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ELECTRONIC MARKETS FOR AGRICULTURAL  
COMMODITIES: POTENTIALS AND PITFALLS

by

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## ELECTRONIC MARKETS FOR AGRICULTURAL COMMODITIES: POTENTIALS AND PITFALLS

### Background

Agriculture in much of the Western World and certainly in North America is approaching the end of a period of transition from agrarian to industrial organization.

I do not mean that all of agricultural production is now occurring in factory-like settings. Indeed, much of production agriculture is still engaged by farm family enterprises where relatively little division of labor occurs. I do mean that the system for converting natural resources into food, natural fibers and biological energy products has been industrialized.

In becoming industrialized, the system is no longer solely dependent upon the farming entrepreneur as the source of production, and the farmer is not even remotely independent of others in the system. The farmer, for example, no longer raises his own power and fuel, hoes his own corn, or barter his butter and eggs at the general store for coffee, calico, and other commodious delights for family consumption. The horse has been replaced by a mechanical tractor, oats by number 2 middle distillate, the hoe by chemical pesticides, and the general store by a complex of food processors and merchandisers.

The point: specialization in the agricultural system has increased dramatically. Jobs that at one time were agrarian in nature have been restructured into highly specialized, off-farm employment. In just the past 30 years, the number of people working on farms in the U.S. has declined by more than 62 percent. But, the number working in off-farm agriculture-related industry has increased significantly--up more than 75 percent in producing farm machinery, up 100 percent in manufacturing chemical pesticides, up 125

percent in producing food processing equipment, and up an astounding 212 percent in restaurants and other eating places.

However, specialization creates interdependence. That is, a lack of economic independence. The livestock feeder is dependent upon a feed formulator who is dependent upon a grain farmer who is dependent upon a pesticide applicator who is dependent upon a petrochemical manufacturer. The "fast hamburger" restaurant is dependent upon a meat purveyor who is dependent upon a meat packer who is dependent upon a livestock procurement specialist who is dependent upon a livestock feeder, ad nauseam.

Interdependence generates risks. To illustrate, the meat packer bears a risk that he will not have a sufficient supply of cattle for efficient use of slaughtering and processing facilities or to meet his commitments to customers. The feedlot operator faces the risk of no buyer once he has committed to the purchase of feeder cattle, feed, labor, and other production inputs. In order to manage or reduce such risks, many participants enter into agreements with others with whom they are interdependent. Such agreements take the form of contracts, vertical integration, privately negotiated trading arrangements, direct trades, private treaties, standardized trade practices, and other forms of product and trade specification between suppliers and users.

This specialized and interdependent industrial-like agricultural system is a paramountcy of operational efficiency, as is witnessed by the relatively low cost supply of food to North American consumers. Main-line participants, and by that I mean those who have become technically efficient operatives in the overall agricultural/food system, have fared reasonably well even though they have experienced a loss of entrepreneurial independence. Closing the

parity gap between the average incomes of farm and nonfarm families in the U.S. during the past decade stands as one piece of evidence.

But, not all participants or aspiring participants have fared so well. Many farmers have either been forced entirely out of agriculture or have had to turn largely to off-farm employment. In the U.S., the largest three percent of all farms now account for about 45 percent of all farm production. Only about one-fifth of the income to operators of these farms comes from off-farm sources. By contrast, the smallest two-thirds of all U.S. farms account for less than 10 percent of total farm output, and depend upon nonfarm earnings for an average of 87 percent of the total farm family income.

While there are many factors associated with this structural change in agriculture, the internalization of product exchange between producers and others in the agricultural system through private agreements and similar arrangements deserves particular attention. The corollary has been a decline in the use of organized, open markets for trading agricultural products. For some products, with perhaps broilers at the extreme, the last vestiges of an open market agriculture have long since disappeared.

It is in terms of marketing or allocative efficiency where the "rub" comes with regard to the declining importance of open markets in agriculture. Allocative efficiency, sometimes referred to as economic and/or pricing efficiency, is a fairly complex concept. Technical or operational efficiency, on the other hand, is much more straightforward as it is essentially concerned with the ratio between inputs and outputs.

Allocative efficiency is concerned with the allocation or distribution of economic burdens and benefits among participants in the system. At the risk of oversimplification, a system is generally considered to be allocatively

efficient when the benefits of economic activity are distributed in equal ratio to costs among those who perform such economic activity. At the risk of being trite, this is to say that the benefits are distributed to each participant in accordance with his contribution.

In a marketing context, prices are generally considered to be the key factor in determining allocative efficiency. Thus, allocative efficiency is frequently referred to as pricing efficiency. Conceptually, at least, price is the common component of both economic burdens (costs) and benefits (revenues). When one person is paying too little of the cost or receiving too much of the benefit, others enter into competition which bids up the price of inputs or bids down the price of outputs, thus redistributing economic burdens and benefits until they equate with those of alternative opportunities.

Organized, open markets excel in their ability to enhance the competitive processes which impinge upon prices and thus on allocative efficiency. The further that product exchange in agriculture deviates from open markets, the greater the uncertainty concerning allocative efficiency. This uncertainty and concern is expressed in numerous ways: insufficient competition among buyers, impacted market information, thin markets, misleading or inaccurate prices and price reports, poor market access by small or geographically dispersed producers, market illiquidity, phantom prices, and market inequities are symptomatic. The relative decline in importance of open market trading and the ancillary decline in effective competition in such markets, at the least, causes participants to look at the emerging structure of agriculture and question the allocation of economic rewards. At the most, it causes an actual inefficient or biased reallocation away from those who cannot accommodate themselves to an industrialized agricultural system, be it for reason

of size, limited resources, geographic location, or personal preference.

Much of the interest in electronic markets as an agricultural marketing alternative stems from this real or imagined concern with allocative inefficiency and its symptomatic problems. To help understand how electronic marketing can impact on allocation efficiency and related aspects of market performance, it is instructive to look at such markets in an institutional framework, that is, as a collection of principles or fundamental rules.

### Electronic Markets

There are many different perceptions of what is an electronic market, and in fact different electronic markets exhibit many variations in operations, design and organization. Nonetheless, all electronic markets have some common or similar features, and these commonalities give substance to the concept of electronic marketing. There are at least five such features common to all electronic markets. Together, these may be viewed as the essential characteristics of such market mechanisms.

1. Organized trading. Electronic markets are organized systems for trading, or exchanging product ownership. Organization implies a set of behavioral rules which apply to all participants. This means that traders know the rules of market behavior and have the right to expect consistent behavior from other market participants. These include but are not limited to rules regarding product delivery and payments. It also means discipline, or sanctions against those who abridge the accepted rules of behavior. Another characteristic of organized marketing is that all eligible traders have equal access to and rights in the market. Implied by this is access to information

on offers, bids, prices, and completed transactions in the market and the right to act upon such information.

Also note that electronic markets are, indeed, markets. This means that they are not simply communications systems for compiling and disseminating market information. Sales negotiation, title transfer, product delivery, and payment are integral functions. As such, electronic markets are mechanisms for completing transactions, including the establishment of prices and other terms of trade, rather than systems for reporting on transactions and prices established elsewhere.

2. Centralized sales negotiation. An electronic market is a single entity where numerous buyers and sellers interface with one another to sort out deals with other participants. It is the antithesis of private, one-to-one trading in that alternative buyers and sellers are readily available and accessible. That is, alternative buyers and sellers stand ready to consummate a deal at terms only marginally different from those in any particular negotiation.

This is most apparent when progressive auction bidding is used to establish price, where the second highest bidder stands as a ready buyer at a marginally lower price. But, it also occurs with other price negotiation methods because the electronic system can monitor both successful and unsuccessful price negotiations, rapidly inform other market participants of available trading opportunities, and facilitate the expeditious matching of potential sellers and buyers. The key to this process is that, the electronic mechanism can manage communications among a large number of market participants simultaneously.



3. Remote market access. An important characteristic of electronic marketing is that neither buyers nor sellers need to be physically present at one location. Traders enter the market and engage in sales negotiations via long-distance electronic communications media such as telephones, teletype, radio-telephone, remote computer terminal, or similar device. Thus, individual traders can be dispersed over a broad geographic area, needing only the appropriate communications technology to become active market participants. The market, in turn, provides the technical capability to handle communications among numerous remotely-located participants at the same time. Electronic computers can be used to provide this technical capability; however, there are other ways to perform this function where a large volume of buyer-seller communications is not necessary.

4. Description selling. Just as it is not necessary to bring traders together physically in electronic markets, neither is it necessary to move products to a central location for inspection by potential buyers. Instead, products offered for sale are described in terms that are clear and meaningful to all market participants. This may be a verbal description including such things as species and variety, weight and size, quality grade and other measures of product value, color, location, conditions of delivery, and other relevant information. In some cases, product description by third-party inspectors may be necessary to assure accuracy, objectivity and integrity. Alternatively, products may be described pictorially by using technology such as closed-circuit television or video recordings, or by using electronic sensing devices which precisely measure product attributes.

Products traded on an electronic system do not have to be standardized or restricted to fit into a limited number of descriptive categories. Because

modern electronic communications and computer systems can handle large amounts of information rapidly, a wide variety of descriptive information can be communicated, covering a wide range of rather heterogeneous products. The key is consistency in the use of descriptive terminology so as not to misrepresent products or mislead buyers.

5. Post-sale shipment. Because products are sold by description between distant traders, product delivery can be made on a direct or nearly direct basis from seller to buyer after the terms of sale are successfully negotiated. It is not necessary for sellers to ship products to a central assembly location for inspection by potential buyers prior to sale, thus sellers can maintain physical control over their products until sold, and total shipping time may be reduced. Furthermore, because products do not have to physically enter the market channel until sales negotiations are completed, traders can agree on future delivery dates rather than making or taking delivery at the time of transaction. Therefore, electronic markets can have both spot and forward delivery characteristics.

None of these five characteristics is unique to electronic marketing. For example, country auctions provide organized trading, terminal markets provide centralized trading, and private trading via telephone accommodates remote trading between distant buyers and sellers with products sold by description and often for delayed delivery. However, electronic markets are unique in combining all of these characteristics in one trading system. It is this combination that makes electronic marketing a unique alternative to conventional marketing systems for agricultural products.

### Technology of Electronic Trading

There are several ways to utilize existing electronic communications and data processing technology for electronic marketing purposes. These range widely in technical complexity, human requirements, speed of transaction, scope of potential market coverage, and development and operating costs.

1. Telephone clearinghouse. Perhaps the most basic form of an electronic market, the telephone clearinghouse uses a central sales desk where buyers' bids and sellers' offers are received by telephone. Clearinghouse personnel sort through the array of bids and offers, make matches where possible, confirm transactional details with successful traders by telephone, and assist with delivery and payment arrangements as necessary. Often, clearinghouse personnel will take a more active role than that of simply matching existing bids and offers by identifying near matches and encouraging one or both parties to modify their bids and/or offers in order to complete a sale. These systems require relatively simple and inexpensive equipment and are probably the least expensive to develop. However, trading capacity is limited to what can be handled by sales desk personnel, and trading is relatively slow. The Egg Clearinghouse in Durham, New Hampshire, began as this type of a system, in 1972.

2. Telephone auction. Another variant of the electronic market based primarily upon telephone communications is the telephone auction, or often called teleauction. On this type of system, several buyers at remote locations are interconnected via a conference telephone arrangement. Sellers make consignments to a market agent prior to the announced time of auction sale. At the appointed sale time, a conference telephone operator makes a common telephone call to several potential buyers and/or remote locations where

several buyers are assembled. The market operator provides a verbal description of the products consigned for sale and proceeds to conduct an auction among the buyers on the telephone network, awarding sales to the highest bidders. Often, printed product descriptions are circulated to buyers in advance, and some buyers may be physically present in the auction ring in addition to those connected by telephone. Teleauctions have the advantages of utilizing readily available equipment and low development costs. However, trading is relatively slow and conference telephone arrangements are often unreliable. Local or regional teleauctions are popular in many parts of the U.S. for selling various species of livestock, most notably feeder pigs and market lambs.

3. Teletype auction. The teletype auction is similar to the teleauction but uses more complex and more expensive teletype communications technology. A network of teletype keyboards and printers is established among potential buyers and the marketing organization. Seller consignments are broadcast to all teletype machines on the system, then an auction is conducted on each consignment. Usually a descending bid, or "Dutch" auction procedure is used as this is most compatible with teletype technology. However, experience in the U.S. has shown that the lack of familiarity with the Dutch auction procedure can be a significant barrier to voluntary acceptance of this system by traders. Teletype auctions are more expensive to develop and operate than are telephone systems, but offer the advantages of more accurate, printed communications and more rapid trading, thus greater trading capacity. To the best of my knowledge, they have been used exclusively in the Canadian butcher hog industry.

4. Computerized auction network. Computers offer the technological capability to rapidly process large amounts of information and to manage communications among a very large number of market participants simultaneously. By using networks of remotely-located computer terminals connected to central processing units by telephone line or microwave transmission, a practically unlimited number of buyers and sellers, all at distant locations, can be interconnected in the marketplace. This allows both direct input of consignments by sellers and direct bidding by buyers. The computer can be programmed to conduct virtually any type of auction procedure, including the conventional English or ascending bid, the Dutch bid, the sealed bid, and the simultaneous bid, as well as the converging bid procedure such as is used in the organized securities markets and commodity futures exchanges. Because of the complex technology and programming involved, these are relatively expensive to develop and operate, and thus require considerable trading volume to be cost effective. Beginning with TELCOT, the computerized cotton market for cotton in Lubbock, Texas which was developed in the mid-1970's, there has been a number of such systems proposed and/or tried for both agricultural and nonagricultural products. However, commercialization has proceeded slowly.

5. Computer-assisted trading system. Another type of application of computer networks to electronic marketing is to organize what heretofore was a highly dispersed, unorganized system of private sales negotiations. The intent is to create a broad-based computer communications network where individual traders can express their intent to buy or sell, query as to others with similar interests, systematically contact potential trading partners, conduct one-on-one negotiations the results of which become market information, while at the same time have ready access to other traders who offer

alternative buying and/or selling opportunities. The experimental American Meat Exchange was, I believe, the first attempt to fully implement such a system although some computer auction systems have aspects of this type of trading embodied in negotiated bidding procedures.

There are numerous variations of these five types of electronic marketing systems that have been developed, proposed, or envisualized. Most likely, different variants will emerge in the future. It is not likely that any one system will emerge as the ideal for all applications. Important questions for future applications are, what are the basic principles essential for success in electronic marketing, and what can be learned from experience?

#### Conditions Necessary for Success

Even though there are numerous ways in which an electronic market can be structured to meet the needs of a particular group of market participants, both logic and experience make it clear that the concept is not necessarily applicable in all market situations. There are several conditions that appear to be essential to successful development and operation. For the most part, definitive quantitative measures regarding the extent to which these conditions must exist for successful implementation have not yet been developed. Nonetheless, conditions can be identified which singularly are necessary; collectively they may be sufficient.

1. Potentially competitive markets. A key objective of electronic marketing is broadening the exposure of individual market participants to potential traders on the other side of their transaction, that is, exposing sellers to more buyers and vice versa. If there is no alternative buyer or seller, this concept is irrelevant. Thus, while electronic marketing may be

especially helpful to sellers in situations where an imbalance in market power favors buyers, or conversely when sellers dominate, it has little to offer in situations where a single party controls one side of the market.

2. Sufficient trading potential. Relatively large trading volume is particularly important in electronic markets for reasons of both cost and trader interest. Regardless of the type and design of the electronic market, these systems impose some additional costs, particularly when compared with unorganized, private treaty selling. These may be relatively low costs associated with additional telephone service and personnel in a telephone clearinghouse or teleauction, or substantial expenditures on computers, programmers, communication facilities and the like in the more complex systems. Potential trading volume must be great enough so that these additional costs, when amortized over realized trading volume, are low on a per transaction basis. Without such trading potential, market participants are likely to judge the cost to be unacceptably high.

The second volume-related aspect deals with maintaining buyer and seller participation over time. Volume begets volume, and lack of volume begets lack of volume. If buyers find that they consistently cannot meet their acquisition requirements, they can be expected to quit the market. A loss of buyers means a decline in selling opportunities for sellers, and they in turn can be expected to quit the market. Thus, the lack of adequate trading volume can set off a downward spiral in sales activity that is difficult if not impossible to repair.

3. Acceptable method of product description. Little elaboration is required regarding this factor. Products traded electronically must have

characteristics which lend them to verbal and/or pictorial description, and buyers and sellers must be willing to accept a common descriptive system. For products that can change condition appreciably in the time between description for sale and delivery to buyer, some system for reconciling price-quality differentials is needed. In general, these do not create particularly difficult problems in agriculture due to widespread experience with description selling in private trade.

4. Performance guarantee. Because face-to-face dealing does not occur in electronic markets, participants in any given transaction may be unknown to each other. To assure confidence by participants that sellers will deliver what was offered and that buyers will pay as agreed, some method of warranting trader behavior is needed. Bonding, performance contracts, and third-party oversight are alternatives commonly used.

5. Market support. Superimposing an electronic trading system in an existing market environment is both an imagined and real threat to some existing market participants and agencies. For example, a new electronic market could be perceived as a competitive threat to existing marketing organizations and as a threat to the status quo of any trader who dominates or has cornered a local market situation. Considerable resistance can be expected by anyone whose vested position is threatened. Such resistance may take the form of extra-competitive aggression aimed at "buying" patrons away from the electronic system. Backers of the electronic market must be prepared to deal with this probability. Strategies can range from fighting fire with fire--that is, supporting the market during the introduction at price levels which both attract trading and which make competitive resistance prohibitively expensive--to the development and implementation of legal sanctions for



electronic trading such as has been done by the hog marketing boards in some Canadian provinces.

6. Venture capital and entrepreneurship. A good measure of indomitable and innovative spirit is an essential ingredient in the successful development and implementation of electronic markets at this point in time, partly because there is no clear cut pattern to follow for success and partly because those with vested interests in the current system have much reason to argue that it can't be done and to discourage its use by whatever means possible. Because development costs are often high and because competitive reaction demands a good measure of staying power, this entrepreneurial spirit must be backed by adequate venture capital. An undercapitalized electronic trading venture, as is true of most commercial innovations, is likely to wither before it can be fully and fairly tested in the marketplace.

7. Development of human capital. Because electronic marketing is a relatively new and innovative concept, there are not many participants in agricultural markets who understand how they function, much less their potential benefits and costs. This includes marketing agents as well as buyers and sellers. Considerable investment in education is essential. Marketing personnel must be educated in the various ways that electronic markets can be designed and operated, and traders must be educated in both the procedures and the potential benefits and costs associated with electronic marketing.

Further experience may reveal that this is not a complete list of considerations necessary for the successful development of electronic markets. However, it is clear that successful operations depend upon achieving or realizing each of these seven conditions or criteria. Furthermore, the list

does serve as a reminder that electronic markets are not universally applicable and that they are not likely to emerge in the absence of concerted effort and hard work.

### Expected Impacts of Electronic Marketing

Ultimately, the question which begs answering is, are the costs of developing and implementing electronic markets outweighed by their potential benefits? Before proceeding farther, I acknowledge that there is not a definitive answer. Perhaps, there is no correct or singular answer. One's answer depends, at least in part, upon one's perspective. In particular, it turns on how much value one places upon allocative efficiency and its attendant implications for market opportunities and equity in the distribution of economic rewards, compared to how much one values maximization of technical efficiency and its implications for structural change and economic survival.

Assessing the benefits and costs of electronic marketing and its most likely impacts upon both participants and the marketplace in general reveals five performance criteria that are of particular relevance.

1. Increased competition. This is a major objective of electronic markets, that is, to increase effective competition among market participants by expanding the potential exposure of buyers and sellers to one another and by creating trading procedures that encourage competitive interaction. This is most easily illustrated by comparing a farmer who is selling by private treaty to a single buyer and who has only an occasional bid from a competitive buyer, with a farmer selling at teleauction with 10, 15 or more buyers active in the bidding. This is not to argue that potential competition does not

exist in private trade; rather that electronic marketing can convert that often-latent potential into competition that is active and aggressive.

2. Improved market information. Market information is generally considered to be a "public good," in that the availability of accurate, complete, and timely information creates benefits to which no individual can lay complete claim. To illustrate, when a seller learns of an attractive selling opportunity close by, both the seller and buyer benefit from potentially lower-cost transportation. But, society in general also benefits because fewer resources were required in total. In this sense, information is the lubricant which reduces (inefficient) friction in the market system.

Legions have been written about how market information becomes limited, constrained, imperfect, inaccurate, unavailable, biased, untruthful or otherwise impacted as trading moves away from organized, visible markets to private deals. Persistent public and private criticism of price reports such as the National Provisioners' Yellow Sheet and Uner Barry's Price Current stand as well-worn examples. Because electronic markets are organized and centralized trading mechanisms, the collection of accurate and comprehensive information is facilitated. Because they utilize electronic communications, timely dissemination of that information is also facilitated.

3. Enhanced market access. The remote access and description selling characteristics of electronic trading can facilitate access to the marketplace by geographically dispersed or isolated buyers and sellers. Because of the centralized nature of these markets, a greater number of potential trading opportunities exist than is typical of most private, direct trading situations. This improves market opportunities for smaller producers, as their consignments can be combined with those of others to provide viable

purchasing options for buyers with larger-volume needs. These market access features of electronic markets appear to be of particular benefit to the smaller and geographically dispersed trader--in fact, the same people who face diminishing economic opportunity in an industrialized agriculture.

4. Greater pricing accuracy and allocative efficiency. Because of greater competition, improved information, and expanded market access, price behavior is altered in electronic markets, in comparison to private trading, in such ways that prices tend to be more responsive to short-run changes in market conditions and thus are more accurate reflections of true market-determined values. This, in turn, enhances allocative efficiency. There are two processes involved: arbitrage and tatonnement. Arbitrage is the process by which price differentials in different trades are aligned with differences in transportation and storage costs and in product quality. Tatonnement is the process by which the often-changing perceptions of different traders concerning true market conditions are reconciled. Both processes depend upon rapid competitive interaction, and available evidence demonstrates clearly that both are enhanced by electronic trading.

5. Higher marketing costs. Numerous arguments have been made that electronic marketing can increase operational efficiency in the marketplace because it centralizes trading without the necessary movement of buyers, sellers and/or products to a common location. When compared to centralized assembly markets, those arguments have merit. However, when compared to private, direct trading, such arguments become fallacious. Most direct trading involves minimum travel by sellers and/or buyers who rely heavily upon the telephone, and products are seldom shipped until the deal is completed and the buyer known. Indeed, private trading has grown to dominance

in part because of its relatively low cost. Electronic trading imposes an additional cost structure on the market. Those costs may be viewed as being prohibitively high by those accustomed to private trading and direct deals.

### Conclusion

There are many who argue that North America has the finest, most efficient agricultural system yet devised by man. Impressive statistics can be cited to document such an argument--such as one farmer produces enough to feed 67 (or is it now 81) nonfarmers; such as North American consumers spend a smaller share of their disposable income for food than do any other people, anywhere, anytime; such as agricultural productivity has far outpaced any other sector of the economy; ad infinitum. Explicitly or by implication, the agricultural marketing system is extolled or at least exonerated of any shortcoming. Again at the risk of being trite, the logical conclusion of persons so arguing is often stated as, "if it isn't broken, don't fix it."

However, progress is exceptionally elusive for those with the "if it isn't broken, don't fix it" mentality. One needs to look back no more than 10 to 15 years to find North American auto, tire, and steel industries that were world standards for efficiency. Today, they are relics and models of inefficiency. In the same manner, our agricultural system which has been pointed out as an example of efficiency and progressiveness is undoubtedly subject to displacement and decline. Only a constant, aggressive search for a better way will validate the claims by those who extoll our agricultural system 10 to 15 years from now.

Electronic markets for agricultural products appear to be one means of change; one means of improving certain aspects of the performance of our

agricultural system. In particular, they appear to offer the potential for improving allocative efficiency and its attendant impacts on economic opportunity and equity in the marketplace.

But, they also come at some very real cost, particularly the costs associated with the displacement of existing marketing practices and institutions. Those costs may be viewed by many as being so large as to prohibit the commercial development of electronic markets. If so, electronic markets are not likely to be much of a factor in the potential advancement of American agriculture in the years ahead.

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