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Commodity Grade Criteria

Breakout Session 3, Saturday, January 15th, 1994, 8:00 am
Moderated by Chuck Handy, Economic Research Service

Major papers:

Re-engineering Marketing Policies in Food and Agriculture: Issues and Alternatives for Grain Grading Policies

Eluned Jones, Virginia Polytechnic Institute and State University, and Lowell D. Hill,
University of Illinois
Presented by Eluned Jones

Assessing Federal Grade Criteria for Fruits and Vegetables: Should Nutrient Attributes Be Incorporated?

Carl Zulauf and Thomas L. Sporleder, The Ohio State University
Presented by Carl Zulauf

Grading Systems in the Pork and Beef Industries

Marvin Hayenga and James Kliebenstein, Iowa State University
Presented by Marvin Hayenga

Are Standards of Identity Obsolete or Redundant?

D.I. Padberg, Texas A&M University, and Phillip Kaufman, Economic Research Service
Presented by Dan Padberg

Discussants:

Michael Phillips, Office of Technology Assessment

Ken Clayton, Agricultural Marketing Service

Steve Meyer, National Pork Producers Council

Chuck Handy, Economic Research Service, Moderator:

At this Consortium it is appropriate to examine the role of commodity grades and standards established in the 1930s and 1940s and ask whether the rationale for these standards has changed, especially as the marketing system becomes more vertically integrated.

**Re-engineering Marketing Policies in Food and Agriculture:
Issues and Alternatives for Grain Grading Policies**

Eluned Jones and Lowell D. Hill

The concept of re-engineering implies that the environment within which grain markets developed, and on which current rules and regulations were predicated, has changed and that the processes are no longer coherent (Hammer and Champy 1993). Grain market institutions were developed in the 19th Century to operate in the 20th century. But will the same structures and processes still be relevant in the 21st century? Do the processes perform well within the world in which they operate, or has the world changed beyond the limits of their capability to adjust? Re-engineering policies supporting grain grades and standards involves identifying the current and future needs of the grain and oilseed markets. Who are the final consumers? Who are the stakeholders of the market, and particularly, what is the process that describes the commodities moving within the system, i.e., grades and standards? What value is added by the grades and standards process? Are the rules and fundamental assumptions on which the current process is based appropriate to current business and market operations? Does current legislation aid or hinder the ability of grain and oilseed markets to dynamically adjust to a new environment? (Hill 1991, Stewart 1993)

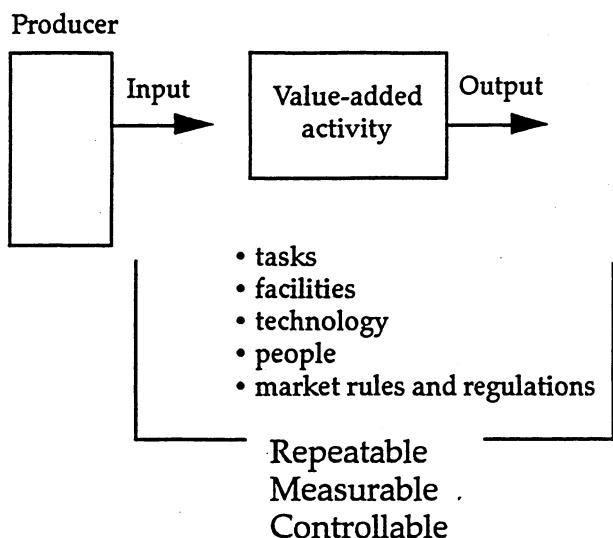
The assumption of fungibility of agricultural commodities is being seriously challenged as we approach the 21st century, thereby challenging the assumptions on which the grades and standards have been established. Advanced technologies, disappearance of boundaries between national and international markets and altered expectations of customers confuse

the goals, objectives, and basic organizing principles on which our current grain markets are established. Nearly all of our market processes originated before the advent of modern computers and communication technology, and even before the futures and options markets were established. These processes are replete with mechanisms designed to compensate for information poverty. We are now in an information affluent environment, but we still use the same processes in which are embedded the initial set of assumptions about grain market structures (Streeter et al. 1991).

**Grades and Standards
in the Traditional Market Structure**

For participants to have confidence in market institutions they must understand the objectives of the processes involved. Price determination and price discovery are the two main processes supporting any market framework. Where the market process is based on barter and exchange, visual inspection can assess the physical and biological state of the commodity. As buyers and sellers in the market become more geographically dispersed, with an associated increasing number of exchange points in the market system, there is a need for rules and regulations to facilitate efficient exchange. Grades and standards comprise one of these sets of rules that provide the guidelines for information signals in the market (Figure 1). They are used to classify products with respect to selected characteristics deemed economically or aesthetically important in

Figure 1. Market Process



markets in which personal inspection and selection are neither physically nor economically feasible.

Grades and standards are theoretically neutral with respect to their economic impact. However, the decision on which factors to include in official grades and standards influences the incentives and disincentives for management and handling practices that, in turn, affect quality via discounts and premia. Legislated grades that provide a prescribed set of factors, and for which an inspection process is established, usurp the price determination and discovery processes in assessing value and negotiating an equitable price among participants. Participants respond to market signals, and if the grade limit on BCFM¹ is 3 percent before incurring a discount, the market incentive is to deliver 3 percent. Incentives can be regulatory or economic. For example, the former includes regulations that prohibit the reintroduction of foreign material into grain (under the 1986 Grain Quality Incentives Act), but there is no disincentive or communication that provides incentive to preclude foreign material at harvest.

Grain supplies are assembled from widely dispersed farms, channelled through

¹Broken corn and foreign material

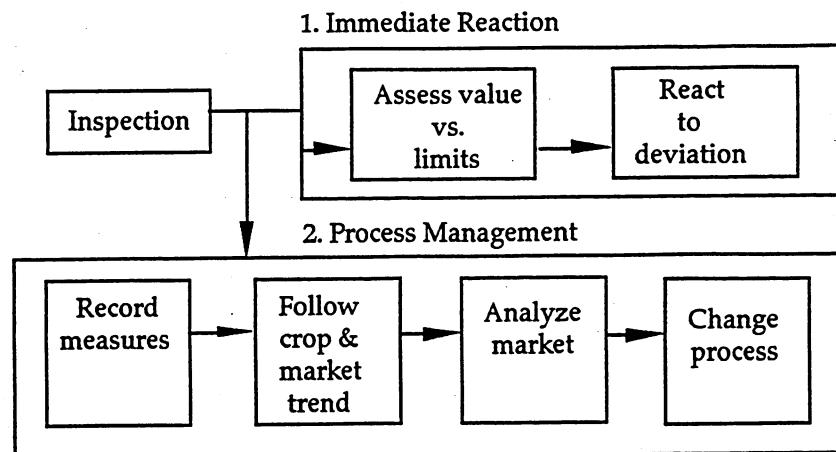
elevators, and sold and resold many times before reaching domestic processors or unloaded in foreign ports for processing. Although country elevator operators are not required to purchase by grade, a set of quality characteristics is generally measured to ensure that the base limits of the grades are met. Standards are a means of identifying characteristics not easily determined from visual inspection; they differ from grades in that they do not classify a product. Since standards are used in conjunction with grades to describe grain exchanged in

commercial transactions, they should be as accurate as technology will permit and economics can justify. For example, standards for calibrating grain-moisture meters are supervised by a federal agency and implemented by state departments of agriculture. Without some form of mandatory or voluntary coordination, every meter manufacturer could establish a different set of calibration standards. Information on moisture-content would have limited value since the signals could not be used by market participants to guide decisions about storage, shipping, and processing. Similarly, accuracy in determining the quantity of grain purchased is achieved by enforcing standards for weighing scales. Test weight is a grade determining factor influenced by both moisture (affecting volume and weight) and scale weight accuracy. Thus, grades and standards are interdependent and the distinction between them often blurred (Figure 2).

Each stage of the market channel attaches different price differentials to grain of different quality and conditions. Certain quality factors, such as moisture, are measured as part of every market transaction and incorporated into price differentials. Other characteristics may be exempt from measurement, particularly at

the country elevator, where experience indicates that most loads will meet base grade limits for those factors. Country elevator buyers may commingle grain to meet minimum standards for their subsequent buyer and will average the quality of loads from a single farmer, or even across farmers, to avoid assessing discounts. Although this simplifies the task of handling grain and determining price, it significantly complicates the market process across all segments in the long run. The information contained in the different loads, and their associated market value, has been eliminated by this action. Thus, any incentive to improve quality has been eliminated, along with the information that

Figure 2. Response to Grain Grades and Standards



would indicate improved grain management and handling practices that led to more desirable grain supplies. This action is also inequitable in returning value to the farmer for any improved management practices. The market's ability to respond to information contained implicitly in prices about crop conditions is negated by this action (Figures 3 and 4).

Figure 3. Cause of Loss in Market Value at the Elevator

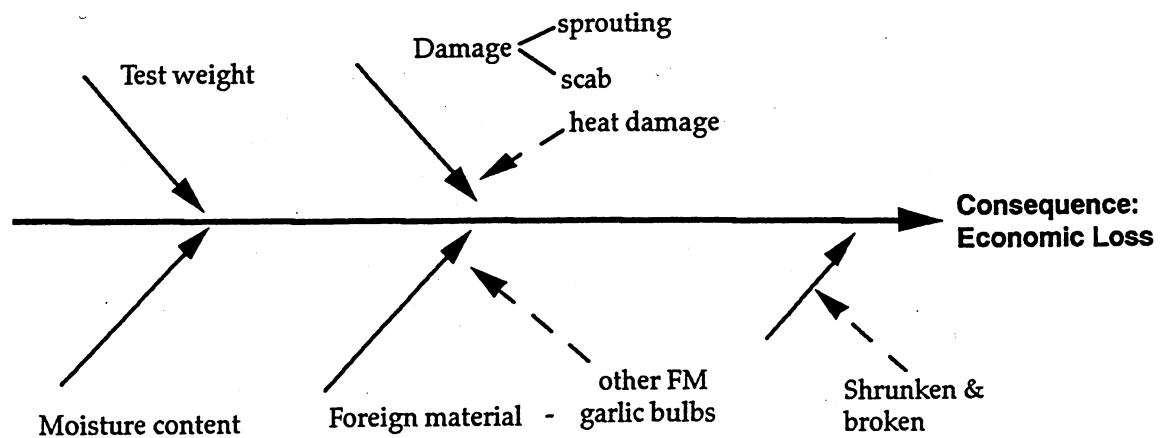
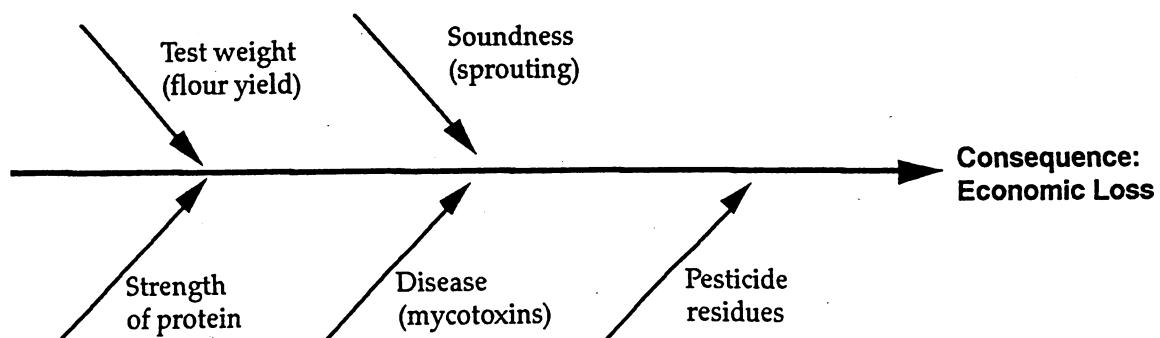


Figure 4. Cause of Loss in Market Value at the Flour Mill



The quality of the final product output depends on the grain inputs at the processor level, at the elevator level, and handling in export channels, and is therefore determined by the aggregate action of all the individuals involved in the market system. But if all individuals are treated alike, regardless of performance, the market will adjust to the lowest common denominator.

A buyer cannot pay full price for grain not meeting grade limits without running the risk of selling the grain at a loss at the next stage in the market channel. U.S. grain grades are based on the "lowest-factor approach"; i.e., the numerical grade assigned to the sample is determined by the factor with the lowest quality level. This practice results in a minimum quality process—the incentives within the process are to blend grain to the minimum level of the grade limit. Country elevators are generally the first receivers of grain from farmers, and much of the resulting quality of commingled grain will be determined by the management practices used at this first stage in the market. The information exchange between the buyer and the farmer significantly influences future management and handling practices through the incentive structure.

The concept of optimal-quality implies that market forces must be allowed to influence decisions. Optimum quality is an illusive concept that is difficult to define across an industry with increasingly varied demands. However, the concept of improved quality is more tangible. Management practices and techniques for improvement of many quality factors are known but have not been implemented because of the lack of economic incentive. Even with economic incentives, tradition and habit are hard to change.

The Role of Regulation and of Public Policy

If we consider the development of legislation associated with grades and standards over the past 20 years, we can see the progression towards the question "Should we be re-engineering?" The grain industry accepted early responsibility for providing descriptive information on grain to reduce market transactions costs and to facilitate merchandising in a large, complex and sophisticated market (Hill 1990). In an attempt to institutionalize guidelines and improve information consistency, these private classification systems were replaced with national grades and standards in 1916 with the U.S. Grain Standards Act.

In 1976 Congress established the Federal Grain Inspection Service (FGIS) with a charge to ensure maintenance of uniform U.S. standards for domestic and foreign trade and to facilitate grain marketing. Since the mid-1980s considerable attention has been given to grain quality and how changes in U.S. standards for grain and the national inspection system could serve to improve grain quality.

Three federal acts since 1976 have influenced the philosophy and direction of policy formation with respect to grain grades and standards: the Food Security Act of 1985, the Grain Quality Incentives Act of 1986, and Title XX of the 1990 Farm Bill. The Food Security Act directed the Office of Technology Assessment to study U.S. grain quality and the forces influencing U.S. competitiveness in grain markets. The resulting report emphasized the interdependence of the production and marketing processes in determining overall grain quality (U.S. Office of Technology Assessment 1989). The report suggested that overall grain quality improvement would result from coordinated efforts in the areas of plant variety development, encouraging market interest in quality characteristics, and improving and adapting the factors and criteria used in grain standards. The report

concluded that all participants working together could change the outcome. But there was no simple prescription that the policy makers could legislate to "correct the problem."

The Grain Quality Incentives Act defined the role of the FGIS in three areas: grain handling practices, insect tolerances, and improving the usefulness of the grain standards. The Act charged the agency with focusing on testing procedures as a means to improve grain quality and to enable the provision of information on end-product yield. This was to be achieved through standards that would address four objectives: (1) facilitate trade by defining uniform and accepted description terms, (2) provide information about grain storability, (3) offer information regarding end-product yield and quality of grain, and (4) provide the framework for establishing grain quality improvement incentives (Hill 1990).

Failure of grades and standards to provide uniform, consistent information can distort market signals and lead to questions of market power. With accurate information, the derived demand schedules for differentiable supplies provide an accurate market signal through price. However, if the "real" supply is not the same as the "apparent" schedule, then the information contained in the price discovery process is inaccurate. Thus, information accuracy underlies the efficiency of the price discovery process.

Market performance depends on the accuracy of the information generated in the market processes. Grades and standards information depends on the objectivity, accuracy, and consistency of the quantitative measurements. Moisture, test weight and BCFM factors have been mechanized and standardized for many years. The measurement technologies used for these factors are objective and therefore independent of inspector competence and experience. However, other factors are less objective and require judgement decisions

by the inspector. This allows subjectivity to enter into the information set. Measurement technology for most quality characteristics of economic interest is available commercially; but the cost and time required at the elevator, and at most processing plants, make their use uneconomic or impractical. For example, chemical composition and nutritional character of feed grains can be determined accurately and easily in most laboratories and in feed processing firms—but not inexpensively. New technologies that are becoming less costly as the learning curve and production of the equipment increases include moisture meters and Near InfraRed Reflectance or Transmittance for measuring oil and protein content (Applewhite 1994). These technologies are being increasingly used by processors and grain elevators (Hill 1994).

In the 1970s and early 1980s users of grain were operating in an environment where measurement and processing technology did not yet have the capability to treat grain markets as other than fungible, aggregate markets. The response to quality problems at that time was logically to reconsider grade limits and the additional information included in standards. The FGIS provided monitoring capability with goals of improving the consistency of implementing grades and standards and improving the information contained within the grades by increasing the uniformity and consistency of the measurements of the quality characteristics.

It is in the confusion between regulation of product quality through inspection and process efficiency that the question of re-engineering is raised, i.e., does inspection imply market performance? To determine values and negotiate equitable prices, market participants need uniform descriptive terms, measurement technologies, and objective, unbiased evaluations. Units of weight, calibration of scales, and operation of testing equipment

must be uniform throughout the market system to generate the efficiency required in large volume, low-margin markets. The role of regulatory agencies should be that of serving the entire industry by ensuring the quality and consistency of the information entering the market. A regulatory agency, therefore, should be viewed as responsive to all segments of the industry, including buyers, sellers, processors, and producers.

Each segment of the industry places a different emphasis on the four objectives. The dynamics of market adjustment are strongly influenced by the rules governing market processes, including grades and standards. Thus, the coordination, or lack of coordination, between market segments in developing legislation that equally addresses all objectives simultaneously and reaches consensus across all market participants, can impact market performance and efficiency. The change from a sellers' market, where producers "push" products, to a buyers' market, where processors (including export buyers) "pull" products, has increased the confusion as to whether grades and standards should be describing what the farmers are producing or what the processors require to add value to grain. In fact, approaching policy formation solely from either direction treats one segment of the market as the driving force and sets up an adversarial relationship between market participants.

Forces Influencing Change in the Grain and Oilseed Markets

Three forces, separately and in combination, are driving today's production and markets—customer, competition, and change. These are not new concepts, but the characteristics are remarkably different from 10 to 20 years ago.

Customers

A number of factors have contributed to the shifting balance of market power from producer to consumer: (1) Increased

demand for food during and after World War II created an environment of insatiable demand. This gave producers the advantage and the belief that consumers will buy what is produced. One of the hardest realities for producers to accept, and adjust to behaviourly, is that each customer counts.

(2) More producers now operate around the world, and many developed nations now have low population growth. Consequently, the expanding, non-differentiating markets of the 1950s through 1970s no longer exist. (3) Consumer expectations soared when competitors burst upon the market with lower prices associated with higher quality goods or services; i.e., price plus quality, service and selection. Furthermore, the buyer participating in today's markets is increasingly better informed.

Until the mid-1980s the U.S. mass market suppliers had very few competitors, but the dominant force in the seller-customer relationship is rapidly shifting. Commodity producers, merchandisers, and handlers assumed their customers were more or less alike and could assume that a standard product would satisfy most of them (Stewart 1993, Hammer 1990). If customers weren't satisfied, they had few alternative sources or choices. Now customers no longer behave as if they were cast from the same mold; rather they are demanding grain supplies that meet the informational needs of their processing systems and may even be configured to fit their specific needs (see Table 1) (Horstmeier 1993).

Competition

Competition used to refer to the market where availability and price of the product or service were the primary factors determining sale. Competition now exists in many different forms. One market may differentiate on the basis of price, another on quality, and a third on the basis of pre- and post-sale service. As trade barriers disappear, no market is protected from

Table 1. "Designer" Acreage in Grains and Oilseeds

	1991	1993	1994	1995	1996
1000 acres					
Specialty oilseeds	51	75	125	250	500
Better Life ^a	20	28	42	51	57
Food corn	23	31	35	38	38
Food soybeans	13	19	25	28	31
High-amyllose corn	—	1	2	4	6
High-oil corn	—	—	—	10	30
Total	107	154	229	381	662

^aPesticide-residue restrictedSource: *Top Producer*, February 1993.

overseas competition. The lowest price, highest quality, and best service associated with commodity handling soon becomes the standard for all the competition.

Competitive markets operate under rules and regulations established by society and government. The presence of rules encourages action of market participants. Grades and standards aren't neutral economic descriptors of quality and value—they become the normal basis for trade and significant distortion of market forces is needed before federal grades will be abandoned or replaced by private firm quality measures. Additional specifications are often added in contract buying, particularly in export trade. The export market has all the same characteristics and changes in demands and sophistication as domestic markets. The ratio of domestic-export market share changes each year and is influenced by price and the demand for quality characteristics. This influence, and competition from other exporting countries, will keep congressional focus on quality. The effect of specification buying on competition, market structure and market efficiency must be evaluated in the context of the conflicting roles of government and private quality specifications.

Change

Many of the aforementioned factors have been used as excuses for loss of export markets. But in almost any industry, some companies succeed, while others operating under the same rules and within the same market, fail. The difference is in whether market participants can integrate the forces of change into their market process and make the necessary adjustments.

Impact of Industry Restructuring

A proliferation of new end-uses and value-added products is increasing the demands on grain characteristics. This also increases the difficulty of reaching consensus on what is currently important, and even greater difficulty on what might be important in the near future—disregarding the problems of setting technological limits. Quality measurements generally start as proxies for the characteristic of economic interest; for example, test weight for flour extraction and protein quantity for both quantity and quality (Duncan and Vetter 1994). Industry response to changing consumer preferences and demands on commodity inputs at the processing level are increasing the proportion of the total market for grains that is appearing in differentiated markets. As markets become more internally coordinated with direct farm-to-processor contracting, market channels will be created that will bypass traditional elevator systems of grain supply assembly. Internally coordinated market channels, including Identity Preserved markets, will also tend to bypass grading systems that are used as the basis for pricing. Although this is happening at a greater rate in domestic markets, large export and multinational firms have bought country and river elevators to better coordinate their needs for timely delivery, quality, and location.

New demands on grain characteristics are also resulting in genetically engineered characteristics; e.g., genetically altered corn starch molecules as an alternative to chemical alteration, high-lysine corn, high-protein corn, high-oil corn, low-tannin grain, low-protein barley for malting, and a rapidly increasing list of others. Preference for genetically influenced quality characteristics must be made known to plant breeders and to producers who make variety choices in production planning. Change can only occur through coordinated participation of industry members acting with full information.

In the past 20 years, technology has dramatically increased the number of physical, biological and intrinsic characteristics that can be economically measured. In addition, communications technology has made access to this information feasible for all participants, such that the price discovery and determination processes can reflect this information almost immediately. Full information is desirable in aiding the market to allocate resources efficiently. However, the issue in question is what constitutes full information, and at what point does less than full information become limiting on market efficiency.

During the 1980s, the grains industry was focused on quality improvement in response to a barrage of foreign buyer complaints. This took the form of more rigidly inspecting export shipments, designing and engineering new measurement technology, and analyzing the possible impact of "tightening" limits on grades and standards. This reactive approach led to becoming focused on the product as the problem, and not on the process. Concentration on maintaining quality through inspection leads to acceptance or rejection of grain loads but doesn't necessarily reveal why the load was rejected, or provide information on how to correct the problem. For example, the

potential for most soft red winter wheat varieties to consistently meet and exceed a 60 lb./bu. test weight is limited genetically. Many varieties meet this grade requirement only under experimental production conditions. This grade requirement is a proxy for flour yield. However, a number of the varieties consistently exceed the milling need for ≥ 72 percent flour yield. Continually discounting for low test weight communicates information neither to the producer nor to the miller. In this instance the issue is with the process, not the product (Jones 1993).

Policy Implications

Does the government have a role in the coordinated market, and is information public or private in the processes associated with this market? Key participants in the grain industry have examined their processes and found them lacking in critical features. For example, Pioneer and DuPont seed companies have introduced new processes involving all market participants in determining varietal lines that meet their customers needs. Cargill has evaluated most of its agribusiness processes and changed many of them to meet new competitive demands on their output.

The whole market may not need redirection. There is still a place in the current environment for a mass, fungible market for grain. There is, however, a rapidly growing market that has a very different structure and involves very different market processes. This latter environment is customer driven and is coordinated across all market segments. Both forms of market structure require some form of signaling. But in the coordinated structure the information contained must be in greater detail and more specific to tailored needs.

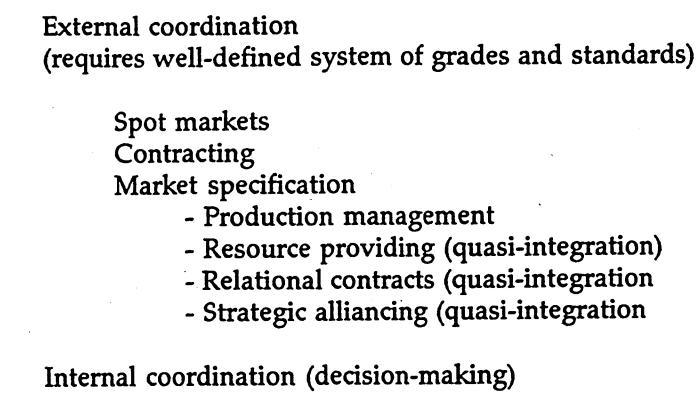
When private benefits coincide with private costs, the government need neither finance nor administer a public good to achieve economic efficiency. Increased vertical coordination through contract

production or ownership control at the production level minimizes the need for government enforced grades and standards (Figure 5) (Barkema et al. 1993). Use of contracts also reduces the justification for using federal grades and federal inspection agencies to adjudicate delivered quality. Grades have less economic value in a tightly coordinated vertical system.

The importance of uniformity of both grades and standards, and the necessity of federally enforced uniformity, depend upon the stage in the market channel. Processors are more interested in grouping diverse qualities into a few uniform categories that minimize the variability of output product quality. A processor may gain a competitive advantage by differentiating among commodity inputs, particularly where a set of unique specifications is required to meet processor requirements or consumer preferences. In such cases, the provision of information is for the purpose of differentiation, not for standardization relying on USDA grades.

The benefits of uniform grades derive from a system of uniform descriptive terms, definitions, and quality categories, not from any single factor or factor limit. No one factor is essential to a system of grades and standards. Benefits are derived from the collection of factors and factor limits providing accurate descriptions of quality and value. Product differentiation provides economic benefits to an individual firm even though it potentially diminishes the total aggregate efficiency of the industry. Government and private grades should describe the full range of qualities that have economic value to the market and allow the market to determine what supplies are acceptable for what end-use. Attempts to allocate costs of grading and standardization to only those firms using grades and standards is self-defeating. Firms will avoid grading costs when possible and, by substituting private—and possibly nonuniform—grades will rely less

Figure 5. A Taxonomy of Vertical Coordination

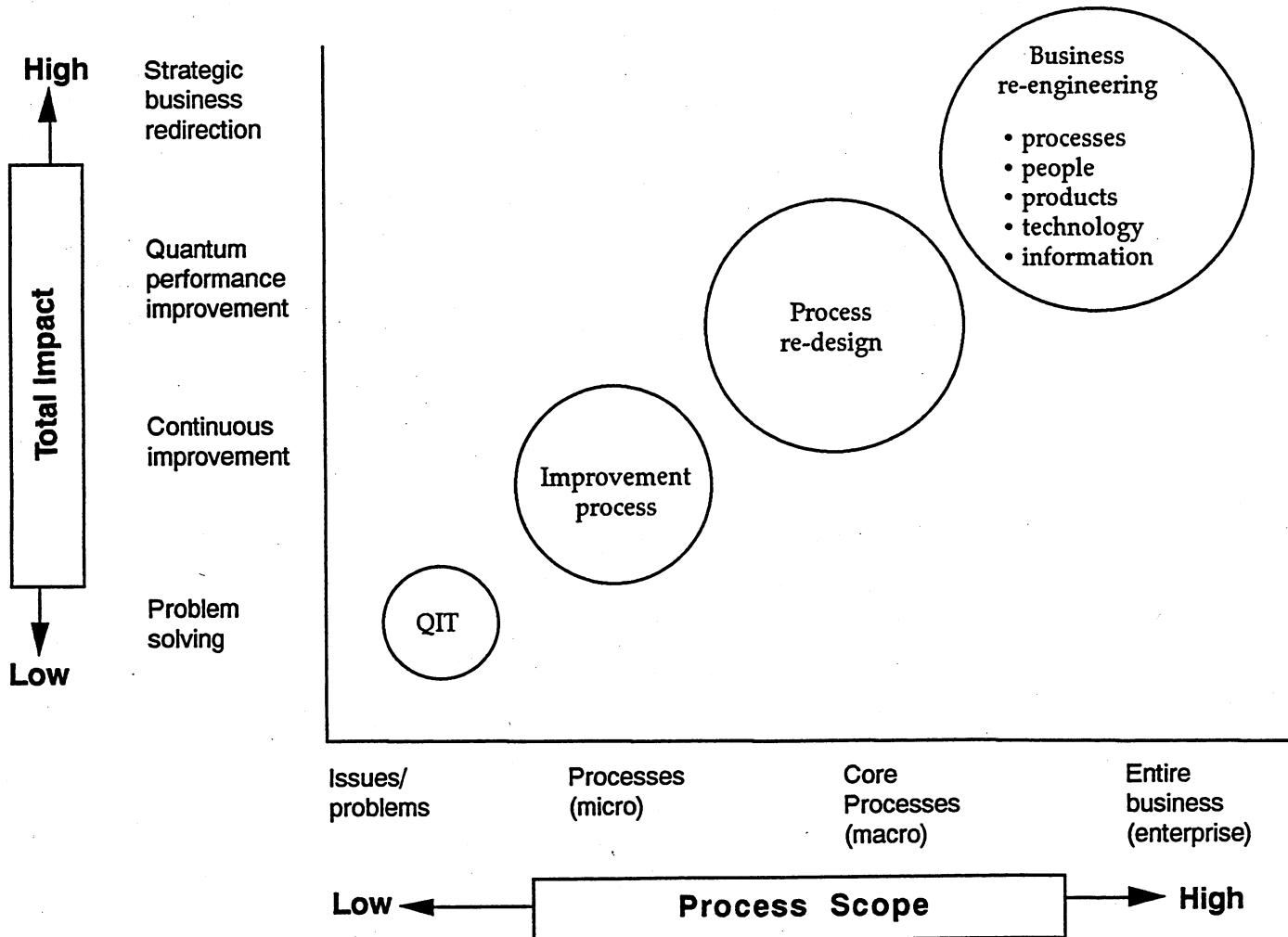


Source: Barkema et al., 1993

and less on national uniform grades. With fewer firms using the public grading system, the value of information about quality will diminish greatly.

The balance between costs and benefits of uniform grading differs among commodities and among market stages. At an individual firm level new demands created by the introduction of processing technology can be managed through adding specification to grain purchase contracts (Figure 6). As more processors adopt new technology the aggregate number of problems increases, and they become industry level problems (macro, in Figure 6). As grain markets enter the 21st century, the increasing number of market participants involved in differentiated marketing of grain will entail changed processes, changed customer preferences, new value-added products, changed technology, and changed information requirements. The changes occurring in 1994-95 bear little resemblance to those 10 years ago and are likely to bear little resemblance to those we might expect in 2000. Thus, the policies surrounding grades and standards need to reflect the ability to support a fungible market, while not placing constraints on the growing differentiated market for grain. This can best be achieved by avoiding reaction to political pressure from any individual group and by

Figure 6. Process Improvement in Relation to Market Re-engineering



Source: Westinghouse, WestTIP, 1983

using the broad authority of legislation to encourage cooperation and consensus within the industry on the uniformity and consistency of information. Markets are differentiated for the purpose of adding value, thereby gaining monopsonistic advantage and/or economic rents in the short run and improving market efficiency in the long run. The provision of additional information that may be required to meet unique processing requirements should not be required of a public or federal agency. However, there is a point at which "unique" information becomes the norm. Industry consensus is needed to determine where this point in time occurs and where the information reasonably changes from being "private" to "public." This can only occur in

a non-adversarial environment, with full industry representation.

The notion of re-engineering enters into the role of the public agency in determining the point of intervention in delineating and balancing the rights between private information (and potential market power) versus the public right to full and accurate information. The definition of the public agency role was that of "inspector" through the 1970s and 1980s. Rethinking the role for the rest of the 1990's and into the next century means considering the dynamic nature of the markets and the division of responsibility between the institutions, or grain markets themselves, and the public agency for maintaining full and accurate information.

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Phillips: The grain area is much less vertically coordinated than are fruits and vegetables, poultry, or other meat; but it is coming here too. It's just a matter of time until grain will also be tailored to specialized end uses. There will also be restructuring in the grain industry. Right now, farm commodity programs constitute a major obstacle to any attempts to enhance quality. This situation wipes out any benefit from a grading system or grading-system substitute. But in the future, variety will impart a whole lot of information that grades do not. Knowing a variety will give buyers information needed on all its intrinsic qualities. So, down the road, there are major substitutes for grades and standards.

Meyer: The "fragmentation" problem facing the grain market system is identity preservation through subsequent market segmentation and targeted marketing. Jones made it clear that such a system will involve many heretofore unconsidered costs and pose great challenges. Two of the main obstacles are (1) seasonality of crop production and the resulting unevenness of storage needs and (2) the costliness of duplicated, smaller-scale storage necessary to handle crops of various varieties. They are easily overcome, however, as long as consumers are willing and able to pay sufficient price premiums for products that better meet their needs. Measurement technology will be a driving force behind these changes.