. EMI operates the water collection and transportation system for HC&S in East Maui on land it owns as well as leases. EMI also provides irrigation and water needs for upcountry Maui,

[1] For a review of the economics of sugar cultivation in Hawaii, see various sections of Thomas K. Hitch, *Islands in Transition: The Past, Present and Future of Hawaii's Economy* (Honolulu: First Hawaiian Bank, 1992)

including the Kula Agricultural Park, and it also transports and delivers water to Maui Land & Pineapple Company (ML&P).

In today's competitive environment, HC&S has been greatly challenged to continue in the future as has in the past. Rising costs and lower sugar prices have squeezed already slim profit margins. Recognizing the vagaries of growing commodity sugar, it has concentrated on higher margin specialty sugar products and selling electricity to Maui Electric Company (MECO). The strategy here is to add value on site and take that to the buyer. The "*Sugar in the Raw*" line, turbinado sugar sold in individual packets throughout the world, is an example of this.

Evaporated cane juice (ECJ) is one of the newest and best examples of HC&S value-added products. ECJ is crystallized juice from the first pressing of the sugarcane. It is unbleached, there is minimal processing, and it retains a hint of a natural molasses flavor. Because ECJ involves far less processing than refined white sugar, it uses less energy and produces less waste,

In the second quarter of 2008, HC&S increased its capacity to produce specialty sugars to about 60,000 tons, or from 30-35% of annual production. Specialty sugar sales currently generate about 45% of HC&S sugar revenue. Management has indicated that specialty sugars could comprise an even larger percentage of HC&S production in the future.

It is critical, however, for HC&S to continue to have reliable access to water, absolutely essential in sugar cultivation, to irrigate its fields. Less water will lead to lower yields. The plantation estimates that yields of between 12 and 14 tons of sugar per acre (TSA) are necessary to remain economically viable. See Section V discussion of the role of economies of scale in Hawaii sugar cultivation. The relationship between TSA yield and production, and therefore sugar revenues after rather capricious movements in sugar prices are taken into account, is crucial. Yields influence production, for example, more than acreage harvested. See Appendix I of this document for evidence on the relationship of production to both yields and acreage harvested. Legal challenges that attempt to reduce current water consumption threaten yields, and therefore add greatly to the uncertainties that HC&S already faces in other areas.

Complicating this issue are the drought conditions that HC&S has had to contend with over much of the last 15 years. Drought causes a reduction in the average crop age by delaying the replanting of harvested fields and prompting the premature harvesting of fields where growth has been stunted by lack of water. In addition, during water short periods, the cane does not grow as well, which means that time age is greater than growth age. The important point here is that the greater the growth age, the higher the TSA yield and the resulting sugar revenues.

Average crop age at HC&S has fallen in recent years due primarily to drought. Given this reduced crop age, HC&S is reducing its near term harvest in order to increase crop age and raise yields. But the short term result is lower revenues due to lower production and reduced production of bagasse to fuel the power plant. Longer term, the planned result will be increased yields and revenues, boosted by larger sales of specialty sugars and expansion of energy sales. But this can happen only if HC&S access to irrigation water is not curtailed.

II. Direct Importance of HC&S to the Maui and State Economy

If the Maui economy were to lose HC&S, the effects would be immediate and quite palpable. Jobs, taxes, power generation, and the environment are just a partial list of the things that would be impacted.

HC&S employs about 800 full time workers on Maui, making it one of the island's largest employers after the public sector. EMI employs another 17 workers. In addition, HC&S employs the services of a number of support industries in Hawaii. These include trucking and other suppliers of goods and services. As well, the company enables the County of Maui to service the water needs of upcountry Maui with water collected and transported by EMI.

In addition, HC&S can take advantage of quantity discounts to buy farm inputs that would otherwise be more expensive to small farmers on Maui. Thus, HC&S helps support Maui's entire agricultural sector.

Another way HC&S has helped Maui agriculture is by allowing Maui cattlemen to use its canetops from the seed operations as a feedstock. Cattlemen must bale it themselves but it is free, and without a cheap feedstock they would face added challenges. The synergy exists because they need the feed and HC&S needs to clear its trash.

But only counting direct contributions, HC&S estimates that it injects over $100 million annually into the Maui economy. Applying even a conservative multiplier of 1.5 to this sum would add about 50% more to that total, or $150 million a year. (For derivation of an appropriate regional multiplier to apply to HC&S direct spending, see Appendix II of this document.)

A jobs multiplier would likely be higher than an overall regional multiplier. Earlier work estimating a jobs multiplier has calculated the jobs multiplier for a sugar operation in Hawaii to be 2.29,[2] but again for conservatism and taking into account that multiplier was estimated some years ago, a jobs multiplier of 2.0 might be more reasonable, 1.87 to be exact. (See Appendix III of this document for derivation of this jobs multiplier.)

If HC&S employs 800 people, that means there are almost 2,300 jobs on Maui that are dependent on it in one way or another. That amounts to over 3% of Maui County employment in 2007 (76,190 people). The $150 million derived by applying the overall regional multiplier would also amount to over 3% of Maui County total personal income ($4,844 million in the most recently available year of 2006). [3]

These percentages may seem small to some, but if 3% were taken out of the Maui economy, the impact would be quite devastating. It would, in fact, be more damaging than if probably any other single private entity ceased to exist. And that does not include any of the ancillary effects discussed in the next section. It would have

---

[2] See Thomas K. Hitch, *How the Collapse of the Sugar Industry Would Impact on Hawaii's Economy*, monograph, December 1987, p. 6.

[3] Following the logic by which this jobs multiplier is derived in Appendix III, we could also get an income multiplier that equals 1.87 instead of the lower number 1.5 derived in Appendix II. That would mean that HC&S is responsible for $187 million in the Maui economy rather than $150 million, and the former number is actually 3.9% of Maui County personal income in 2006.

impacts on jobs, the unemployment rate, State and County tax revenues, and social welfare costs, among other things. The impact would be felt at the State level, but obviously the impact on Maui would be very severe.

III. Other Contributions of HC&S to the Maui Economy

There are a number of other ways HC&S contributes to the economy in addition to the more obvious ones of the previous section. This section mentions several of the most important.

Another way HC&S contributes to the Maui economy is through power sales to Maui Electric Company (MECO). HC&S has been able to generate significant revenues from selling electric power under long term contracts with fixed delivery requirements. Revenue from energy sales accounted for 20% of the revenue generated by A&B's agribusiness component in a recent year. HC&S recently renewed its contract to provide power to MECO through 2014. This represents, especially considering the penalties for failure to deliver the required power, a major commitment to continue sugar cultivation on Maui.

Like all businesses and households nowadays, sharply higher energy prices are having an impact on HC&S operations. For HC&S, however, higher energy operating costs from things like fertilizer and diesel fuel are offset to an extent by these power sales, the price of which is also rising.

Provision of energy by HC&S brings up a larger point. In today's world of sharply higher oil prices, all sources of renewable energy should be taken more seriously and nurtured. The HC&S provision of energy falls under the category of biomass, but this category belongs right up there with other alternative and renewable sources like solar, wind, geothermal, biofuels such as ethanol, and landfill gas.

Just because biomass is actually a traditional renewable energy source in Hawaii -- sugar mills have always burned sugar cane waste, or bagasse, to produce electricity for their operations and to sell to local utilities -- does not mean that this source is any less important today. In fact, it is all the more important given the State's initiatives to raise the renewable component of energy provision in coming years. The exit of HC&S would mean the loss of a viable provider of renewable energy at a time when Maui and the State of Hawaii need it more than ever before.

Perhaps the best way to appreciate these other economic contributions of HC&S is to understand what would happen to the Maui economy if it did not exist. The termination of HC&S sugar operations would greatly increase the amount of idle agricultural land not just for Maui but for the state as a whole. Thus, the reality must be faced that the now green fields that characterize the Central Maui plain would revert to a dry state. Pressure would likely mount to urbanize the former sugar land, and even if it did not the search for alternative crops would be very frustrating.

The historical experience in Hawaii with the closure of other sugar plantations shows that it will take a very long time, if ever, for replacement crops that do not have access to daily water to become economically viable. Even with access to that water, they may not be successful.

A review of the experience where other Hawaii sugar plantation closures have left land fallow proves this. The Hamakua Coast of the Big Island and former sugar acreage in West Maui are recent cases in point. Of the many diversified agriculture crops that have been tried, some have met with checkered success, but many also have failed completely. None have proven able to be as land intensive or as labor intensive as sugar, nor as profitable as a use of the land. Both overall jobs and land use have suffered.

It turns out that sugar actually is an ideal crop for cultivation on the current HC&S acreage, which is located in a windy location without the assurance of water. Production is partially dependent upon the ability to use brackish well water, which most crops like corn would not tolerate, to supplement imported surface water from East Maui. As for the wind, many crops would need extensive windbreaks. In addition, because sugarcane is a two-year crop, the ground is bare for less time than with other crops. Cane can also tolerate some dry periods; with the current ongoing drought, many other crops would be dead.

In fact, HC&S itself has experimented with a number of crops other than sugar over the years. It would be unfair to characterize the plantation as wedded to growing sugar and only sugar. Unfortunately, their track record has not been that good over time. Some examples of these experiments are listed in Appendix IV.

Sugar's exit elsewhere in Hawaii has created other problems:

- Some of the remaining arid land has been subject to fire hazard.
- Erosion and dust control problems have been aggravated.
- Recharge of underlying aquifers has been reduced.

But an even greater harm will have been done. It should not be forgotten that Maui depends upon the attractiveness of its environment to nurture tourism, its main industry. Those who remember the green hillsides of West Maui before sugar's exit there, and can compare that land with the wind-swept red dirt of today, do not need to be convinced that growing sugar made the scene much more attractive to the Maui visitor. [4]

The bottom line is that, despite the dramatic contraction in sugar cane acreage in Hawaii over the last several decades, if a sugar operation *can* survive it is one of the highest and best agricultural uses of the land. Those who wish to contest this must answer the question: If diversified agriculture is the solution, why have such a small fraction of the total acres previously planted in sugar been successfully converted to diversified agriculture rather than lying fallow? Hawaii yields of raw sugar have historically been among the highest in the world, and Hawaii's sugar field workers have a standard of living among the highest of any farm workers in the world.

Ironically, this was predicted years ago. Hitch (*op. cit.*, p. 9), writing in 1987, before the closure of a number of sugar operations in the 1990s, states:

> *While it is possible that some sugar-producing areas in the United States might be able to convert to other agricultural crops, such is demonstrably not the case in Hawaii. Studies, experiments, and history all combine to indicate that most if not*

[4] Maui is arguably more dependent on tourism than any of the State's four counties. An earlier study by the First Hawaiian Bank Research Department calculated that 42% of Maui's personal income was accounted for by the tourism sector. This was closely followed by Kauai, but Oahu and the Big Island were far less. See "Personal Income by Sector: A Comparison Across Counties," First Hawaiian Bank *Economic Indicators*, July/August 1992. In 2007, 31% of Maui jobs fell in the Leisure and Hospitality category, also the highest share in the State.

all land now in sugar would not find remunerative agricultural uses if sugar ceased being grown. Ever since 1851 studies have been made and experiments conducted on agricultural alternatives to sugar, but the successes have been small because the problems are enormous.

Hitch goes on to cite problems involved in the aftermath of sugar closures up until that date – Waimanalo Sugar Company on Oahu in 1947, Kilauea Sugar Company on Kauai in 1971, Kahuku Plantation Company in 1971, and Kohala Sugar Company in 1973.

IV. The Underlying Microeconomics of Scale Economies

As mentioned in the introduction, HC&S owes its continued existence, more than anything else, to its size and the economies of scale it is able to capture. Some explanation of the underlying principles of economies of scale is desirable before the discussion turns to the role of these economies in Hawaii sugar cultivation.

The higher the level of any firm's fixed costs relative to its variable costs, the higher the level of output that must be achieved in order to break even. The higher the level of output, the easier it is to spread those fixed costs on a per unit basis. While many retail or service industries have low fixed costs, heavy manufacturing, utilities, and many agricultural operations generally have much higher fixed costs.

Airlines are a good example of an industry with high fixed costs, because airplanes represent a huge fixed investment. What if an airline cannot carve out enough market share to spread its fixed costs? It may fail. This is one of the problems in serving the Hawaii inter-island airline market. The overall market is not big enough to accommodate three, and perhaps not even two, carriers. The recent exit of Aloha Airlines is a case in point.

A number of other industries in Hawaii are similar to the airlines. The Hawaii market is too small for an individual high fixed cost firm to get big enough to be efficient and competitive. This is one reason so many industries in Hawaii are characterized by only two or three major firms. In other words, a firm might be able to get big enough to be efficient if it were the only provider of a good or service, but it cannot if it must share the market with another provider. Thus, we have one more reason, on a long list, that causes costs of doing business in Hawaii to be so very high.

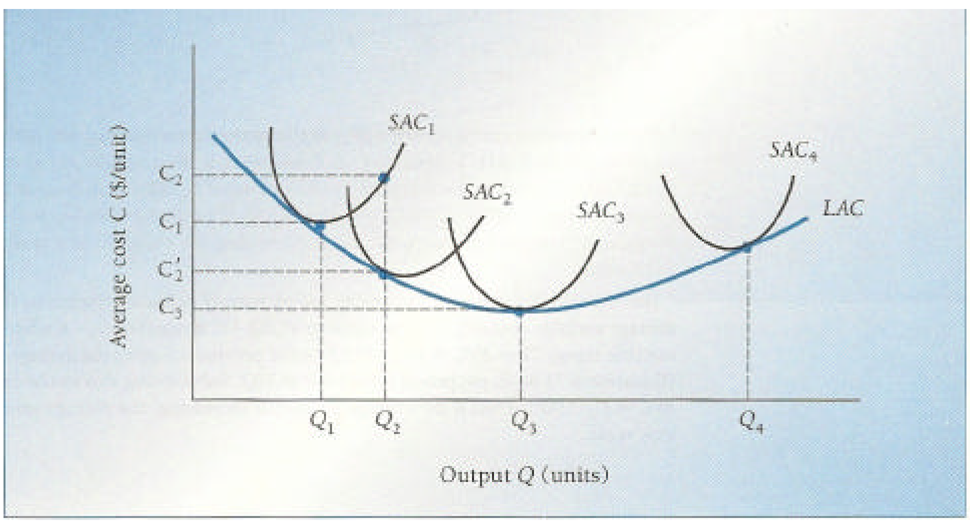
Of course, aggressive competition might eliminate one of the two providers, but if that happens a monopoly is the result -- and the public policy response to such a "natural monopoly" is usually government regulation, which most firms in such industries view as undesirable. Perhaps the best example of a natural monopoly is a public utility, which has such high fixed costs that one firm can provide service at a lower cost than if there were more than one. A natural monopoly exists if average cost for a firm falls over the range of demand in the entire market.

More generally, economists distinguish between a short run and a long run when analyzing economies of scale. They define the short run as a length of time when at least some costs are fixed and others are variable. The long run is defined as a length of time in which all costs are variable. In the long run, for example, a firm might not only be able to expand or reduce its workforce, it can expand or contract its physical plant by building more facilities or selling existing ones. Naturally, the long run in one industry might be quite different from that in another.

Yet in the long run, economies of scale also exist. In fact, that is how economists usually talk about such economies. While scale economies can be achieved in the short run by spreading fixed costs over a larger output, there are no fixed costs in the long run. But in the long run a firm can still achieve economies of scale by choosing among various production methods and technologies, plant size, types and sizes of equipment, labor skills, raw materials, and other inputs to production. Quantity discounts and transportation savings may also come into play.

Typically, the long run average cost function is viewed as the envelope of short run average cost functions, as shown in Figure 1. Increasing economies of scale are achieved with higher output levels until Q_3, the “minimum efficient scale,” is reached. *The minimum efficient scale is defined as the lowest level of output at which long run average cost is a minimum.* After that,”diseconomies of scale” can set in with increased output because the firm has become too large. This may have to do with intractability of managing larger operations, government regulation, unionization, pressure to provide more employee benefits, higher transportation costs, and a number of other things.

Figure 1. Stylized Long Run and Short Run Average Cost Functions.

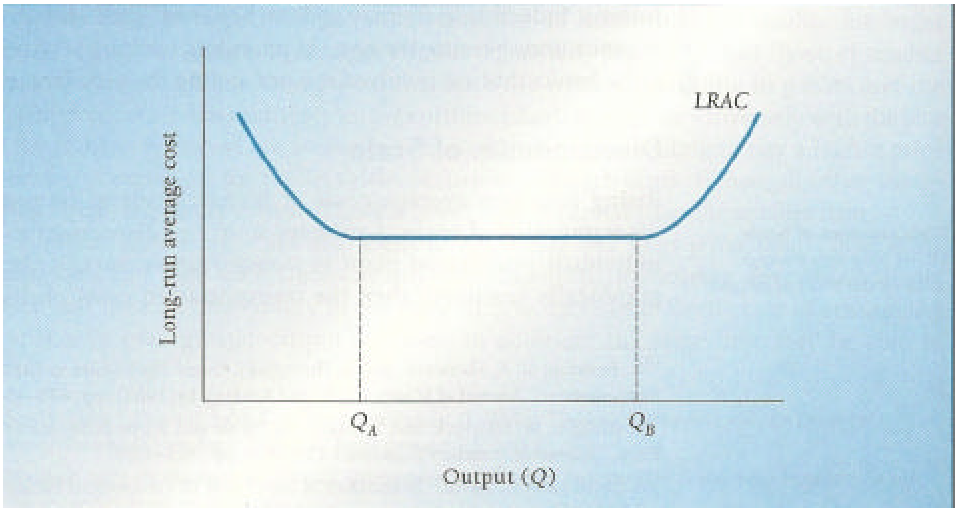


When economists estimate long run average cost functions from empirical data,[5] they usually do not appear as the stylized version shown in Figure 1. More typically, they appear as shown in Figure 2. That is, economies of scale can be captured as output increases up to Q_A, the minimum efficient scale in this case. But it may be possible to increase output after that beyond the minimum efficient scale without incurring diseconomies of scale. Having found an optimal scale, a firm can “become larger by being small many times.” At some point, of course – Q_B in Figure 2 – managerial inefficiencies cause long run average cost to rise and diseconomies of scale to occur. *But the main point is that the minimum efficient scale* Q_A *is very important for management to know, because if their operation cannot achieve*

[5] Usually cross-sectional data is used in such empirical estimation, because with time series data it is impossible to find firms for which the scale has changed but technology and other relevant variables have not.

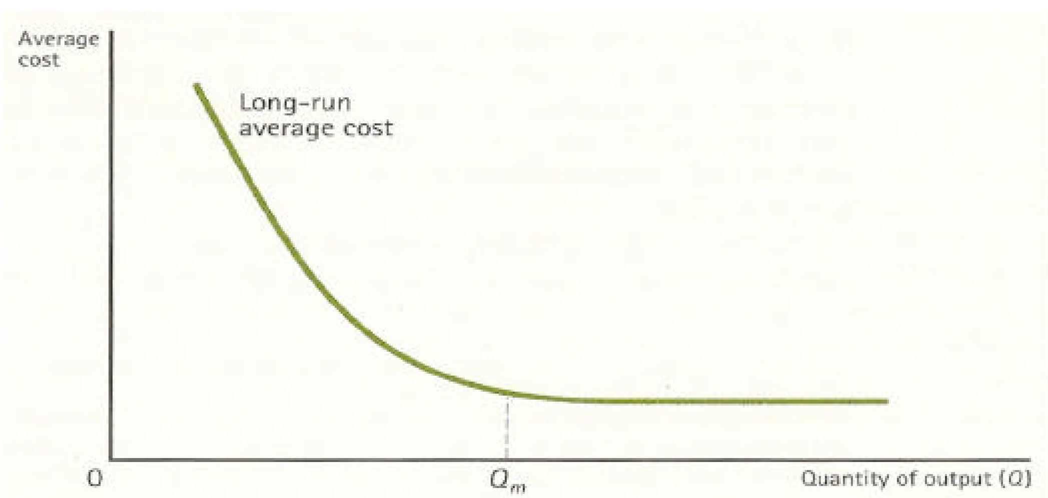
that level of production, it will not fare well relative to a competitor who can achieve it.[6]

Figure 2. A Typical Empirically Estimated Long Run Average Cost Function.



For all practical purposes, the long run average cost curve a firm faces is shown in Figure 3. Enlightened management should know better than to venture beyond Q_B in Figure 2, so that the relevant curve actually becomes L-shaped. The minimum efficient scale in Figure 3 is Q_m.

Figure 3. The L-shaped Long Run Average Cost Curve Relevant to the Firm.



[6] Sometimes empirically estimated long run cost functions are found to be flat, but that is not surprising. Firms unable to get big enough to achieve minimum efficient scale Q_A do not exist because they were uncompetitive. They went out of business, and thus no data exists on them. Likewise, firms unwise enough to produce beyond Q_B similarly went out of business, so that no data exists on them either.

V. The Role of Economies of Scale in Hawaii Sugar Cultivation

It should be clear from the historical record that HC&S has been able to come closer to achieving the minimum efficient scale in sugar cultivation in Hawaii, while other smaller plantations that did not survive are not likely to have done so. (This does not mean that there might not have been other additional reasons for their failure, of course.) Those who advocate incremental reduction of surface water often do not recognize that doing so would push plantation production back to the left along a more steeply rising cost curve.

Sugar cultivation in Hawaii is a very high fixed cost operation. Regardless of the level of output, the plant and the people required to run it remain essentially the same size. Even field labor, which is typically used as the best example of a variable input for most firms, is more or less fixed. In Hawaii's labor market, the workers must be used 100% of the time or they leave.

There is an enormous contrast between HC&S and other sugar operations in Hawaii that have failed in the past few decades. Unlike those other plantations, the company has been and hopes to continue to be an important contributor to the Hawaii economy and to the economy of Maui in particular. And one of the main reasons HC&S has been able to survive while other operations have not is the economies of scale that it has been able to capture because of its larger size.

The approximate 35,000 acres that it cultivates is far larger than the cultivated acres of those plantations that are now gone. Table 1 illustrates this. In 1994, just prior to the wave of sugar plantation closures that left only two in the state, HC&S accounted for 29% of the acreage and 31% of the raw sugar production, far bigger shares than the next largest operation.

The very fact that HC&S has survived when other smaller plantations have failed can itself be taken as evidence that economies of scale are important in the industry. In fact, economists often use the size of surviving firms in an industry to determine the minimum efficient scale in that industry. This has become known in the literature as the "survivor principle." [7]

One might logically ask how it has been possible for the other remaining sugar plantation, G&R, to survive until now when it is not nearly as big as HC&S. Several special circumstances provide an answer to this. G&R is located on very productive land with abundant water and sunlight. Thus yields per acre there have traditionally been high. The land also is not flat, which means less pumping of water is necessary from the higher elevations where water is abundant. The natural slope of the land can move the water to fields under cultivation, where drip irrigation systems water the sugar.

Yet despite these advantages, G&R has still had to be subsidized by its owners, the Robinson family. Moreover, even though the plantation provides worker housing, it

[7] This survivor principle, according to which the minimum efficient scale in an industry can be determined by observing the size of operations that survive and prosper in the marketplace, was first articulated by the University of Chicago economist George G. Stigler in an article on economies of scale in 1958. See a reprint of that article in George G. Stigler, *The Organization of Industry* (Irwin & Co., Homewood, Illinois, 1968). In 1982, Stigler was awarded the Nobel Prize in Economics for his work in this area, among other contributions.

has not granted a pay raise in several years. And on top of all of this, the plantation still had to struggle to survive.

Table 1.

Sugar Companies in Hawaii; 1994

Company	Total Caneland Acreage	Raw Sugar Production (short tons)
A&B-HAWAII INC.		
Hawaiian Commercial & Sugar Co. (Maui)	*35,693*	*206,217*
McBryde Sugar Co., Ltd. (Kauai)	7,333	17,273
Total A&B	**43,026**	**223,490**
AMFAC/JMB HAWAII, INC.		
Kekaha Sugar Co., Ltd. (Kauai)	8,365	41,224
The Lihue Plantation Co., Ltd. (Kauai)	11,336	43,220
Oahu Sugar Co., Ltd. (Oahu)	10,432	68,249
Pioneer Mill Co., Ltd. (Maui)	6,241	34,299
Total Amfac	**36,374**	**186,992**
C. BREWER AND CO., LTD.		
Ka'u Agribusiness Co., Inc. (Hawaii)	8,875	44,365
Mauna Kea Agribusiness Co., Inc. (Hawaii)	4,778	40,564 *
Olokele Sugar Co., Ltd. (Kauai) **		
Total Brewer	**13,653**	**84,929**
DOLE FOOD CO. INC.		
Waialua Sugar Co., Inc. (Oahu)	11,877	58,099
HAMAKUA SUGAR CO., INC. (Hawaii)	8,634	60,822
GAY & ROBINSON, INC. (Kauai)	7,431	42,763
HILO COAST PROCESSING CO. (Hawaii) ***		
UNITED CANE PLANTERS' COOPERATIVE *	145	1,443
TOTAL ALL COMPANIES	**121,140**	**658,538**

* Growers only; cane processed by Hilo Coast Processing Co., which together with Mauna Kea Agribusiness phased out of sugarcane production and processing in 1994.

** Production figures included with Gay & Robinson, Inc., which purchased Olokele Sugar Co. in 1994.

*** Produced 42,007 tons of raw sugar for Mauna Kea Agribusiness.

In 2007, G&R announced an intention to re-package itself as an alternative energy company and get away entirely from its traditional business of growing commodity sugar. A major part of this initiative was an intended ethanol plant, in a partnership with Pacific West Energy LLC of Vancouver, Washington. Since then, permitting and financing hurdles have delayed the project. Ethanol is just one of those alternative energy sources that has been considered by G&R. Bio-diesel and solar energy have been mentioned, among other things.

To a great extent, even though ethanol and other alternative energy projects are risky, G&R is pursuing them because the future of its traditional business simply is not bright. The latest development at G&R was the September 10, 2008 announcement that it will harvest its last sugar cane crop in 2010, with Pacific West focusing after that entirely upon ethanol production, provision of energy to the Kauai Island Utility Cooperative, and leasing some of its former cane acreage to other agricultural interests.

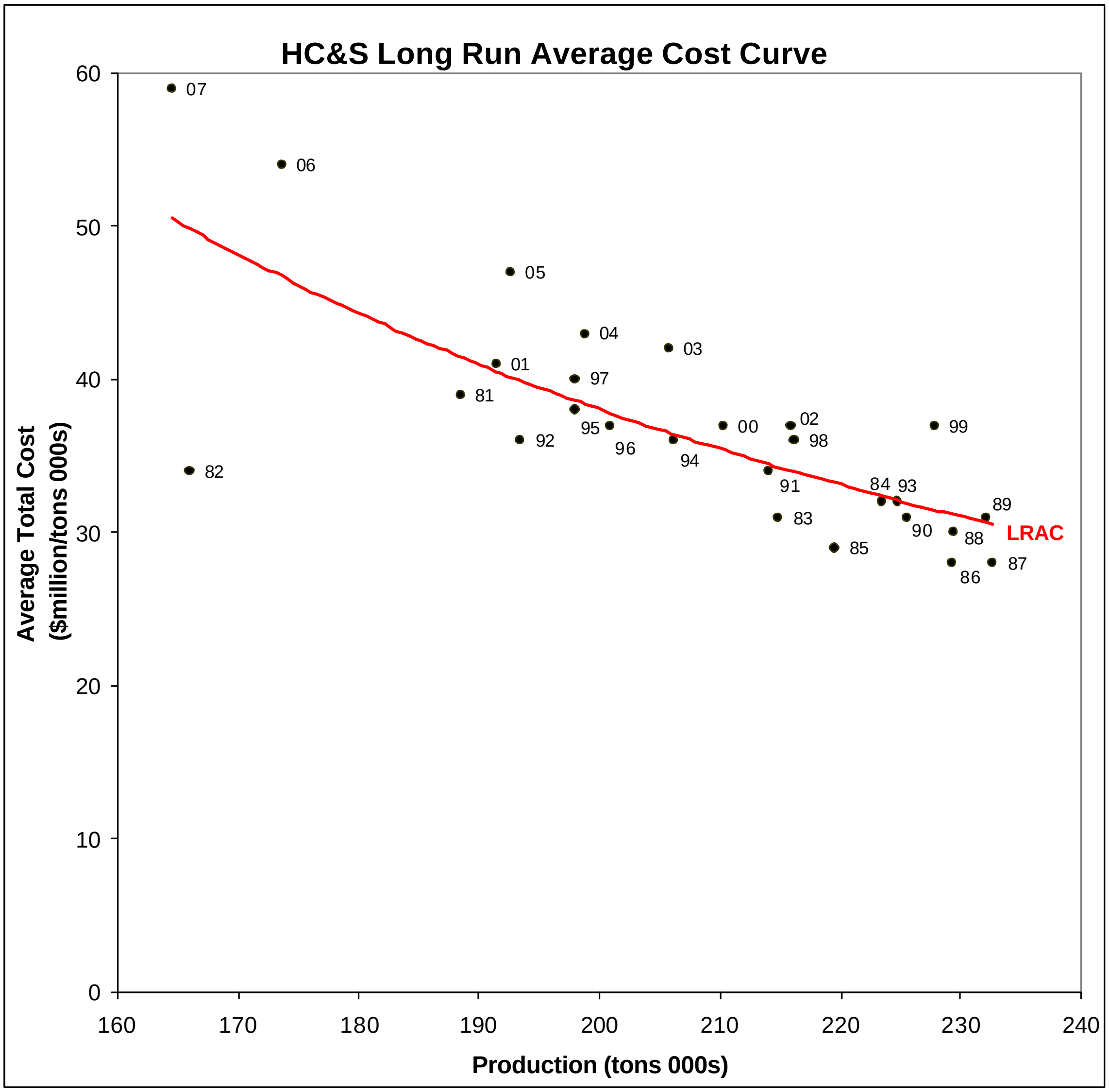
In addition to its sheer size, HC&S can achieve cost efficiencies from the fact that most of its land is located in Central Maui on lands that do not receive much rainfall. When unirrigated, the sugar can be dried and more easily accessed by harvesting equipment.

Challenges to the correlation between Hawaii sugar plantation size and survivorship by resorting to U.S. industry wide data are misplaced. It is true that, according to USDA data, far smaller plantations exist on the Mainland. But HC&S, due to its isolated location, must not only grow the cane, it must also process it into a form that can be shipped economically to market. Smaller growers on the U.S. Mainland do not have to process their own cane. They have the options of selling it to a third party processor, joining a cooperative that processes the cane of its members, or growing another crop.

Having formally introduced the concept of economies of scale in the last previous section, it is useful to build upon that and see how it applies to HC&S. This can be done with resort to HC&S data on total annual costs of operation and production. [8]

Figure 4 below shows a scatter diagram with HC&S annual average total costs from 1981 through 2007 on the vertical axis and total production for the same years on the horizontal axis. (Thus, these axes correspond to those in Figures 1 through 3 in the section above.) The points depicted in the diagram plot the average cost and production combinations for each year, with the year identified next to the point.

[8] For this investigation, annual sugar production was obtained from the SEC 10K reports of A&B, while total costs of operation were obtained from HC&S itself.



The red line through this scatter of points is an approximation of what the HC&S long run average cost curve might look like. Naturally, the points do not fall neatly on that line, because of the many things that influence costs and production. But interestingly, the points do fall fairly close to the line.[9]

---

[9] The long run average cost curve is generally conceived to be curvilinear, as depicted in Section IV. But to illustrate the tightness of fit to any line sloping downward to the right, a linear regression was performed on the data used in Figure IV. The results were (where ATC = average total cost in millions of $ per thousand tons, P = production in thousands of tons, t-statistics are in parentheses below coefficients, and the asterisk indicates statistical significance at the 95% level using a one-tailed test that the variable is signed as hypothesized) :

$$ATC = \underset{(9.82)^*}{0.97} - \underset{(-6.07)^*}{.003\,P}$$

Adjusted $R^2 = .58$
F statistic = 36.79*
Durbin-Watson statistic = .75

Results are quite good. Both the intercept term and the independent variable are quite significant, and 58% of the variation in average total cost is explained by production. The unacceptable Durbin-Watson is not surprising, given the many other things that might influence cost. (For example, a drought dummy variable – unreported – equal to one in the past 15 years, zero otherwise, was significant with a t-statistic of 4.02.)

If HC&S has ever achieved its minimum efficient scale, it would be in the years of the late 1980s that appear at the right end of the cost curve. In the years from 1986 through 1989, TSA hovered around 14.0, the best the plantation has ever achieved. This evidence would therefore support the contention of HC&S management that a TSA in the 12-14 range is necessary to remain economically viable. While management may not be thinking explicitly in terms of minimum efficient scale when they quote such a range, it is clear that such thinking parallels the concept.

VI. What is the true "public interest" in instream vs. offstream water issues?

In the rhetoric surrounding legal challenges to the continued HC&S use of Maui surface water at current levels, there has been an attempt to juxtapose "private gains" against "public rights," as if there were some clear dividing line between the two – even assuming there is agreement on what these two terms mean. The assumption seems to be that more instream water constitutes a public gain, while noninstream use of the water is *merely* for private gain. The purpose of this brief section is to clarify the fact that such an assumption defies generally accepted economic principles.

First, mainstream economists find nothing wrong with private gain per se. In fact, the very foundations of a market economy rest on the pursuit of private gain. The identification of *private gain* with *public good* can be traced at least as far back as Adam Smith. Smith's book *The Wealth of Nations*, his most famous work published in 1776,[10] is generally considered to have laid the cornerstone of modern economics. As well, it is one of the most influential books of the ages, and not just among economists. The book is peppered with passages that proclaim the fact that private gain, or at least the pursuit of it, leads to public good. Only two are quoted here:

> *It is not from the benevolence of the butcher, the brewer or the baker, that we expect our dinner, but from their regard to their own self interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities but of their advantages.*
>
> *...every individual necessarily labours to render the annual revenue of the society as great as he can. He generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it. By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it. I have never known much good done by those who affected to trade for the public good.*

But that is not even the main point here. At a less ideological level, an objective economic cost-benefit analysis can only show that significant reductions in the amount of water used by HC&S would endanger its economic viability. That would be

---

[10] See Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (University of Chicago Press edition, 1976).

contrary to the public interest because it would have very considerable adverse economic, environmental, and social consequences. Thus, objective economic analysis cannot but conclude that it is in the public interest of the people of Maui County and the State of Hawaii for HC&S to continue to use the water at or near current levels.

VIII. Conclusion

This paper has made several important points:

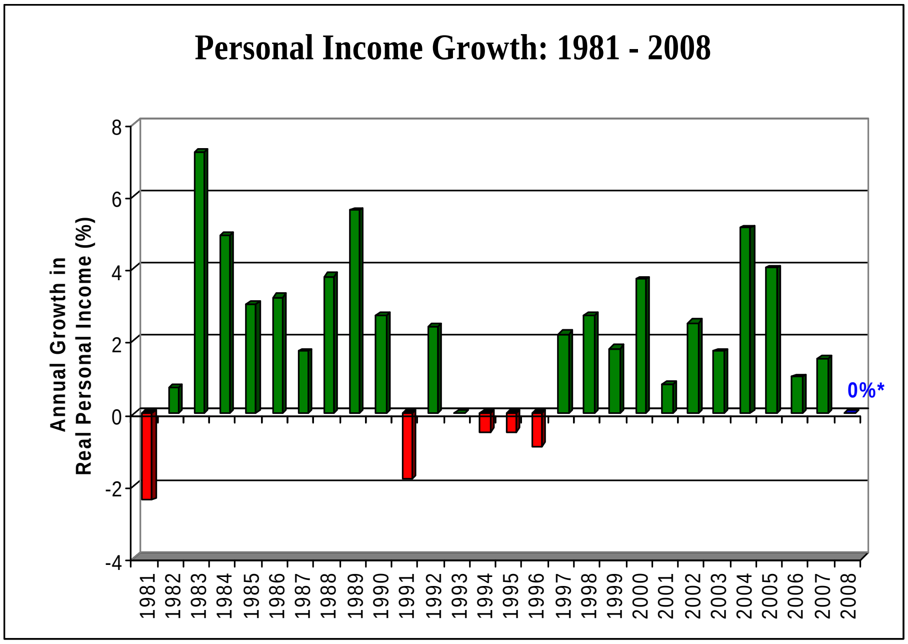
- The demise of HC&S would have major negative economic impacts. Considering direct impacts alone, it would reduce Maui County employment and broad measures of its overall economy by at least 3%. This estimate was obtained using quite conservative economic multipliers.
- Those estimates do not even include other benefits to Maui provided by the plantation. These include its power sales to MECO, the provision of water to upcountry Maui by EMI, its provision of agricultural inputs to smaller farmers at a discount because of its ability to buy in quantity, and its provision of cane waste as a feedstock to Maui cattlemen. It might be difficult to quantify the values of some of these in any kind of macro-econometric model, but the sum of those values would be considerable.
- Sugar cultivation appears to be the highest and best agricultural use of HC&S land, and history shows that finding alternative successful diversified agriculture crops to occupy current HC&S acreage would be quite difficult, if not impossible.
- Environmental harm (erosion and dust, brush fire hazards, lack of recharge to the Central Maui aquifer) caused by the exit of HC&S would far exceed the benefits of returning water to its instream state.
- The attractiveness of the island that is so important to the visitor industry, Maui's major export, would be greatly diminished. This is another impact that, while hard to quantify exactly, we know is extremely important. (What can be quantified is the relative size of Maui's visitor industry. In 2007, 31% of Maui non-farm jobs fell in the Leisure & Hospitality category, the largest of any county in the state. Kauai was a close second with 29%, followed by Hawaii County's 22% and Oahu's 14%.)
- Mere shrinkage of HC&S sugar cultivation, without its complete exit, would so add to existing problems that it could easily cause the plantation's demise anyway over the longer term. This is because that shrinkage would negatively alter HC&S cost structure and reduce its economies of scale.
- TSA in sugar cultivation is greatly influenced by water availability, and higher TSA is critical for survival of HC&S in today's environment of low sugar prices and rapidly escalating costs.
- The contention that around 12-14 TSA is necessary for HC&S to remain economically viable appears to be borne out by an empirical investigation of the plantation's minimum efficient scale.
- The juxtaposition of private against public gain in this case clearly defies economic logic.

There is one remaining noteworthy reason that HC&S should not be encumbered with added burdens in the current environment. This concerns the stage of the Hawaii economic cycle at which the State Of Hawaii now finds itself.

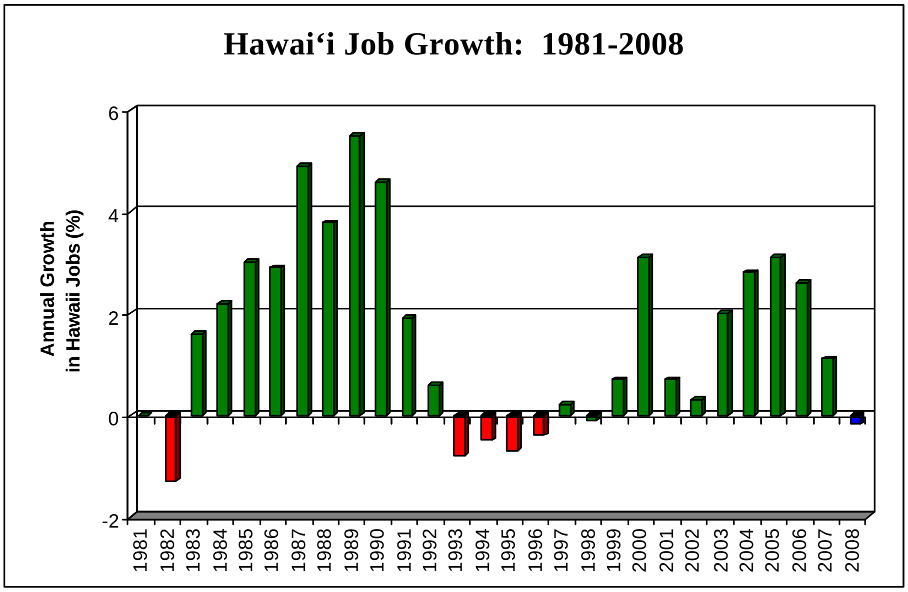
Economic growth has ground to halt in 2008, after an 11-year expansion that saw booming tourism, construction, home sales and prices, and other optimistic trends.

That expansion broke the record of the previous one that came to an end in the early 1990s, which lasted 9 years.

We can examine several time series to get a grasp on how long expansions and contractions in the Hawaii economy last. Inflation-adjusted personal income growth is one of the best ones, because it is one of the broadest measures we have of the state economy. It is often used as a proxy to generate preliminary estimates for State Gross Domestic Product, in fact. The chart below shows recessions in 1981 and 1991. Both of these corresponded to national recessions and were over quickly. After 1981, the 9-year Hawaii expansion ensued. Following the 1991 recession, there was a brief return to healthy growth for one year, then a 4-year recession that was brought on by a number of circumstances – among them the first Gulf War, the collapse of the Japanese speculative bubble, and a California recession that lasted several years longer than the national one. Then in 1997 the 11-year Hawaii expansion started. That expansion is the one that is coming to an end this year. So the general pattern that emerges is an expansion of about 10 years that is followed by a slump that is a little less than half that long.



Job growth is another broad gauge of the Hawaii cycle. The chart below shows a pattern very similar to real personal income growth – 9 years of expansion after the early 1980s recession, a 4-year recession in the mid-1990s, then the 11-year expansion that is now ending. (The only notable difference is that the current expansion started a little more weakly for jobs than for income.)



The important point in all this is that, even though expansion phases in the Hawaii economy typically last a good bit longer than contractions, the contractions do not pass quickly. The beginning of such a contraction, or simply a hiatus in growth, is no time to encourage pulling 3% – and likely a good bit more than that – out of one of the County economies.

We know that has already begun to happen. Adding to the exit earlier in 2008 of Aloha Airlines, ATA Charter service, Molokai Ranch and two Norwegian Cruise Line ships from the Hawaii circuit, Maui's own recent example of a big time blow to another kama'aina company is the July announcement that Maui Land & Pine is reducing its workforce by 274, or over 26%. HC&S struggles with the same skyrocketing costs of fuel, fertilizer, and transportation that brought ML&P to that pass. Reducing HC&S water rights is yet another way to speed it along to the same fate.

Bibliography

Adler, Jacob. *Claus Spreckels: The Sugar King in Hawaii* (Honolulu: University of Hawaii Press, 1966)

First Hawaiian Bank, *Economic Indicators*, "Personal Income by Sector: A Comparison Across Counties," July/August 1992.

Hitch, Thomas K. *How the Collapse of the Sugar Industry Would Impact on Hawaii's Economy*, monograph circulated by First Hawaiian Bank, December 1987.

________________, *Islands in Transition: The Past, Present and Future of Hawaii's Economy* (Honolulu: First Hawaiian Bank, 1992)

Keynes, John Maynard. *The General Theory of Employment, Interest, and Money* (New York: Harcourt, Brace and Company, 1936)

First Hawaiian Bank Research Department, *The Impact of Exports on Income in Hawaii*, 1961.

Smith, Adam. *An Inquiry into the Nature and Causes of the Wealth of Nations* (University of Chicago Press edition, 1976).

Stigler, George G., *The Organization of Industry* (Irwin & Co., Homewood, Illinois, 1968).

Mansfield, Edwin, W, Bruce Allen, Neil A Doherty, and Keith Weigelt. *Managerial Economics; Theory, Applications, and Cases*, fifth edition (New York: W.W. Norton and company, 2002)

APPENDIX I.

The Influence of Yield per Acre and Acreage Harvested on Total Sugar Production at HC&S

Sugar revenues in any given year can be influenced by a number of variables, but the chief direct ones are sugar prices per ton and total production in tons. Sugar prices, volatile as they are, can be influenced by a host of global variables – growing conditions elsewhere, trade agreements, tariffs, subsidies, consumer tastes, new markets, and other things. But they are entirely beyond the control of local management, and they are often quite unpredictable.

Production is in turn influenced by two other main variables, yield per acre and acreage harvested. Of these two, yield per acre is more critical than acreage harvested. It is relevant for this study to demonstrate this, because it is yields that are affected by water availability. Acreage harvested may be at least partly a management decision, but yield is largely beyond its control. The econometric investigations below demonstrate this stronger influence of yields than acreage planted on total production.

Data on total HC&S production in tons, yields per acre (TSA), and acreage harvested was taken annually from the Form 10K Reports of Alexander & Baldwin, Inc. from 1981 to 2007. That data is shown below. Scanning that data indicates the best year for yield was 1987 and the worst was 2007.

Year	Production (tons)	TSA	Acreage Harvested
1981	188526	11.6	16287
1982	166001	12.2	13653
1983	214806	12.9	16640
1984	223414	13.1	17047
1985	219468	13	16903
1986	229228	13.9	16515
1987	232718	14.7	15806
1988	229388	13.9	16490
1989	232079	14.1	16430
1990	225555	13.2	17089
1991	214122	12.3	17340
1992	193485	12.3	15715
1993	224677	13.4	16726
1994	206217	12.4	16547
1995	198009	11.2	17661
1996	201018	11.7	17183
1997	198037	11.6	17005
1998	216188	12.7	17210
1999	227832	13.2	17278
2000	210269	12.2	17266
2001	191512	12.7	15101
2002	215900	13	16557
2003	205700	13.1	15660
2004	198800	11.8	16890
2005	192700	11.6	16639
2006	173600	10.2	16950
2007	164500	9.7	16895

In a simple regression of production on acreage harvested – that is, with production in tons as the dependent variable and acres harvested as the independent variable – the following results are obtained (where P = production in tons and A = acreage harvested, t-statistics are in parentheses below coefficients, and the asterisk indicates statistic significance at the 95% level applying a one-tailed test that the variable is signed as hypothesized):

$$P = \underset{(1.02)}{75917} + \underset{(1.77)\,*}{7.92\,A}$$

Adjusted R^2 = .08
F statistic = 3.14
Durbin-Watson statistic = 0.48

The independent variable of acreage harvested is barely acceptable at the chosen level (the critical value for the t-statistic = 1.71), but the independent variable explains only 8% of the variation in total production, the F-statistic gauging statistical significance of the R^2 is not acceptable (critical value = 4.23), and the very unacceptable Durbin-Watson statistic (critical value = 1.46) indicates serial correlation in the residuals or the unexplained component of production, a sign that there is another variable missing from the equation. In the next regression, it is clear that missing variable is TSA.

In a simple regression of production on TSA – with production in tons as the dependent variable and TSA as the independent variable – the results below are obtained (where TSA = tons of sugar per acre, and the other conventions described in the regression results above apply):

$$P = \underset{(0.97)}{21740} + \underset{(8.34)\,*}{14826}$$

Adjusted R^2 = .73
F statistic = 69.62 *
Durbin-Watson statistic = 1.87 *

The independent variable TSA is quite acceptable at the chosen level (the same critical values as above apply here and below), the independent variable explains a much larger 73% of the variation in total production, the F-statistic gauging statistical significance of the R^2 is quite acceptable, and the Durbin-Watson statistic is well within the acceptable range, showing that serial correlation of residuals is no longer a problem.

Combining both TSA and acreage harvested in a multiple regression gives better fit still, much better in fact, as might be expected since the two independent variables govern production:

$$P = -205981 + 16604\,TSA + 12.40\,A$$
$$(-56.89)^{*} \quad (128.60)^{*} \quad (70.01)^{*}$$

Adjusted R^2 = .99
F statistic = 9308.31*
Durbin-Watson statistic = 2.11*

Almost all of the variation in production is explained (99%). Yet while both independent variables are quite significant, it is still TSA that is the stronger of the two, more evidence that it is the dominant factor.

APPENDIX II.

An Appropriate Regional Induced Multiplier for the Hawaii Economy

Most people, even those who have never had any formal exposure to economics, understand the principle that any injection into an economy does not stop there. There are further ripple effects throughout the economy. If one dollar is spent on something, the person who receives that dollar will spend a portion of it on something else, and then a portion of that portion will be spent, and so on. Thus, the total economic contribution of the original injection can be much larger than the initial outlay. There is a "multiplier" effect. *

This multiplier can be applied to any expenditure to measure its total impact on the economy. Note that after the first round, it makes no difference what the original injection is – that is, what the wages are in that industry and the like. After that, the money is circulating in the general economy and it is only economy-wide averages that count.

The problem comes in calculating an accurate value for the multiplier. This value is sometimes subject to manipulation. Those wishing to convince others that a certain undertaking will have a big impact want to see a big multiplier; those who do not favor the project might lean toward a smaller one.

Essentially, the value of the multiplier depends upon "leakages" from the income stream at each stage of the re-spending process. The greater these leakages are, the quicker the subsequent spending will be attenuated and the smaller the multiplier will be. The smaller the leakages are, the more potent the multiplier is.

There are three such leakages that are usually considered -- savings, taxes, and imports. For example, if HC&S injects $100 million annually into the Maui economy, the recipients of that money will not spend all of that. They will *save* some of it, be required to pay some of it in *taxes*, and part of what they do spend will be on items that come from *outside* Hawaii -- thus it will leak out of the local spending stream that way.

So, the higher tax rates are, the greater the propensity to save, and the greater the tendency to buy imports is, the smaller the multiplier will be. Naive multiplier calculations often consider only the propensity to save, because that is how it is usually presented in an economics principles text -- and this is one reason multipliers are sometimes overstated. But if people save nothing, if tax rates are zero, and if they only buy things produced locally, the multiplier is unbounded. That obviously does not happen.

Without deriving it, a simple formula for an "open economy" multiplier is --

$$\mathbf{1 / [1 - (c - m)(1 - t)]}$$

where **c** represents the marginal propensity to consume out of one dollar of income, **m** represents the economy's marginal propensity to import, and **t** is the marginal tax rate. For example, if people generally consume 90% of their income, the marginal tax rate is 30%, and 15% of goods consumed are imported, then the multiplier becomes

$$1/[1 - (.90 - .15)(1 - .30)] = 2.1$$

A number of that magnitude is about what most people have in mind when they think of a multiplier, often even larger. (If only the marginal propensity to consume **c** is considered, the multiplier formula would be only **1/[1-c]** and it would equal 10 -- far too high.) So if that 2.1 number were applied to the $ 100 million above, the total HC&S impact on the economy would be $ 210 million.

Yet the assumed numbers above might not be appropriate for an economy like Hawaii. Better estimations of numbers that are more appropriate for Hawaii can be had by resorting to actual data on the economy. It might be reasonable to assume the marginal propensity to consume is still .90, but tax brackets and the marginal propensity to import would likely be higher for Hawaii. A tax rate of .35 is more reasonable, as is a propensity to buy imports of .40. (Ultimately, practically everything we consume in Hawaii comes from outside the islands. But if something is built here, cooked here, or otherwise creates local jobs, it is fair to consider it a domestic item for the purposes of this analysis. And local services, which are an important part of any budget, must come from here.)

So that yields,

$$1/[1 - (,90 - .40)(1 - .35)] = 1.5$$

While this multiplier is lower than many might have in mind when they think about it conceptually, it is far more defensible from the standpoint of realism. That is the number used for the multiplier in the text. The multiplier could, of course, be higher -- but it is in the interest of conservatism that this lower estimate is chosen. Although it is lower than what many would assume, it still means that the ultimate impact of any injection is 50% greater than its direct contribution.

(Some recent trends in the Hawaii economy would tend to lower the actual value of the multiplier as compared to the past. One is the tendency to import more over time as the world economy -- not just Hawaii's -- becomes more global. In addition, the tax burden has risen over time.[**] Plus, when the economy is close to capacity, there is less room for the multiplier to have its full effect. Obviously, if we took every economic activity in the state now and subjected it to a multiplier, we would get a sum far greater than the State Gross Domestic Product. But that Gross Domestic Product is supposed to include many indirect multiplier effects.)

---

* This effect was originally pointed out by John Maynard Keynes in his seminal book, *The General Theory of Employment, Interest, and Money,* published in 1936. This was during the Great Depression, and multipliers would likely have been larger in a situation like that than when the economy is closer to full employment.

** Earlier and larger regional multipliers for the Hawaii economy may have been more realistic then than they are today. One used in a past study on the sugar industry by First Hawaiian Bank was **1.72**. See Hitch, (*op. cit*.) p.7.

APPENDIX III.

An Appropriate Jobs Multiplier for the Hawaii Sugar Industry

The derivation of an appropriate jobs multiplier here follows the methodology of Hitch. * Hitch divides jobs created by the sugar industry in Hawaii into three levels:

(1) The direct jobs are those in the sugar industry itself.

(2) First round indirect jobs are those that are created by suppliers who service the sugar industry, such as local suppliers of fertilizer, herbicide, gasoline, mill equipment or machinery, or services such as construction, transportation, communications, legal, etc. These suppliers may service others besides the sugar industry, but at least part of their job is owed to sugar.

(3) Indirect multiplier jobs that are created. For example, when employees in categories (1) and (2) are paid, they spend most of their paycheck in the local economy. Those who supply those general goods and services therefore also benefit from the sugar industry. The multiplier in this category corresponds to the overall regional multiplier derived in Appendix II.

Hitch then estimates that 35% of the money disbursed by a sugar plantation goes to the direct creation of jobs. Of the remaining 65%, he also assumes that about half becomes income to residents of Hawaii (firms or individuals) – about 32% of the direct disbursements of a sugar company, with 33% leaking out of state. This means that there are almost as many indirect jobs created by sugar as there are direct ones, 91% in fact (32/35 = 91).

The third category of indirect multiplier jobs can then be derived by resorting to the overall regional multiplier derived in Appendix II.

To summarize:

Level 1: direct sugar job	1.00
Level 2: indirect sugar job	.91
Sub-total	1.91
Level 3: multiplier effect	x 1.50
	2.87

Subtracting the 1.00 for direct sugar jobs means that there are 1.87 jobs in Hawaii that are created indirectly for every job created directly by sugar itself. **

* Hitch (*op. cit.*), p.3. This multiplier was originally estimated by the Research Department of First Hawaiian Bank in 1961, and was published in a study entitled *The Impact of Exports on Income in Hawaii*.

** Hitch arrived at a number of 2.29 instead of 1.87, but that was because he used a regional multiplier of 1.72 instead of 1.50. As explained in Appendix II, today the regional multiplier might be smaller than it was in earlier, thus a more conservative number is adopted.

APPENDIX IV.

HC&S Endeavors to Diversify Away From Commodity Sugar Over the Years.

Various HC&S experiments to diversify away from commodity sugar over the past century would include: *

- In 1907, rubber trees were planted in Nahiku, but operation was abandoned in 1913, due to cheaper sources of rubber elsewhere.

- In 1917, corn, sweet potatoes, cassava, and fodder crops were planted, and equipment for drying and grinding was installed to provide flour for local consumption, with some export to Oahu. That also was abandoned after World War I ended, when cheaper produce could be found elsewhere.

- In 1961, Puunene Distillery was opened to produce ethanol for blending with Seagram's Leilani Rum. In 1967, the distillery closed in reaction to competition elsewhere and low profitability.

- In 1970, A&B land at Kealia was leased to Fish Farms Hawaii to raise Malaysian prawns. Disease problems and other production issues caused closure of this enterprise.

- In 1971, the first experimental papaya planting occurred at Omaopio, and the following year the Princess Orchard subsidiary was established to produce and market papaya. Though quality of the fruit reportedly was good, profitability was a problem.

- In 1974, A&B commissioned Stanford Research Institute to explore the possibility of manufacturing neutral spirits for export to Japan, but cheap synthetic ethanol from petroleum made the project uneconomical.

- In 1979, the Ethanol from Molasses Project Group Partnership -- which included the State, Maui County, and the Hawaii Sugar Planters Association -- was established to explore the possibility explore of modifying and restoring Seagram's Rum Plant in Puunene for gasohol production. The preliminary report showed gasohol to cost two times that of gasoline, and concluded that the economics needed to be improved, including obtaining value from byproducts of fermentation such as yeast and potash.

- Also in 1979, the Rum Plant was reopened under the management of Maui Distillers, processing 7500 tons of molasses annually, or 14% of HC&S's production. Up to 10% of the distillery's capacity of 100,000 gallons per month of 190 proof ethanol could be retained by A&B, which had the right to purchase it at cost for blending with gasoline and diesel fuel for experimental use in sugar plantation vehicles and possible sale. Competition again caused closure.

- In 1982, there were experimental plantings in patchouli, tea, and macadamia nuts. Patchouli was found not to be feasible. Tea and macadamia nuts were later transferred to Kauai, to be grown on former A&B sugar land at McBryde

Sugar Company. The Macadamia trees were found vulnerable to hurricanes, and not replanted.

- In 1984, a feasibility study was conducted to develop alternative revenue products such as paper with James River Company, and specialty chemicals with the Tennessee Valley Authority. In the case of paper, HC&S was found to be too small for the capital investments needed, and there were also environmental concerns raised, so A&B did not undertake it. This issue of being too small for certain enterprises has arisen in other cases also.

- 1987 saw the beginning of Maui Brand specialty food grade sugar by HC&S. This is ongoing, a success story for Hawaii agriculture.

- In 1993, a $10 million biomass gasification project sponsored by Pacific International Center for High Technology Research (PICHTR), the State of Hawaii and U.S. Department of Energy was begun. The ultimate goal was to answer questions about converting cane leaves to energy. Problems arose with bagasse handling because the project underestimated the task.

- In 1999, there was an expansion to increase food grade turbinado and specialty sugar production, which also bore fruit.

- In 2000, HC&S contracted with "Sugar in the Raw" to be the sole supplier of its turbinado sugar, another ongoing and successful venture.

- Also in 2000, Hawaii Duragreen Company, a $12 million investment utilizing bagasse to make high density fibreboards, was created. Low prices and equipment problems forced the closure of the facility in 2001.

- In 2001, a dryland taro commercialization project for a newly patented dessert was initiated, but lack of assurance of water put project on hold.

---

* The author would like to thank Mae Nakahata of HC&S, who drew some of the examples from Jacob Adler, *Claus Spreckels: The Sugar King in Hawaii in Hawaii* (Honolulu: University of Hawaii Press, 1966) for the list to follow.