IMPROVED EFFICIENCY THROUGH ELECTRONIC MARKETING OF FRESH FRUITS AND VEGETABLES

by

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The authors evaluate the advantages and disadvantages of electronic marketing in the fruit and vegetable industry.

INTRODUCTION

America's food marketing system is characterized by an intricate network of activities aimed at meeting the needs of consumers while providing reasonable returns for participants. Effective coordination of assembly, transportation, processing, handling, storage, and distribution functions is imperative for the system to function efficiently. While this system has performed relatively well in meeting needs, it is desirable to continuously monitor it and strive for improvements.

Current and emerging computer technologies offer potential for improving efficiency in the fresh fruit and vegetable marketing system. Theoretical benefits accruing from implementation of such a system have been delineated by several authors for other commodities and in general (2, 4, 5, 6, 7, 8). Cotton was the first (1975) agricultural commodity to be traded through a computerized system (TELCOT). Lambs, feeder and slaughter cattle, hogs, and eggs have been traded on similar type systems since then with varied degrees of success. Few studies have evaluated the potential of electronic marketing for fresh fruits and vegetables (1, 3).

OBJECTIVES

The purpose of this analysis is to compare current marketing methods and costs with those of an electronic marketing system for fresh fruits and vegetables so as to evaluate feasibility of the latter system. Potential improvements accruing with electronic marketing of fresh fruits and vegetables are discussed along with impediments to implementation of such a system.

METHODOLOGY

Costs of negotiating transactions via a computerized system are synthesized for selected fresh fruit and vegetable commodities using the Southeastern United

States as the geographical area for the analysis. Commodities to be analyzed are cabbage, snapbeans, sweet corn, tomatoes, and watermelons. The Southeastern United States is defined to include Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee. Quantities of the respective products available are defined as the average annual production of the region from 1979-81. Costs are estimated for a time sharing system on the basis of single and multi-commodity use and comparisons are made.

ANALYSIS AND DISCUSSION

Computerized marketing entails the conventional practices of marketing a particular commodity with the exception that physical proximity of buyers, sellers, and product is not necessary. Market participants are linked by one or more central processing units (CPUs) via telephone lines. Bids, offers, and messages are communicated to the CPU through computer terminals. The CPU matches bids and offers according to criteria established for the system. The system may be designed to accommodate any number of commodities with varied characteristics over any geographic area.

REDUCED COST OF TRANSACTIONS

Costs of negotiating and consummating transactions via a computerized system can be estimated by identifying operational requirements of the system and associated costs. Volumes, in truckload lots, of the respective commodities available in the Southeastern region which could be marketed using a computerized system are presented in Table 1 along with associated computer connect-time requirements. Computer connect time was derived based on the assumption that each buyer and seller requires three minutes of connect time per lot. Thus, each lot traded requires six minutes or .1 hours of connect time (3).

Transactional, monitoring, and programming components of computer costs are estimated for each respective commodity and a multi-commodity electronic exchange in Table 2. Cost estimates are for a time-sharing computer system because other analyses have shown it to be the least costly and offer the greatest flexibility for growth (3).[1] Transaction costs are derived using the hourly charge for computer connect time and annual hours of connect time. Monitoring and programming costs are obtained from actual expenses incurred by a major marketing organization operating a telephone exchange for agricultural commodities in Georgia (3). Cost per lot is computed using the number of lots traded which was given in Table 2. Unit costs other than cost per lot shown in Table 3 differ by commodity and are in units for which prices are commonly reported. These units are obtained according to the weight of each lot by commodity and state of origin.

By comparing costs among commodities in Table 3, it can be seen that per unit costs vary inversely with volume traded. Thus, a computerized market for tomatoes would be far less expensive per lot traded than one for snapbeans. Economies of size can be realized as costs which vary only partially or not at all with volume traded may be allocated over additional lots traded.

The benefits of economies of size reflected in the single commodity framework are even more pronounced in a multi-commodity framework. By treating each lot the same regardless of commodity, unit cost per lot becomes uniform for all commodities traded through the multi-commodity system. Unit costs in a multi-commodity framework are lower than the single commodity framework for tomatoes ($1.85) and watermelons ($2.56) and substantially lower for sweet corn ($8.08), cabbage ($8.27), and snapbeans ($17.79), Table 3. Thus, the cost analysis highlights the benefits of a multi-commodity

TABLE 1. NUMBER OF LOTS AND ANNUAL HOURS OF COMPUTER CONNECT TIME FOR SIMULATED COMPUTERIZED EXCHANGES BY COMMODITY, SOUTHEASTERN UNITED STATES

Commodity	Lots[a]	Connect Time[b]
	Number	Annual hours
Tomatoes	35,831	3,583
Watermelons	31,780	3,178
Sweet Corn	16,419	1,642
Cabbage	13,865	1,387
Snapbeans	5,463	546
TOTAL	103,358	10,336

[a]Lots are defined as trading units where each unit constitutes a truckload. A lot of tomatoes contains 36,000 pounds, except for lots originating in Florida which contain 38,000 pounds. Lots of watermelons and cabbage contain 40,000 pounds each, while sweet corn and snapbeans are in lots of 32,000 pounds.

[b]Hours of computer connect time are derived assuming 3 minutes of connect time are needed by a buyer and seller per lot traded; thus, 6 minutes are needed per lot (3).

computerized exchange and the related volume of activity.

A comparison of per unit costs using electornic marketing and the conventional system is provided in Table 4. Cost estimates for conventional marketing represent the charge for performing the sales services but do not include charges for other marketing functions, such as loading and unloading, grading, and packing (9). Therefore, selling costs derived from the survey and from the synthesized electronic marketing system can be compared.

Comparisons indicate a potential improvement in marketing efficiency favoring adoption of a computerized marketing system. Tomato selling costs can be lowered up to 22.29 cents per carton, and watermelons, sweet corn, cabbage and snapbean selling costs can be reduced up to 28.35 cents per hundredweight, 19.31 cents per crate, 28.28 cents per bushel, and 25.83 cents per 50 pound bag, respectively, using a multi-commodity electronic marketing system. These reductions represented potential savings in transaction costs of 90 percent or more for each commodity, Table 4.

OTHER POTENTIAL BENEFITS

Beyond reduced selling costs, electronic marketing offers several other benefits to market participants. As classified for electronic marketing in general by Henderson and Holder, these are improved market efficiency, greater pricing efficiency, increased competition and higher prices, and more equitable access (4). The following discussion relates these to the fruit and vegetable industry.

Availability of a sufficient quantity of quality information is an extremely important factor contributing to the viability of any market. While traditional markets for fruits and vegetables sometimes function with much imbalance in information, electronic marketing can contribute to the efficient assembly and dissemination of data. Buyers (sellers) can instantly search for eligible sellers (buyers) plus monitor the "tone" of the market through time by analyzing activity. Also, spatial differences in market conditions can be isolated and evaluated. Accuracy of the information leaves little to question in that it is generated from actual transactions.

Improved pricing efficiency is highly related to availability of timely and accurate information. With viable and acceptable grading standards, such information will enhance pricing efficiency through more appropriate signals

TABLE 2. PROJECTED ANNUAL COMPUTER MARKETING COSTS FOR SINGLE AND MULTIPLE COMMODITY EXCHANGES BY COMMODITY, SOUTHEASTERN UNITED STATES

Commodity	Computer Costs			
	Transactions[a]	Monitoring[b]	Programming[c]	Total
		- dollars -		
Tomatoes	98,537	41,250 (6 hr./day)	42,059	181,846
Watermelons	87,396	34,375 (5 hr./day)	42,059	163,830
Sweet Corn	45,153	27,500 (4 hr./day)	42,059	114,712
Cabbage	38,130	20,625 (3 hr./day)	42,059	100,814
Snapbeans	15,024	13,750 (2 hr./day)	42,059	50,833
TOTAL	284,240	89,375 (13 hr./day)	42,059	415,674

[a]At $27.50 per hour of connect time per terminal.

[b]At $27.50 per hour and 250 days per year.

[c]Includes a $60,000 annualized initial investment in software development plus $25,000 per year for software maintenance and evolution.

being provided in the marketplace and improved coordination of marketing activities. Given that most produce can be electronically traded, both time and space dimensions of produce availability can be provided instantaneously with physical proximity requirements for buyers, sellers, or product eliminated. Buyers and sellers can be apprised of opportunities in the market and thus competition is enhanced. Sellers tend to benefit from exposure of their produce to more buyers while buyers gain due to potential access to a broader array of produce.

Potential for higher prices may result due to the fact that other marketing costs can be reduced with electronic marketing. For example, operational efficiency may improve due to a decrease in the number of ownership transfers and the amount of commodity hauling which would lessen travel expenses for buyers, assembly expenses for sellers, and reduce multiple handling. Also, there is potential for integrating truck brokerage activity with the system to improve coordination of transportation. These factors provide greater opportunity for price competition in that costs saving could be bid into prices.

Access can be improved through availability and use of improved information by buyers and sellers--what is available, in what quantity and quality, when, where, price, and other desirable data. Equitable access facilitates competitive pricing and also increases pricing accuracy in that prices more adequately reflect the time, form, and space utility of the commodity to buyers. Market entry by spatially dispersed producers may also be enhanced. Pooling

TABLE 3. PROJECTED ANNUAL COMPUTER MARKETING COSTS BY COMMODITY IN A SINGLE AND MULTI-COMMODITY SYSTEM, SOUTHEASTERN UNITED STATES

Commodity	Single Commodity	Multi-Commodity
	- dollars -	
Tomatoes:		
Overhead	292,566	263,972
Computer Cost	181,846	144,101
Total Cost	474,412	408,074
Cost/lot	13.2403	11.3888
Cost/30 lb. carton	0.0106	0.0091
Watermelons:		
Overhead	279,548	234,128
Computer Cost	163,830	127,809
Total Cost	443,378	361,937
Cost/lot	13.9515	11.3888
Cost/cwt.	0.0349	0.0285
Sweet Corn:		
Overhead	204,995	120,961
Computer Cost	114,712	66,032
Total Cost	319,707	186,993
Cost/lot	19.4718	11.3888
Cost/4.5-5 doz. wirebound crate (42 lb.)	0.0256	0.0149
Cabbage:		
Overhead	171,770	102,146
Computer Cost	100,814	55,761
Total Cost	272,584	157,907
Cost/lot	19.6599	11.3888
Cost/sack (50 lb.)	0.0246	0.1420
Snapbeans:		
Overhead	108,565	40,247
Computer Cost	50,833	21,971
Total Cost	159,398	62,218
Cost/lot	29.1777	11.3888
Cost/bu. hamper (30 lb.)	0.0274	0.0107

Source: Calculations from previous tables and Van Sickle, et al., (10).

arrangements by sellers or buyers may improve opportunities for market access for smaller volume producers.

PROBLEMS TO OVERCOME

While the potential benefits accruing from an electronic marketing system for fresh fruits and vegetables seem substantial, the impediments to successful implementation of such a system are

TABLE 4. PER UNIT SELLING COSTS AND COMPARISONS OF CONVENTIONAL MARKETING VERSUS SINGLE AND MULTI-COMMODITY COMPUTERIZED MARKETING SYSTEMS BY COMMODITY, SOUTHEASTERN UNITED STATES

Cost and Cost Savings by Marketing Method	Per Unit Selling Costs by Commodity				
	Tomatoes	Watermelons	Sweet Corn	Cabbage	Snapbeans
	($/ctn.)	($/cwt.)	($/crt.)	($/50#)	($/bu.)
Costs:					
Electronic Marketing System (EM):					
Single Commodity	0.0106	0.0349	0.0256	0.0246	0.0274
Multi-Commodity	0.0091	0.0285	0.0149	0.0142	0.0107
Conventional Marketing System (CM)[a]	0.2320	0.3120	0.2080	0.2970	0.2690
Cost Savings:					
Multi Versus Single Commodity (EM) System (%)	14.2	18.3	41.8	42.3	61.0
Single Commodity EM Versus CM System (%)	95.4	88.8	87.7	91.7	89.8
Multi Commodity EM Versus CM System (%)	96.1	90.9	92.8	95.2	96.0

[a]Conventional charges per unit were taken from a survey conducted in Florida in 1981 (9).

also formidable. Both real and social costs are associated with implementation. Real costs relate to the outlays associated with developing, implementing and maintaining such a system. Development costs can be high--computer hardware must be purchased, leased, and/or time shared. Also, software must be developed to accommodate needs of market participants and the system. Implementation costs can also be large, especially in terms of educating participants and promoting use of the system. Potential users must be aware of the procedures and benefits of the system and accept it so that sufficient volume can be generated to guarantee economic viability. Also, the system must be constantly monitored and upgraded once established.

Social costs of computerized marketing may be even more difficult to overcome. Economic functions are not eliminated with electronic marketing. Produce is still assembled, shipped, packed, etc. However, the nature and extent of these functions and possibly the participants and institutions involved may be affected. Entities which have traditionally benefitted from superior knowledge will likely suffer from such a system and thus be hesitant to accept it. Nevertheless, those entities who view the system as an opportunity rather than an obstacle may benefit. Also, since the innovation involves change and risks, it is natural for market participants to question feasibility. This is reasonable and will be beneficial in the development process. Education will play a vital role in lessening these concerns.

Most fresh fruits and vegetables are currently traded using verbal descriptions via telephone. Success of computerized marketing depends greatly on specification of a system of grades and standards which is acceptable to participants and definitive enough for computerized trading. While this may appear to be an enormous task, other electronic marketing systems have shown this versatility. For example, the TELCOT system successfully describes and trades more than 3,000 different classes of cotton (6). Similar success should be expected with fruits and vegetables.

Market participants must also adjust to a somewhat more impersonal system. Some claim that a certain "feel" for the market will be lost when voice contact is discontinued. However, an electronic market can provide participant identity. Also, it can provide a more thorough and accurate assessment of market conditions because more complete, timely, and accurate information is available. Thus, the "feel" for the market may be improved.

Time must be allocated during the implementation phase for adjusting the system to needs of participants and to allow users to acquaint themselves with new trading procedures and gain trust in the system. Reliability must be built into the system with backup procedures. This plus involvement of a highly respected marketing organization can affect the credibility and acceptance of this system.

CONCLUSIONS

Electronic marketing offers several benefits which contribute to its attractiveness as a marketing medium for fresh fruits and vegetables. Operational efficiency can be improved through improved assembly, handling, distribution and related activities which facilitate these functions. The costs of search for trading partners, successfully negotiating and consummating transactions, and physically transferring products from seller to buyer can be reduced. Analyses indicate that selling cost can be reduced 90 percent by shifting from the conventional system to the synthesized electronic marketing system.

Electronic marketing also allows improved price performance. Price discovery processes are improved through enhanced communication and information, fast and efficient transactions, and improved distribution of power in consummating transactions. Benefits can accrue to small, dispersed producers through pooling to meet the needs of the market, assuming grade standard requirements are met. Handling can be reduced and problems of shrink and quality deterioration minimized. Integration of the truck brokerage function in the system can further improve the distribution function. Buyer and seller risks and uncertainty can be reduced because more markets and outlets can be accessed.

While electronic marketing offers much potential, it is not without problems which must be overcome. Primary among these is overcoming the reluctance to make necessary changes in the traditional methods for marketing fresh fruits and vegetables. However, a comprehensive program of education aimed at illuminating requirements and merits of electronic marketing could reduce this reluctance. Two other problem areas which could affect viability of the system involve availability of a system of acceptable grading standards and generation of sufficient volume to justify the system. Current economic conditions in terms of the need for efficient marketing and the continuing downward pressure on the price of technological advances add impetus to adoption of electronic marketing alternatives.

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FOOTNOTE

[1] A $27.50 per hour computer connect charge was used in calculations. This rate was quoted by an agricultural marketing company which utilizes a major time-sharing company.