



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

4

Paper presented at AAEA Summer Meetings, August 2-5 1987.  
Michigan State University, East Lansing, Michigan

1987

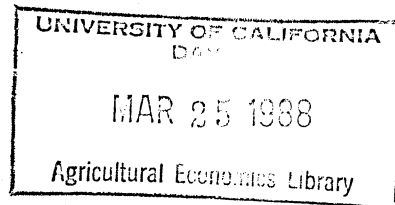
An Economic Evaluation of Additional Market Information

by

Stuart T. Nakamoto  
John M. Halloran

Dept. of Agricultural and Resource Economics  
University of Hawaii at Manoa

Information Services



Abstract

A "pseudo quasi-experiment" is used to evaluate an ongoing information acquisition-dissemination system for two vegetables in Hawaii. Results indicate that how information is used, as well as a distinction between the users as opposed to the beneficiaries of a program, are necessary for evaluating and improving system performance.

## AN ECONOMIC EVALUATION OF ADDITIONAL MARKET INFORMATION

The concept of information as an economic good is universally accepted. The theoretical basis for this belief is usually some variation of producer/consumer surplus and/or Bayesian statistics. There is less consensus on the value of additional information, which must serve as a complement or substitute to information already available.

Most of the literature can be categorized into four areas. These are studies on: (1) determining the optimum amount of information (see for example Stigler, Grossman and Stiglitz), (2) how information used in forecasting enters the market system (e.g. Bessler, Leuthold and Hartman), (3) the efficient market hypothesis (e.g. Fama, Garbade and Silber), and (4) the distributional impacts of additional information (e.g. Marshall, Hirschleifer). One area which is relatively neglected is empirical evaluations of specific information acquisition-dissemination (A-D) systems. More specifically, this topic addresses the impacts of a particular information A-D system on individual decision makers and on aggregate market performance. For example, some concerns are the impact of the publication of market wholesale prices on growers' or shoppers' well-being, and the identification of those impacts.

When viewed in this manner, some possible reasons for the relative paucity of empirical research in this area are apparent, especially in the evaluation of ongoing programs. For one, an analysis based on time series data is subject to history effects. A quasi-experimental research scheme (Campbell and Stanley) is one approach to account for history effects. While analyses with properly specified models may be useful, appropriate data are often unavailable

in sufficient form or quantity, especially with ongoing programs which by definition do not have a post-test or post-treatment phase. In general, data to directly measure the impacts of additional information are not available. Ideally, we would like to observe if market participants gained an increase in utility. We are usually left with secondary data sources as aggregate measures of market performance.

We contend that the initial evaluation of an information A-D system should be made from the point of view of the intended beneficiaries. An important distinction also need be made between the beneficiaries of a system and its users. For the initial analysis, documenting the impacts on intended beneficiaries is sufficient. If these are negative, the system can be modified or terminated. If impacts are positive, then distributional consequences can be investigated.

The remainder of this paper presents an empirical investigation into a real-world information A-D system. It is an example of how problems were overcome to evaluate the impact and value of a system and the additional information it provided.

**The Setting.** In Hawaii, marketing and production conditions have been leading to shrinking market shares of local produce. While there are problems with the quality of certain crops, the prime limiting factor to maintaining and expanding the market share of Hawaii-grown produce is inconsistent and therefore unreliable supply, compounded by inadequate marketing coordination (CTAHR, DOA, OlokoFunbi).

In 1983, the Hawaii Agricultural Statistics Service (HASS), at the request of the Hawaii Farm Bureau, started a program involving the collection and dissemination of production and harvesting information

on head cabbage and head lettuce. On a weekly basis, growers report planned and actual harvest and planting data to HASS, who processes, summarizes, and makes the information available to the general public. The goal of this program is to alleviate the perceived supply problems of both crops and in doing so, make local farmers better off. The question posed to researchers was "Is this program working?"

**Hypotheses.** What would be the effects of a successful information program? Past and future use of the information is contingent on its value to users in making better decisions. For the risk-averse profit maximizer, "better decisions" translates to a higher level of profits. Profitability is also enhanced if risk and uncertainty are reduced; even if the average level of profits remains unchanged, participants are better off in a more stable (i.e., predictable) market.

The research focused on the magnitude, direction of change, and stability (inversely related to dispersion) of selected variables from secondary sources, for the period prior to the program and the period after the program's initiation. Finding certain changes would be consistent with the program having an impact, although it would not necessarily prove that the program caused the observed changes. Thus, increased profitability is the goal of the information program. It was hypothesized that *ceteris paribus*, a higher level and/or increased stability of the value of in-state unloads would reflect a successful information program. The expected results for other variables varied with the crop being analyzed.

**Procedures Used.** Given the problems of an ongoing program, poor data, and probable history effects, a new approach was used to evaluate the information program. This might be described as a cross-

sectional approach to time series data, and is called a "pseudo quasi-experiment." In this scheme, identical analyses were conducted on pairings of head cabbage and head lettuce and a similar crop for each, and the results compared for similarities and differences. The rationale was that crops which behaved similarly before the information program—i.e., whose prices, unloads, and value of unloads exhibited similar patterns over time—should also behave similarly during the program unless the program had an effect on the variables (and discounting spillover effects to similar crops). Further, a comparison is strengthened and spurious relationships could be reduced by comparing crops with similar characteristics. Based on this evaluation for similarity in characteristics and in behavior, romaine and Chinese cabbage were respectively selected as similar crops for head lettuce and head cabbage.

Similar behavior was determined from local unloads (unloads from in-state sources), price, and the value of local unloads over the time period preceeding the introduction of the information program. Similar characteristics were based on physical similarities as in vegetable type (i.e., leafy greens vs roots and bulbs vs fruit) and perishability after harvest; similarities in consumption patterns, (i.e., head cabbage is consumed in a variety of raw, cooked, and preserved forms that reflect the diverse cuisines in Hawaii, while the vast majority of head lettuce is consumed in sandwiches or tossed salads); and similarities in market characteristics such as total market volume, market value, and market share of unloads from local sources versus from imports.

The analyses in the pseudo quasi-experiment relied on a combination of three relatively simple techniques to find the

magnitude and direction of any changes in the levels and stability of the market variables. These techniques have the advantage of being easy to apply as well as interpret. Further, a certain degree of robustness is gained by using several different methods, not so much via their sheer number as via the different perspective each gives to the overall analysis. The analytical techniques used were descriptive statistics, line graphs, and box-and-whisker plots.

Descriptive statistics were used for exploratory purposes and for statistical comparisons of variables between the periods before and during the information program. Specific items include measures of central tendency and dispersion, a coefficient of variation, and tests for differences in the variances as well as means.

Line graphs of the variables over one-week intervals were used for a visual evaluation of patterns in the data before and during the information program. The comparison between periods included an assessment of higher or lower overall levels, changes in slopes, wider or narrower variations in magnitude, and more or less frequent and pronounced "valleys" and "peaks."

Box-and-whisker plots are based on the median as a measure of central tendency, so provide visual comparisons of the same data from a different angle (Tukey, SYSTAT Inc). When data are grouped according to the values of a given variable, such as the periods before and during the information program, box plots are described as the "graphical analogy of one-way analysis of variance" (SYSTAT Inc).

In summary, the techniques provided an indirect measure of the impact of the information program on the market for head cabbage or head lettuce. The results for each vegetable were evaluated for any changes in the level and stability of each variable over time. The results for each target vegetable were compared with the corresponding

results for the respective similar crop. The implication of any differences is the program had an impact.

Results. To recapitulate, market impact was evaluated via analyses of the level and stability of several variables before and during the information program, as applied to head cabbage and Chinese cabbage, and to head lettuce and romaine. Table 1 is a summary of the evaluations and a comparison of each target and similar crop.

Table 1. Selected Changes in level and stability from period before to period during information program

Parameter	Crop:			
	head cabbage	chinese cabbage	head lettuce	romaine
Price:				
level	inc	dec/none	none	inc
stability	inc	inc	inc	inc
In-state unloads:				
level	none	none/inc	none	none
stability	inc	inc	none	none
Imported unloads:				
level	n.a.	n.a.	none/inc	inc
stability	n.a.	n.a.	none/dec	none
Total unloads:				
level	n.a.	n.a.	none/inc	inc
stability	n.a.	n.a.	dec/none	none
Value of in-state unloads:				
level	inc	none	none	inc/none
stability	inc	none	none	none

Key:

- inc - increase from before to during program
- dec - decrease from before to during program
- none - no change between periods
- na - not applicable; variable not measured for crop

For double listing, first rating indicates stronger effect.

The two target crops had contrasting results. The study did not consider causality, but its findings are consistent with expectations for a program whose information has an impact on the Hawaii market for head cabbage, and no impact on the market for head lettuce. Further,



given a goal of improving the well-being of program participants, increased level and stability in the value of in-state unloads are indicative of a successful program for head cabbage.

Head Cabbage. The findings from the comparison of head cabbage and Chinese cabbage were that both crops did not behave similarly. An implication is that decision making for both crops were similar before the program and continued unchanged for Chinese cabbage. In comparison, for head cabbage the information program is associated with increases in (1) the price level, (2) the spread between high and low prices, (3) the level and (4) the stability of the value of local unloads. Since imports for both crops were insignificant, imports and total unloads were not analyzed.

The most significant findings were increases in the level and stability of the value of local head cabbage unloads. These changes imply an increase in profitability for the participants, and correspond to the expectations for a successful program. The increase in stability was especially evident in the elimination of major downside fluctuations, indicating that head cabbage growers and/or buyers not only received more income, but also were exposed to less downside risk. In comparison, there were no significant differences in the level or the dispersion of unload values for the similar crop. Further, while overall stability increased, week-to-week fluctuations in the value of head cabbage unloads were more apparent during the program. This was interpreted as being indicative of adjustments in either prices, unloads, or both taking place in the second period, and presumably in response to the information provided by the program.

Given that in-state production accounts for practically the entire market supply of head cabbage, the existence of a "pocket

market" (Peters, DOA), and the cited need for a consistent supply, a major expected effect of a successful information program on head cabbage was an increase in the stability (reduction in the variation) of in-state unloads and consequently, increased stability in prices. In absolute terms, the stability of unloads and prices did increase, but for both head cabbage and Chinese cabbage. Thus, there was no change relative to the target crop. Since value is the product of price and unloads, it is nevertheless significant that even with these increases, the value of local unloads for Chinese cabbage did not increase in stability, while the value for head cabbage did. This suggests that the information program was instrumental in affecting the timing or some other relationship between prices and unloads.

The expected effects on the levels of price and quantity were uncertain. Theory predicts that the reduction in risk and uncertainty from additional information would result in an outward shift of the supply curve with a subsequent reduction in price and increase in quantity. However, one reason for farmers to use the program is to avoid market gluts via better planning of production. Being successful may similarly involve a reduction in quantity to raise prices.

In fact, there was little or no change in the level of unloads for either crop, and average head cabbage prices increased relative to prices for Chinese cabbage. The same volume of head cabbage was being supplied, but apparently in a smoother, more stable fashion. By minimizing market gluts, low prices and the subsequent slow recovery found by Peters were also avoided, so the average price level increased. Higher prices with the same volume resulted in a higher value of unloads.

The observed results are consistent with an explanation of growers using the information program to control market supply, presumably by controlling plantings. Within the production cycle, growers have some leeway in speeding up or delaying harvest and marketing to avoid anticipated gluts or meet expected shortages, but such actions are limited by factors such as biological constraints and transportation schedules.

While a successful program involves use by growers, it might also have included buyers. Activities such as contracting or presales by farmers to market a crop before a production glut, or by buyers to fill orders before a shortage are possible. These actions would also tend to stabilize the quantities of produce being marketed.

Through informal conversations with producers, it was verified that at least some head cabbage growers take an active interest in the information as an aid to their production decisions, notably in planning for plantings. Cabbage growers have reported stabilized production since the inception of the program (CTAHR). Unfortunately, there is no corresponding information prior to the program, or for what occurred at the buyers' level.

Head Lettuce. In contrast to the results for head cabbage, all measures except the price level of head lettuce were interpreted as being substantially identical in an item by item comparison with romaine. Further, the only conclusive change over time in absolute terms for head lettuce was an increase in price stability. At best, analytical results indicated a limited difference between periods for the level or dispersion of all other variables.

The findings were affected by disease problems and consequently, highly seasonal production, which were reported to be acute from one

to two years before the information program's inception, and which may have masked its effects. Nevertheless, similarities between head lettuce and romaine were apparent throughout the study, including the impact of disease on local production. The overall conclusion was that both crops behaved similarly over time. There were no observed relationships between the information program and market variables that were consistent with an explanation of the information program having an impact on the market for head lettuce.

**Implications.** The most striking aspect of our analysis is the disparity in results for head cabbage and head lettuce. The expected impacts of a successful information program are apparent in cabbage, but there were no discernible impacts for lettuce. Why the difference? A comparison between the produce in question suggests several explanations. These identify issues that should be addressed before the program is expanded, or even continued for especially crops that must compete with a significant amount of imports.

Disease problems in head lettuce may have been of sufficient magnitude to mask the effects of a program. Disease also affected head cabbage, but not to the same degree. Further, cabbage growers as a group seem to be more organized and cohesive, which may augment the information disseminated by the program.

However, the major difference between head cabbage and head lettuce is related to market shares; the information program seems to have had an impact where most of the market supply is from in-state or local sources versus out-of-state sources. Cabbage growers affect market supply by using the program to adjust their production and marketing (and ultimately their well-being); imports are not a factor. In the case of lettuce, some of the decision-makers who need to use

the information to make the program work are not the program's primary beneficiaries.

The large proportion of head lettuce imports suggests that both growers and buyers need to be involved for a successful program. Buyers have expressed a willingness to substitute local produce for imports (DOA), contingent on a consistent, steady supply. Credible projections of future production would yield a similar result, namely a reliable and predictable local supply. Even if supply is not consistent, buyers will know in advance when either overproduction or shortages will occur. Under such conditions, the market could absorb any and all local production, with imports being used to make up the difference.

The apparent key is for growers to first use the information to develop credible projections, then for buyers to use the projections in making their orders. No results would be apparent if there were insufficient participation by either party. For growers, a successful program would result in higher average prices, since low prices from production gluts with the subsequent slow recovery characteristic of the Honolulu market will not occur. In turn, higher, more stable prices might encourage more production with corresponding decreases in imports. However, there is little evidence that buyers actually use the information.

Several factors explain the program's non-use. After discussions with buyers, it was apparent they had only marginal awareness of the program, its purpose, and informational content. Some confusion also existed between this and other programs that disseminate information. Relatedly, the gains to the buyer from using the system may be minimal, and it may have been too difficult or too costly to access the information. Most buyers also have a core group of local

producers that they consistently deal with. Thus, the information disseminated via the program may be a redundancy, at best, for any individual buyer who already has a communication network in place. (It is also possible that the program substituted for a less efficient method of acquiring information, but with identical end results.) Finally, it is also possible that the program was not distributing the correct information. For example, if a two-week lead time is needed to order imports but information is available only one week in advance, the program will not be used.

The issue facing the information program administrators is how to modify the program to get necessary and sufficient participation. The problems described suggest two obvious actions: one, query buyers on their informational needs and two, increase both growers' and buyers' awareness of the program. In addition, the advantages of participation must be demonstrated to buyers.

In summary, the relative impacts of the information program on head cabbage and head lettuce are explained as a function of the market shares of locally grown produce. In cabbage, the beneficiaries are the only necessary users of the program. The results illustrate the need to analyze how the information disseminated through a particular program is used, and the need to identify the key decision-makers and users as opposed to the beneficiaries of an information program. We argue that more empirical analyses of real world information acquisition-dissemination systems need to be conducted along these lines so that system performance can be improved.

### References Cited

- Bressler, R.G., Jr. "The Measurement of Productive Efficiency." In Waananan, M.V. (ed), Western Farm Economic Association Proceedings, 1966. Pullman, Washington: Washington State University, January 1967.
- Campbell, Donald T. and Julian C. Stanley. Experimental and Quasi-Experimental Designs for Research. Rand McNally College Publishing Co., Chicago. 1966.
- College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii. "Agricultural Industry Analysis: The Status, Potential, and Problems of Hawaiian Crops. Leafy Vegetables Industry Analysis Number 3." December 1985.
- Fama, Eugene F. "Efficient Capital Markets: A Review of Theory and Empirical Work." Journal of Finance 25(2):383-421, 1970.
- Garbade, Kenneth D. and W.L. Silber. "On the Information Content of Prices." American Economic Review 69(1):50-59, March 1979.
- Grossman, Sanford J. and Joseph E. Stiglitz. "Information and Competitive Price Systems." American Economic Review, 66(2):246-53, May 1976.
- Hawaii State Department of Agriculture, Commodities Branch, Division of Marketing and Consumer Services (DOA). "The Hawaii Market for Nine Fresh Vegetables: Current Status and Potential." December 1981.
- Hirschleifer, J. "The Private and Social Value of Information and the Reward to Inventive Activity." American Economic Review 61(4):561-72, 1971.
- Leuthold, R.M. and P.A. Hartmann. "A Semi-Strong Form Evaluation of the Efficiency of the Hog Futures Market." American Journal of Agricultural Economics 61:482-89, 1979.
- Marshall, John M. "Private Incentives and Public Information." American Economic Review 64(3):373-390, June 1974.
- Olufokunbi, Banwo. "Analysis of Structure and Operational Efficiency in the Distribution of Fresh Produce: A Case Study of the Hawaii Produce Distribution System." Ph.D. dissertation, University of Hawaii (Dept of Agricultural and Resource Economics), December 1971.
- Peters, C.W., Robert H. Reed, and C. Richard Creek. "Margins, Shrinkage, and Pricing of Certain Fresh Vegetables in Honolulu." University of Hawaii, Agricultural Economics Bulletin 7. June 1954.
- Stigler, George J. "The Economics of Information." Journal of Political Economy 69(3):213-25, June 1961.

SYSTAT, Inc. SYSTAT: The System for Statistics, user manual, 1985.

Tukey, John W. Exploratory Data Analysis. Addison-Wesley Publishing Company, 1977.