

The Use of Interactive Cost of Production in Extension and Teaching Agribusiness Management-Linking Hawaiian Agribusiness to the World via the World Wide Web

S. Shehata, Professor of Agribusiness

**University of Hawai'i at Hilo
200 Kawili St.
Hilo, HI 96720
sabry@hawaii.edu**

Abstract: Innovative Techniques in Teaching Agri-marketing and Management. The website, HawaiianAgriculturalProducts.com, was developed and run to help students learn how to market agricultural products through the website, estimate their cost of production, and improve management and marketing skills. The overall goal of this project is to provide hands-on experience for agribusiness students and farmers in the area of marketing and management. The first objective is to compare different ways of introducing capital budgeting to farmers and students using innovative, interactive cost of production methods. The second goal is for the farmers to apply this technique to their own farming enterprises. The third goal is to use the website to teach e-marketing of agricultural products to farmers and students and apply that same information to market their own products successfully. The website will be used as a training site for Native Hawaiian, rural, underprivileged high school students and their families to help in marketing their products and improve their chances for business success. Extension agents and educators can then use the interactive cost of production program to teach various financial principles. Students and growers can now estimate cost of production at their leisure. The website features interactive cost of production programs. These programs can be customized for many different crops. Eventually, the website will be used to teach various market principles with e-commerce, to teach students how to improve the distribution efficiency of different products. This website could be duplicated by other universities as a model to serve their community

I. Introduction

Agriculture in Hawaii has changed over the past few decades. In place of large-scale productions like sugarcane and pineapple, we are now smaller diversified producers. These producers, although small in size, have the advantage of complementing one another. Furthermore, Hawaii's remote location poses challenges for these producers, who are attempting to deliver high-quality products to distant locations. However, many of Hawaii's agricultural products ideally could be marketed together on the same website. Farm products, including nursery plants, flowers, herbs, spices, specialty crops, and value-added products, including meat, macadamia nut candies, and Kona coffee, could be sold on the same e-commerce "shelves."

There is a need to help the producers achieve better planning. To do this they need to estimate in advance their cost of production using a simple and easy method. The interactive cost of production over the Internet could be the answer to the problem. The interactive cost of production can help in analyzing different scenarios, as well as a variety of crop choices. We currently developed a program that provides a profit and loss statement, balance sheet, cash flow, and financial bank analysis. The Internet can also assist them in their efforts, by linking producers to buyers around the world.

II. Literature Review

Many agribusiness firms are adopting e-commerce strategies (Mintert, 2003). However, the possible advantages to agribusiness have been overlooked as today's economy has become more global (Mintert, 2003). The use of the internet and telecommunications, including voice and data transmission and wireless capabilities, has an impact on marketing and it improves competition among market participants (Mintert, 2003). This new technology will increase the availability of

information on marketing opportunities worldwide and will improve the communication between buyers and sellers; thus it will increase price and marketing efficiency worldwide (Mintert, 2003). Wagner's article on Agribusiness technology in 2010: directions and challenges, predicted that the introduction of the Internet into agricultural producers means that they will have more access to the world and to information (Wagner, 2001). Consumers will also have access to more products than ever before, and with the instantaneous communication via the Internet, transactions will take place within moments (Wagner, 2001).

Beuskens in his article on: The economics of Dot.coms and E-commerce in the Agrifood Sector, studied the possibilities of the Internet for both large and small agribusiness firms. They stated that the Internet may bolster the large firms that are already successful, but it is also possible that smaller entrepreneurial farms may get helped up by the worldwide instantaneous capabilities of the World Wide Web (Beuskens, 2003).

It has been also made clear that the internet is not a new to farmers (Henderson, 2004).

Henderson in their paper on Internet and e-commerce adoption by agricultural input firms found farmers have been aware of the uses of the Internet for both information exchange as well as business purposes. Modern farmers need to be able to build personal relationships with buyers online (Henderson, 2004).

Currently, the Extension agents use Excel spreadsheets to help farms (CTAHR, 2007). Extension agents use these Excel templates to provide farmers with needed information on the cost of production. For farmers to use these cost templates they need help to know how to use Excel. These spreadsheets do not provide information such as the balance sheet, cash flow, and bank financial analysis that are badly needed to make financial decisions. Further, to start production of a product, farmers will assistance with cost and loan analysis, to help guide them as to what they can afford and what they would need. This process can be cumbersome, arduous and expensive. Often they need to find a

consultant who can do an economic feasibility study for them, and this can pose an additional cost that small farmers can't afford (CTAHR, 2007).

In 1992, a computer program was developed that estimated cost of production for anthurium farms in Hawaii (Shehata, 1992). To create the base of the program a survey was conducted to estimate the cost of production by the size of the operation. Then production output was forecasted using growth rate model and decay model, to create more accurate results. This information and data was then used to develop the cost of production software based on Pascal computer programming language. The software was tested, found accurate, and distributed to growers. Growers were able to use it at their own time to make necessary decision in management (Shehata, 1992).

III. Goals

This research aims to achieve two main goals: to provide an easy extension method for farmers and to provide hands-on experience for agribusiness students in the area of marketing and management.

IV. Objectives

The objective is to develop a website to be used in teaching and extension for e-marketing of agricultural products. The second objective is to develop innovative interactive cost of production methods that can be used for extension and teaching.

V. Methodology

The first objective was achieved using a questionnaire. It was designed to gather information regarding producer's desire to join an e-commerce marketing website. Feasibility Assessment for an e-Commerce Cooperative to Market Hawaii's Agricultural Products Survey covered types of crops or products produced, methods used for direct marketing, crops sold through e-commerce, interest in becoming member of a cooperative, need for technical assistance, willingness to attend

workshops in website development, willingness to invest in the e-marketing website, willingness to pay fees for using the service, and willingness to serve on the board if it becomes a cooperative. The questionnaire was initially mailed to a few participants to test the survey. The sample frame was defined as all agribusiness firms located in the State of Hawaii. A total of 350 were indentified. All members in the sample frame were invited to participate in the survey. The members in the list were contacted by telephone to determine if they were interested in participating in the survey. These participants were interviewed either over the telephone or in person. The completed survey was used in the analysis. The survey period was from April to December 2004. Out of the 350 agribusiness managers contacted, 147 agreed to participate in the survey.

The second objective was achieved through modifying the 1992 version of cost of production to the 2005 economics and production technology. The author developed a survey of orchid growers. The sample frame was defined as all orchids farms located in the State of Hawaii. A total of 57 were indentified. Telephone and personal interviews were conducted with growers across the State of Hawaii from April to September 2005, in order to determine the costs associated with producing potted orchids by each variety. Fifty-two producers participated in the study; 43 that produced only potted orchids were used in the estimation. Then the cost of production was tested for accuracy by entering data on the cost of production from existing farm operation in Hawaii.

Database

A database was developed that included all agricultural producers and processors in the State of Hawaii using contact information collected from the telephone book and the Internet. It also included agricultural producers and processors in the State of Hawaii that already had a website. Those who do not have a website yet were invited to participate in their site development, and the site was then linked to our website, www.hawaiianagriculturalproducts.com.

Development of interactive cost of production

In Hawaii, farms are very different from each other in terms of the type of management and method of production. This variation includes the different land types and uses, infrastructure, location and many other variables that can influence cost of production. The present methods used by many universities in calculating the cost of production use the average cost for the industry and the use of spreadsheets to help in calculating the cost. Using the simple average in estimating the cost of production will provide an inaccurate forecast of the cost of production for individual farms.

Unlike the spreadsheet methods for calculating the cost of production, the interactive cost of production was developed from obtaining various technical coefficients, and defined the relationship between production cost and various other farm inputs. The data on cost of production were collected and used to develop and test prediction model to predict the cost of production by size operation and other economics variables. The software was developed using JavaScript, an internet language.

This program was tested using existing farms to find out how well the software made predictions. Various versions were edited, and the final version was uploaded to the website. Training in the use of the model was conducted with commercial growers to educate them about various financial and economic analyses. The cost of production software was then uploaded to the website after being made more user friendly for farmers.

VI. Results

Results of questionnaire for e-Commerce

Almost half (46%) of the survey participants indicated that they would be interested in joining an e-commerce cooperative. Regardless of their intention to join an e-commerce cooperative or not,

33% of the respondents surveyed wanted to receive technical assistance, and 36% were willing to attend workshops on e-commerce (Tables 1 and 2).

Table 1. Interest in joining an e-commerce cooperative.

	<i>Number</i> <i>r</i>	<i>Percentage</i> <i>e</i>
Yes	67	46
No	68	46
Maybe	12	8

Table 2. Need technical assistance.

	<i>Number</i> <i>r</i>	<i>Percentage</i> <i>e</i>
Yes	48	33
No	32	22
Do not know	5	3
No response	62	42

The majority (59%) of the businesses surveyed did not use e-commerce at the time. The products most likely to be sold on the Web by the respondents were flowers and potted plants (15%) and coffee (12%). Given the large number of non-users, e-commerce appears to have potential for expanding sales for this group. In forming an e-commerce cooperative, one should target producers of these products to join (Table 3).

Table 3. Products currently sold using e-commerce.

	<i>Number</i> <i>r</i>	<i>Percentage</i> <i>e</i>
Coffee	8	12
Tropical cut flowers	10	15
Potted orchids	3	4
Potted plants	10	15
Mac nuts	3	4
Do not use	33	59
Total*	67	100

*Only those responding "yes" to interest in a cooperative (Table 1) were included.

Of those willing to participate in an e-commerce cooperative, 19% were willing to invest in the operation (Table 4), while 39% were willing to pay a fee for using the cooperative's services (Table 5).

Table 4. Willing to invest in a cooperative.

	<i>Number</i>	<i>Percentage</i>
	<i>r</i>	<i>e</i>
Yes	13	19
No	23	35
Maybe	31	46
Total*	67	100

*Only those responding “yes” to interest in a cooperative (Table 1) were included.

Table 5. Willing to pay a fee for a cooperative’s service.

	<i>Number</i>	<i>Percentage</i>
	<i>r</i>	<i>e</i>
Yes	57	39
No	6	4
Maybe	15	10
No response	69	47
Total	147	100

In summary, the survey results indicated that almost half of the survey respondents are interested in joining an e-commerce cooperative. In addition, respondents expressed an interest in supporting the cooperative in terms of financial investment, patronage, and management support.

3.2 Website development

The www.hawaiianagriculturalproducts.com website is divided into three areas. The first area is the e-commerce portal, where you can find several types of Hawaiian commodities from coffee to anthuriums. The second area is interactive cost of production for selected commodities, which is geared towards the farmers themselves so they are able to quickly and efficiently calculate their costs. The third part of the website is links to research and information as well as other services for farmers, including data research, statistics, and other economic information. The different aspects are given in more detail in the subject headings below.

E-commerce organization

The website links various growers organized by commodity to help consumers compare prices and quality services (Figure 1). Buyers will also be able to shop for more than one product.

Buyers are asked to give feedback by filling out an evaluation form on the quality of service provided by the seller. This evaluation is then posted, and later reviewed to help improve the service to the customers. At this point we were able to link about fifty growers to the site and are in process to developing and adding more growers each day.

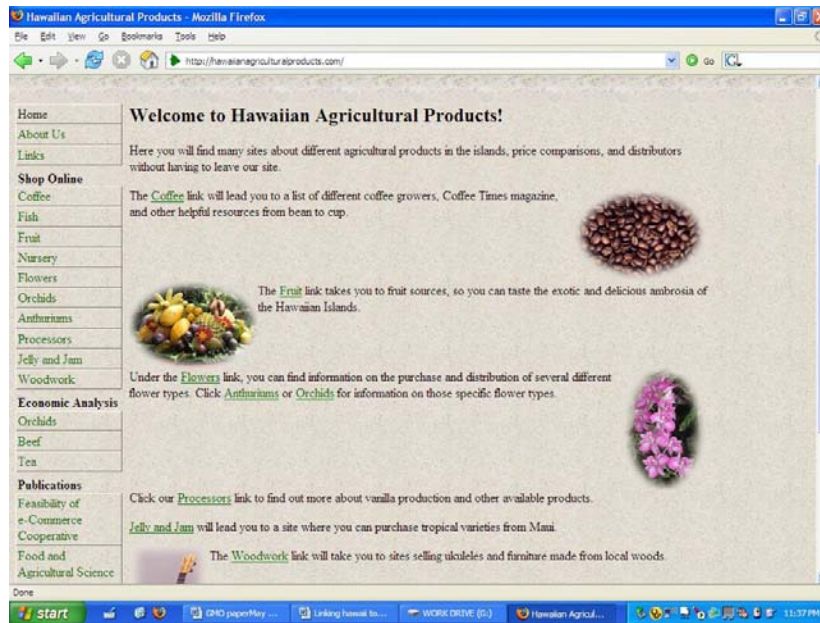


Figure 1: Main webpage, www.hawaiianagriculturalproducts.com

3.4 Management

3.4.1. Interactive Cost of Production

The management site and interactive cost of production was initially developed for orchids, tea, and anthuriums and more crops will be added in the near future. The information about production costs was collected from growers and a mathematical model was used to forecast the impact of changes in various production data on the cost of production. With the program, the farmer can calculate annual costs and returns. The form is readily available through a link on the webpage, where the farmer can enter his/her data and the cost of production is calculated. Different sizes of farms as well as several different products are available on the interactive cost of production.

Variable Cost

To calculate cost of production, growers input information about their operations, such as direct production cost: fertilizer, water, wages, direct harvesting and marketing labor cost. Indirect cost such as office supplies, computers, interest paid on financing farm operation and office average monthly bills including electricity, phone, internet, cell, other utilities, etc. are also entered by the growers.

Fixed cost

Growers also enter monthly administration expenses including management, secretary wages, etc. For each item in the fixed cost, they enter quantity and price.

Other Information

The growers also enter price and the number of products they intend to produce per year for each product species. In addition, they can change the life expectancy of the capital equipment and use the straight line depreciation methods to calculate the cost of using this capital equipment. After entering their value into a text box, the program forecasts the cost and return of this particular enterprise as seen in Figure 2.

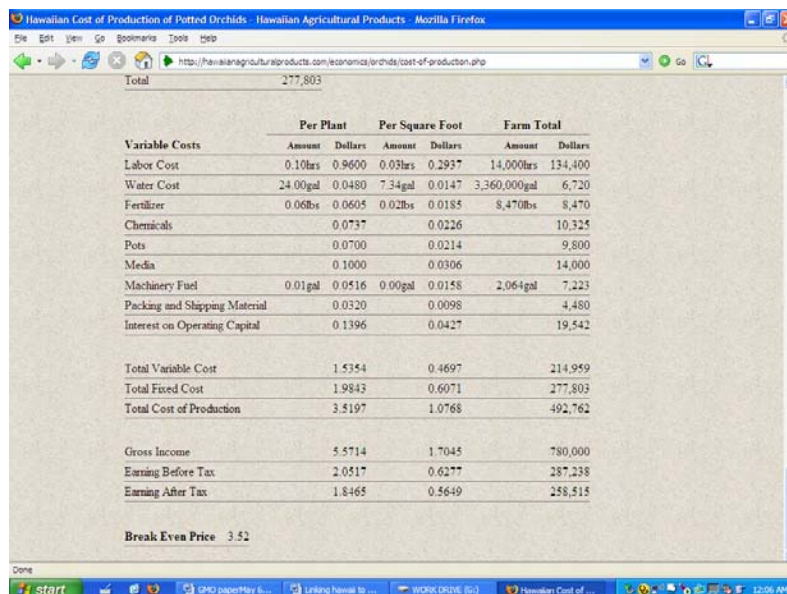


Figure 2. Interactive Cost of production webpage

Application in Teaching and Extension

This method represents innovative techniques in teaching agri-marketing and management. The website, HawaiianAgriculturalProducts.com, was developed and run to help teach students how to market agricultural products through the website, estimate their cost of production, and improve management and marketing skills. Teachers can use a hands-on method using the website to give the students experience in capital budgeting and sensitivity analysis. The teacher can then use the interactive cost of production program to teach various financial principles. Students and growers can now estimate cost of production at their leisure. These programs can be customized for many different crops. Eventually, the website will be used to teach various market principles with e-commerce, to teach students how to improve the distribution efficiency of different products. This website could be duplicated by other universities as a model to serve their community.

The website will be used as a training site for native Hawaiian, rural, underprivileged high school students and their families to help in marketing their products and improve their chances for business success. In the past year, approximately 860 people have visited the site. The top five grower websites visited via this website were Hawaiian Tropicals, Aloha Orchid Nursery, Pacific Tropical Gardens, Asia Pacific Flowers, and Hawaii Blooms. The Economic Feasibility pages has been visited 135 times.

Research information and other links

The site will also be used to link other government, state and university websites with economic data that may help growers improve their ability to predict various economic conditions as well as finding different venues for financing their operations, such as grants. Further, we will also add publications and other information related to production information such as ways to combat disease and pests and other production information (Figure 3).

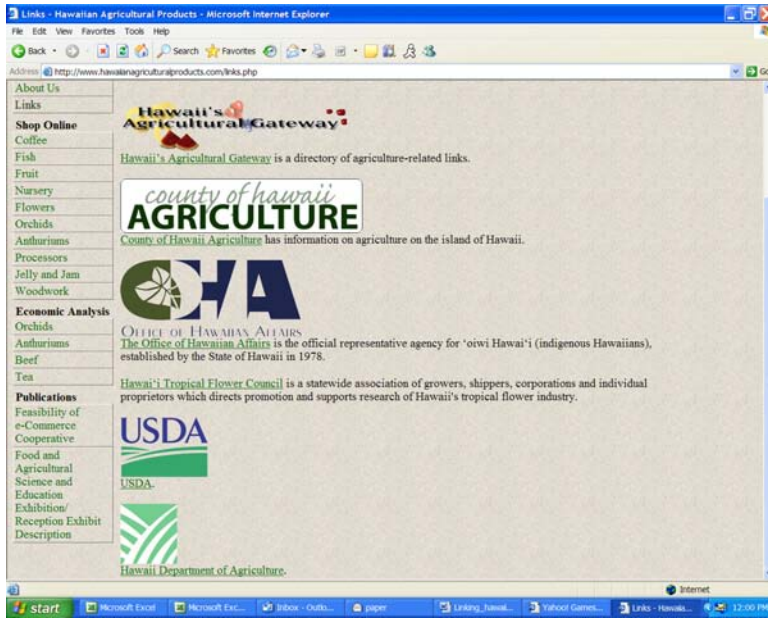


Figure 3. Links

Monthly website visit count

This project, although still in the early phases, has already shown promise. Several community site demonstration projects have been underway. Farmers have been shown preliminary web features that they can have access to, and have given positive feedback about the website. Figure 4 shows that from November 2005 through June 2006 a record has been kept of the number of visits to various product links. The results indicate that over the eight months from commencement of the website there has been a steady increase in the number of visits totaling 1926. Of those visits, 39% were to orchid growers, 18.6 % to nurseries, and 16.6% to flowers, 6% coffee, and 3% fruit.

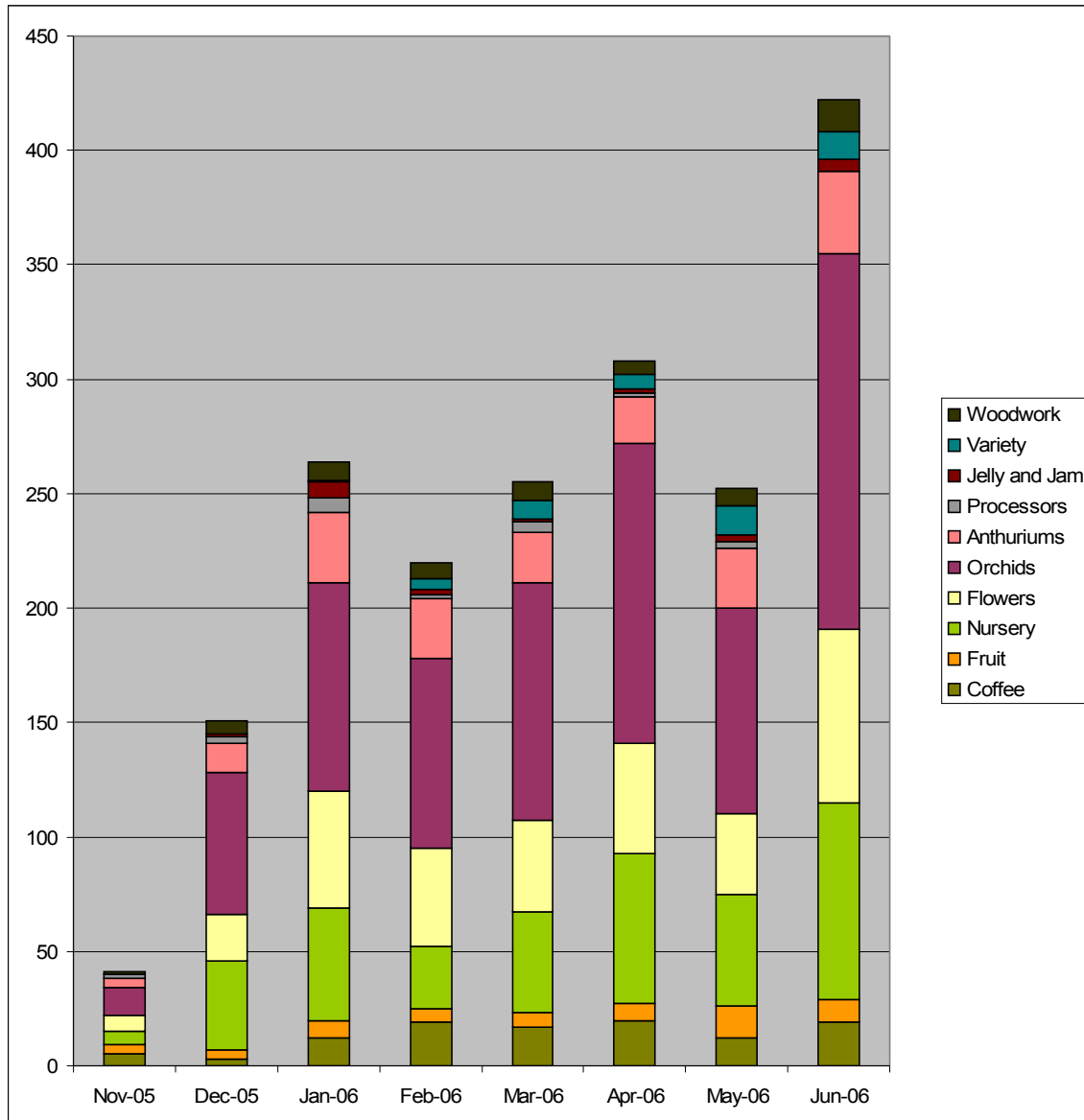


Figure 4. Number of visits to website by product

To date there has been 277 visits have been to the interactive cost of production programs as depicted in Figure 5. It is anticipated that as the website becomes more established, the number of visits will increase, and farmers will begin testing the interactive cost of production programs, which have been designed to be user friendly and easily accessible.

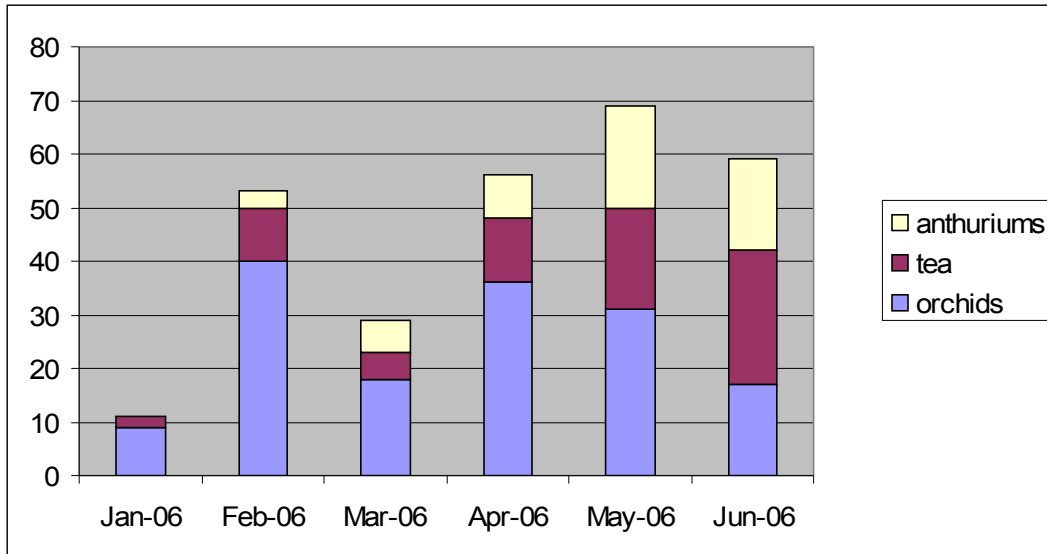


Figure 5: Number of visits to website by Cost on production

Many agribusinesses outside of Hawaii have visited the website from ranging from the USA Mainland to other countries as seen at Figure 6. This portal will be the first step in establishing a much bigger and greater project worldwide, and can be the step linking Hawaiian agribusiness to the world.

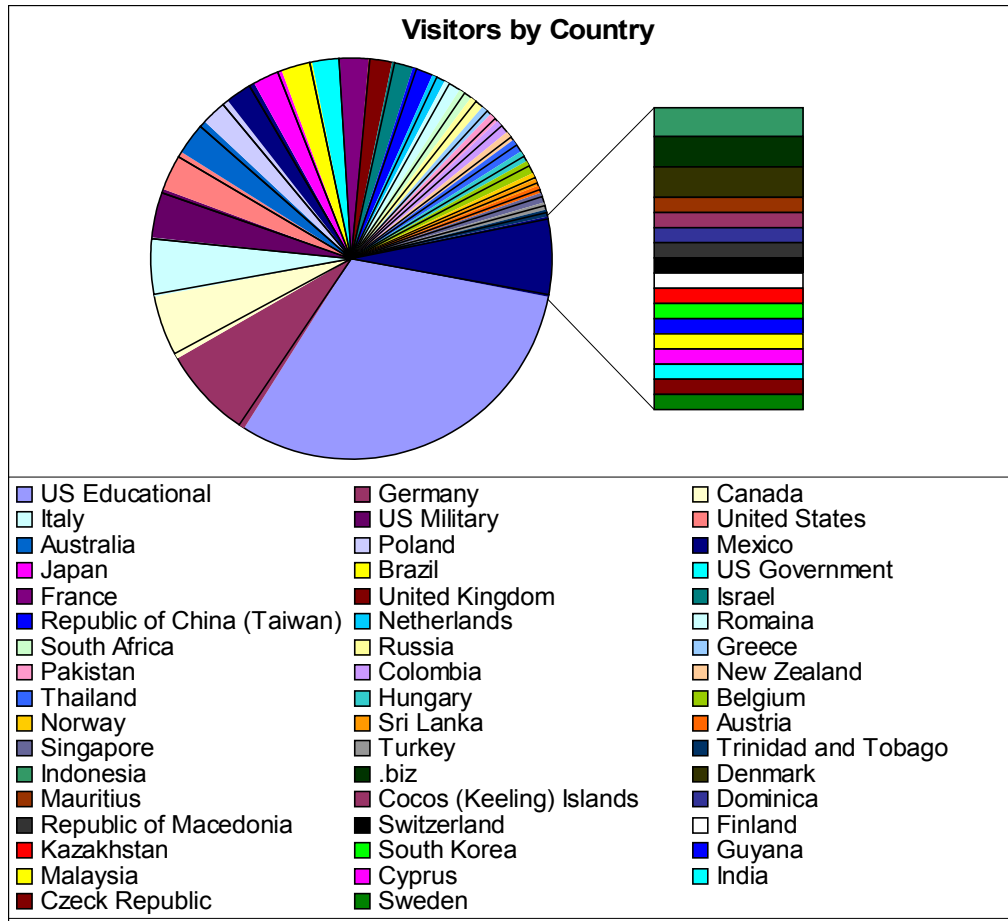


Figure 6: Number of visits to website by Country

VII. Conclusion

In conclusion, this interactive cost of production model is the only one-stop shop on the Internet for every aspect of successful agribusiness e-commerce specifically geared toward rural island farmers in Hawaii. They will be able to access a wealth of information from a myriad of sources, to use interactive cost of production designed to forecast the costs of every aspect of their operation and, best of all, to link their special product to the World Wide Web in a virtual marketplace that will revolutionize the traditional concept of the Farmers' Market. Not only will this site improve their chance for business success, but it will also achieve a higher goal: to keep

the next generation of farmers in the business, as well as supporting the traditional heritage of the people of Hawai'i.

Students are learning how to estimate production coefficients based on the information provided by the growers, surveyed and validated with researchers and previous publications. Teachers can use a hands-on method using the website to give the students experience in capital budgeting and sensitivity analysis. They can also use the interactive cost of production program to teach various financial principles. Students and growers can now estimate cost of production at their leisure.

The website features interactive cost of production programs, and can be customized for many different crops. Eventually, the website will be used to teach various marketing principles with e-commerce, to teach students how to improve the distribution efficiency of different products.

This website could be duplicated by other universities as a model to serve their community.

Acknowledgment

Support of this research was provided in part by US Department of Agriculture-CDREES Alaska Native/Hawaiian Serving Institutions Education Grant.

References:

Beurskens, (2003), "The economics of Dot.coms and E-commerce in the agrifood sector." Review of agricultural economics, Spring-Summer. Volume 25 (1): 22-28.

College of Tropical Agriculture and Human Resources (CTAHR) website. (2007).
www.ctahr.hawaii.edu

Henderson, J.; Akridge, J.; Dooley, F. (2004). *Internet and e-commerce adoption by agricultural input firms*. Review of agricultural economics, Winter, Volume 26 (4)

Mintert, J., Andresen, D., and Schroeder, T. (2003), "Improving efficiency in business-to-business information transfers: a Web-based solution in the beef sector", International Journal of Information Management, Volume 23 (5)

Shehata, S., Anderson, M., and Waite, M. (1992) "Software on the Cost of Anthurium Production and its Use in Teaching and Extension, New Technologies and Innovations in Agricultural Economics instruction". Proceedings of a Conference and Workshop hosted at the University of Kentucky co sponsored by the Southern Agricultural Economics Association and endorsed by the American Agricultural Economics Association, (113-120)

Shehata, s., Linda Cox, and Tim O'Connell. (2006) "Feasibility Assessment for an e-Commerce Cooperative to Market Hawaii's Agricultural Products" Cooperative Extension service, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa, ET-6: (1-4).

Wagner Weick, C. (2001) "Agribusiness technology in 2010: directions and challenges", Technology in Society, Volume 23 (1): 59-72.