Agriculture in the Twenty-First Century

Neil E. Harl
Iowa State University, harl@iastate.edu

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AGRICULTURE IN THE TWENTY-FIRST CENTURY*

— by Neil E. Harl**

As with most sectors of the world economy, agriculture in the last years of the Twentieth Century has been a sector of great change. Closed markets are giving way to free trade, open democratic systems with decentralized decision making are gaining ascendancy over despotic regimes, technology is revolutionizing every facet of production and distribution and competition is assuring that consumers everywhere are elevated to a high pedestal faintly reminiscent of the kings of old. As the Twenty-First Century dawns, the world is poised on the edge of what could be the era of accomplishing the elusive goals of the ages—peace, prosperity and victory over hunger.

It is assumed that the governing policy goals for the food and agriculture sector will continue to include—(1) availability of an abundant supply of food, at reasonable prices; (2) maintenance or enhancement of the productivity and environmental integrity of natural resources; and (3) a prosperous and productive economic climate for producers (including family farmers).

I. Structural Considerations

Structure of the Agricultural Sector

A major concern as we move into the Twenty-first Century is the structure of the agricultural sector. By structure, I mean to embrace considerations of size and scale as well as who is to manage, control and finance farming and agribusiness operations.

Role of competition. To a considerable extent, structure will be driven by economic considerations. This country has been committed for some time to the notion that if someone can develop ways to produce goods or services at a lower cost, barriers are unlikely to be erected to prevent that from happening. In large part, the consumer is king and generally rewards the best value with purchases. However, for the economic system to function properly, it is critical to have—

• Policies in place to deal with cost externalities such as odors and stream and groundwater pollution, and

* Presented at Integrated Crop Management Conference, Iowa State University, December 1, 1999.
** Charles F. Curtiss Distinguished Professor in Agriculture and Professor of Economics, Iowa State University, Ames, Iowa; Member of the Iowa Bar.
• A system of market protection (or antitrust) to penalize collusion and to prevent undue concentrations of economic power.

**Farm size and structure.** One facet of the structure is what is likely to happen with respect to size and control of farming operations. While it is believed that cropping operations will continue for some time to be dominated by family-owned and operated firms, the stage is set for a great deal of consolidation of farming operations over the next few decades. It appears likely that, absent implementation of countervailing policies, farm size will continue to increase, perhaps on an accelerated basis, for three reasons—(1) the pressure to spread machine costs over more acreage and to achieve economies in purchasing inputs and selling outputs; (2) the desire to achieve higher income levels; and (3) the present levels of concentration of land ownership in older hands.

It should be recognized that the competitive effect of a particular operation is essentially the same whether located in the same section or across the country. If the product involved is sold into a national commodity market, the competitive impact is similar wherever located. Indeed, to the extent the product involved is traded in an international market, the effect of low cost operations on the sector is the same wherever production occurs. This suggests that there are practical limits on the extent to which one state, acting alone, can deliberately influence the structure of the subsector. Long term a state can impose additional costs, direct or indirect, on a firm only to the extent that the state enjoys an overall competitive advantage over production in other states. Costs imposed beyond that point would be expected to cause new investment to be made elsewhere.

Although rarely used, another policy alternative for influencing structure would be to affect the cost curve for certain operations, perhaps those above a specified size or scale. This discussion has typically centered around (1) use of property tax increment financing incentives for large operations and (2) granting of property tax preferences of family farm operators and agricultural buildings up to a specified amount.

Cost curves could be raised for larger, more efficient firms to remove any perceived cost advantages by imposing a tax on facilities, use of inputs or outputs produced. Long-term, if done uniformly over the entire market, the result would be higher costs of the end products to consumers or lower profits or both. Justifications for such action may either include recovery of public costs associated with externalities of larger operations or structural preferences of the public.

Another approach would be to impose additional requirements on firms above a specified size or scale, perhaps relating to waste handling and disposal, which would impact the cost curve of firms. The result would be similar to a tax. It should be noted that, in both instances, the effect could be a competitive disadvantage for a state levying a tax or imposing additional requirements unless the measures were imposed uniformly over the production area comprising the market for the product.

A contrasting policy response is to provide a subsidy for smaller producers to assist in defraying costs of environmental compliance as is now available under the Environmental
Quality Incentive Program (EQIP) authorized by the 1996 farm bill. Half of the funds allocated under the EQIP program must be directed to environmental problems of livestock production. Large operations with greater than 1000 animal units are not eligible for cost sharing under the program. Alternatively, providing subsidies to institutions that provide small farmers with access to critical factors of production, capital or markets represents an indirect response to achieving a similar end.

The Era of Contract Agriculture

The signs of increasing use of contracts are commonplace—especially on the production side of agriculture. Specialty grains, feeder livestock, even fruits and vegetables, are being produced under contract and have for some time. So what's the concern about the rising tide of contract agriculture? Basically, the concern is a tilt in market power with a possible shift in bargaining power as input suppliers and output processors (and first purchasers otherwise) gain greater economic power, undoubtedly at the expense of producers.

Concentration in seed companies. Mergers, alliances and various other forms of arrangements are reducing the number of players in input supply, particularly in seeds, and increasing the level of concentration. Figure 1 shows the extent to which arrangements between and among the major firms in the seed area have come to permeate the input supply sector. While the level of mergers, alliances and consolidations is not a completely reliable indicator of competition, the fact that nearly $15 billion of such amalgamations has occurred over the past three years, some at price levels difficult to justify under present economic conditions, suggests that—(1) some are discounting revenue from a pot at the end of some unknown rainbow; (2) irrational behavior is being displayed; or (3) some acquiring firms are assuming that a greater share of the world's food bill can be claimed by seed suppliers.

But increasing levels of concentration among firms do not tell the entire story. The revolution in ownership of germ plasm, the feature of cells that determines the characteristics of offspring, also is moving rapidly toward concentration in a few hands. The high-profile alliance (and now merger) between DuPont and Pioneer Hi-Bred International, the Monsanto acquisition of DeKalb and the Monsanto acquisition of Delta and Pine Land Company are recent examples of how the ownership and control of genetic material in crops is falling into the hands of a few, economically powerful players. Increased concentration is also leading to control by a few firms over the major processes by which genetic manipulation occurs, thus enabling those controlling the technologies to block use by other firms.

This development is partly related to the changing role of the land grant universities, partly to the ability in recent years to manipulate germ plasm through genetic engineering, and partly to the consequences of the ability to obtain a monopoly-like position over unique life forms and over the process of genetic manipulation.

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Figure 1. Concentration in the Seed Business

I. Astra Zeneca * (United Kingdom)
   A. Advanta BV (August 1996, 50% Equity)
      1. Cooperative Cosum UA # (August 1996, 50% Equity)
      2. VandeHave + (August 1996, 100% Equity)
      3. Interstate Payco + (August 1996, 100% Equity)
      4. Garst Seed Co. + (August 1996, 100% Equity)
   B. Mogen International NV + (June 1997, $78M, 100% Equity)
   C. ExSeed Genetics LLC + (December 1997, 30% Equity)

II. Aventis SA * (France)
   A. Hoechst AG * (December 1998, Joint Venture 50% Equity)
   B. Hoechst Schering AgrEvo GmbH (Dec. 1998, Equity to be decided)
      1. Schering AG * (January 1994, 47% Equity, $161M)
      3. ProagroGroup + (February 1999, 100% Equity)
      4. Kleinwanzlebener Saatzucht AG (KWS) + (12% Equity)
         a. Great Lakes Hybrids, Inc. + (1988 50% Equity, 1993 80% Equity)
   C. Rhone-Poulenc SA * (Dec. 1998, Joint Venture, 50% Equity)
      1. RhoBio + (March 1998, 50% Equity)
      2. Groupe Limagrain # (15% Equity)
         a. Biogemma # (1997, 56% Equity)
            (1) RhoBio # (March 1998, 50% Equity)
            (2) Pau Euralis + (1997 acquired 25% Equity in Biogemma)
         b. Callahan Seeds + (July 1994, 85% Equity)
         c. King Agro Inc. + (June 1994, 100% Equity)
         d. Nickerson Seeds + (October 1990, 100% Equity)
         e. Biotechnica International, Inc./LG Seeds + (October 1998, 80% Equity)
         f. Mais Angevin + (99% Equity)
         g. Akin Seed Co. + (March 1994, 100% Equity)
   D. Dow Chemical Company *
      A. Verneuil Holding SA + (December 1996, $9.4M, 18.75% Equity)
      B. Advanced Agri Traits # (March 1999, 83.6% Equity)
      C. Illinois Foundation Seed, Inc. + (Acquired 16.4% Equity in Advanced Agri Traits in March of 1999 and 29% of its Equity was acquired by Dow in March 1999 for $15M)
         1. Dinamihlo Carol Productos Agricolas Ltda. + (Apr. 1998, $32M, 100% Equity)
         2. Híbridos Colorado Ltda. FT Biogenetics de Milho Ltda. + (Sept. 1998, 100% Equity)
         3. Morgan Seeds + (Sept. 1996, $34.5M, 100% Equity)
         4. United Agrisseeds, Inc. + (Feb. 1996, $72M, 100% Equity)
      E. Dow/Danisco JV # (Dow Agri Sciences LLC, May 1999, 50% Equity)
         Also owned by—Danisco Seed + (May 1999, 50% Equity)

IV. E.I. DuPont de Nemours & Co. *
   A. Hybrinova SA + (April 1998, 100% Equity)
   B. Protein Technologies International # (Dec. 1997, $1.3B, 100% Equity)
   C. Optimum Quality Grains, LLC # (August 1997, 50% Equity)
   D. Pioneer Hi-Bred International, Inc. + (August 1997, $1.7B, 20% Equity)
      1. Optimum Quality Grains, LLC + (August 1997, 50% Equity)
      2. Dois Marcos + (March 1999, 100% Equity)
V. Monsanto Company *
   A. Hubri Tech Seed Int'l, Inc. + (1982, 100% Equity)
      1. HybriTech Europe SA (Feb. 1996, 90% Equity)
         a. Paul Euralis + (Feb. 1996, 10% Equity)
      2. AgriPro Seed Wheat Division + (July 1996, 100% Equity)
   B. Jacob Hartz Seed Co., Inc. + (1983, 100% Equity)
   C. Sementes Agroceres SA + (Nov. 1997, $150M, 100% Equity)
   D. Agracetus, Inc. (April 1996, $150M, 100% Equity)
   E. Delta & Pine Land + (May 1998, $1.9B, 100% Equity, Nov. 1998 Share Exchange)
   F. Calgene, Inc. + (Apr. 1996, $30M, 100% Equity; Nov. 1998, $50M, 5% Equity; May 1997, $242M, 45% Equity; Total Cost $322M)
      1. Stoneville Pedigreed Seed Company + (Announced Auction, Jan. 1999)
   G. Holden's Foundation Seeds + (Jan. 1997, $1.02B, 100% Equity)
   H. Mossyo (Nov. 1997)
   I. DeKalb Genetics Corporation + (March 1995, $1.2M, 40% Equity; May 1998, $2.5B, 100% Equity; Total cost $3.7B)
      1. Custom Farm Seed + (July 1997)
   J. Asgrow Seed Company LLC + (Nov. 1996, $240M, 100% Equity)
   K. First Line Seeds, Lt. + (June 1998)
   L. Plant Breeding International Cambridge, Ltd. + (July 1998, $525M, 100% Equity)
   M. Cargill's International Seed Division + (July 1998, $1.4B (est.))
   N. Renessen (May 1999, $100M, 50% Equity, Joint Venture)
      1. Cargill Hybrid Seeds +

VI. Novartis AG * (Switzerland)
   A. Wilson Seeds, Inc. +
      Also owned by—U.S. Cooperative System: Cropland Genetics, FFR, GrowMark, etc. #
      (Land O'Lakes, Nov. 1998, 50% Equity)
      1. Zimmerman Hybrids, Inc. + (1998, 100% Equity)
   B. Sturdy Grow Hybrids, Inc. + (April 1998, 100% Equity)
   C. Agritrading + (Aug. 1998, 100% Equity)
   D. Maisadour Semences SA + (Dec. 1998, 40% Eqty)

VII. Other Companies +
   A. Crow's
   B. Fielder's Choice
   C. Golden Harvest
   D. Stine Seed Co.
   E. NC+

*Life Science Companies; + Seed Companies; n Joint Ventures; # Cooperatives; • Other Companies
Source: Pioneer Hi-Bred International, Inc. and the Center for International Agricultural Finance.
• For decades the land grant universities developed the basic genetic lines and made those lines available to the seed industry. Because of limitations on university funding and the near-revolution in genetic engineering, the private sector several years ago began pouring more money into basic research. Developments have progressed to the point that the payoff from research and development funding can no longer be used to compare the present with prior periods. Payoffs are expected to flow more readily than when biotechnology was in its infancy.

• The advent of genetic engineering meant that scientists could manipulate genetic composition—not through conventional crop breeding techniques but through laboratory procedures—to change the genetic makeup of plant and animal life. That has produced herbicide-resistant crops, for example.

• Finally, the U.S. Supreme Court in a 1980 landmark case determined that life forms could be patented. In addition to federal Plant Variety Protection (PVP) and simply shrouding research efforts with secrecy, the ability to patent life forms provides a powerful tool to keep competitors at bay.

Effect of contracts. An important question is the effect concentration in the seed business and control by the few resulting firms over germ plasm will likely have on contract negotiations with producers. It depends on the options open to producers who don't like the terms of contracts offered to them. With numerous contract possibilities available from input suppliers, each offering inputs of roughly equal productivity and cost, the answer is perhaps "not much."

But if there are just a few options, with the next best offering a much less attractive set of inputs in terms of cost and productivity, such as when a variety of seed is developed with significant yield premium over otherwise competitive varieties, the answer is "take what you're offered." A greater proportion of the value of the yield premium is expected to be captured by the seed supplier under those conditions than has historically been the case. The outcome is likely to be a tilting in the terms of contracts in favor of the input supplier. The division of revenue from production would be expected to shift over time in favor of the party with the monopoly or near-monopoly position. Seed companies and other input suppliers can be expected to drive the best possible bargain which means, in the case of seed, capturing the greatest possible percentage of the value from any yield premium.

• The outcome would be a smaller share of the revenue from production going to the producer, resulting in less compensation to the producer and less to capitalize into land values.

• Seed companies would end up with a larger share of the pie with more to capitalize into the stock of the input supply firms. Even if unique corn derivatives produce revenue of $2 million per acre, it's fairly clear that whomever holds the rights to the technology involved will capture the lion's share of the revenue, not the producer.

1 Diamond v. Chakrabarty, 447 U.S. 303 (1980) (bacterium having unique genetic characteristics is patentable subject matter under the general patent statute).

A good argument can be made that this perception of potential profits in the future is part of what is driving the intense push toward concentration in control over germ plasm now occurring.

Thus, a major issue is whether a shift in market power occurs between input suppliers and producers, whether that shift in market power is translated into enhanced bargaining power and whether the enhanced bargaining power is employed to siphon a greater proportion of the economic return generated by the sector into the hands of input suppliers.

Other shifts may follow. The negotiating power of seed firms could well have other impacts.

- In an effort to control the germ plasm more completely, seed companies are likely to negotiate for ownership of the product with the producer under contract having only a contract right to payment, short of ownership of the crop or livestock involved.

- Similarly, the contract may contain what would appear at first glance to be an attractive feature—the input supplier bearing the price risks.

These seemingly innocent shifts would mean, however, that the economic position of the producer would be transformed from that of a risk-taking entrepreneur into a relatively riskless world of fixed compensation. Thus, a shift not only of compensation would occur in favor of the input supplier but also a shift of management functions in the same direction. The outcome would be reminiscent of the limited role played by growers under broiler contracts.

Barriers to entry. In general, one would expect high handed economic behavior by near monopolists to be met by entry of new competitors attracted by the generous terms of contracts in favor of the input suppliers. And that would likely occur if entry were possible. However, barriers to entry may be fairly high.

- One barrier is capital needed to mount the kind of research effort needed to maintain a product flow similar to that of the firms pressing for monopoly-like concentration levels. The capital needed is very substantial.

- Also, existing patent and plant variety protection may mean that potential competitors are frozen out of competition as a practical matter for the duration of the patent or PVP certificate or the duration of a patent over processes by which genetic manipulation occurs.\(^5\)

**Position of Small Seed Firms**

A major issue is whether smaller seed firms are likely to be able to acquire germ plasm and thus remain viable. Certainly the small firms have remained surprisingly healthy in recent decades as performance traits of the varieties and hybrids developed by the larger firms have tended to outdistance the performance of seed marketed by small firms.

\(^5\) 7 U.S.C. §§ 2541(a), 2483.
But the era of transgenic hybrids produces both the incentive to maintain greater control over high performing germ plasm and the technology and resources to challenge those who manage to obtain the germ plasm in clandestine ways. The larger firms may acquire some smaller firms to complete their distribution network and licensing germ plasm for a fee may well occur. However, it is unlikely that the dominant firms will generate additional competition by licensing to smaller firms.

Indeed, with the smaller firms predictably unable to maintain access to higher performing germ plasm, the price of lower performing seed varieties and hybrids is expected to reflect the economic disadvantage inherent in the lower performing varieties. At some point, many if not most of the smaller seed firms that are unaligned with the dominant firms will be unable to survive economically.

**Antitrust Surveillance**

Another possible area of protection against a sharp tilt in the economic terms of contracts is vigilance by federal (or state) anti-trust agencies. Certainly the Federal Trade Commission and the U.S. Department of Justice should be sensitized to the potential for economic abuses down the road.

Further consolidation in any highly concentrated sector merits scrutiny under the Clayton Act rules that impose limits on mergers expected substantially to diminish competition. So-called horizontal mergers or mergers of competitors are the most likely to be challenged. Other areas of antitrust challenge involve production, including price fixing, agreements to divide markets and group economic boycotts. These are all per se offenses under federal antitrust law.

It's been well established for decades that firms with monopoly power over a product should not be able to "tie" other products to the transaction and extend the monopoly position. Such contracts are used to create "economic leverage" by using monopoly power in one market (the market for the tying good) to create monopoly power in a second market (the market for the tied good). Such arrangements, which involve tying products over which a firm does not have monopoly power (such as financing, insurance or risk management) to a product over which the firm does have monopoly power (such as a seed variety), are also illegal per se unless it can be demonstrated that the product in monopoly status wouldn't work as well with other firms' products. And, that is rarely the case.

In a 1936 U.S. Supreme Court decision, IBM was prevented from requiring purchasers of its calculators to buy punch cards for data entry from IBM. Similarly, in *United Shoe Machinery Corp. v. United States*, a seller occupying a "dominant position" in the shoe machinery industry, without more, violated the Clayton Act by contracts tying to the lease of its machines the purchase of other types of machinery and incidental supplies. In a 1947 U.S. Supreme Court

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7 International Business Machines Corp. v. United States, 298 U.S. 131 (1936).
8 258 U.S. 451 (1922).
9 Clayton Act, § 3.
decision, conditioning the leasing of patented machines for dispensing industrial salt on the
lessee's purchase of the lessor's salt, the court said that it is "unreasonable, per se, to foreclose
competitors from any substantial market" if the seller enjoys a monopolistic position in the
market for the tying product or if a substantial volume of commerce in the "tied" product is
restrained.\footnote{International Salt Co. v. United States, 322 U.S. 392 (1947).}

In finding that the leases violated the Clayton Act, the court relied on International Salt's
patents as establishing its market power in the tying products (the salt dispensing machines) and
on the substantial dollar volume of business in the tied product which was foreclosed to
competitors as establishing the requisite competitive effects. Once the minimum threshold
conditions were met, the court held that a violation had occurred. As the court stated—

"We think the admitted facts left no genuine issue. Not only is price fixing unreasonable, per se,
but also it is unreasonable, per se, to foreclose competitors from any substantial market. The
volume of business affected by these contracts cannot be said to be insignificant or insubstantial
and the tendency of the arrangement to accomplishment of monopoly seems obvious.\footnote{Id. at 398.}

The court rejected the defense that the tying arrangement was necessary for the effective
functioning of the potential product (or product over which the firm had monopoly power). As
the court stated, "[b]ut it is not pleaded, nor is it argued, that the machine is allergic to salt of
equal quality produced by anyone except International."\footnote{Id. at 398.}

Some economists have criticized the antitrust treatment of tying contracts as not leading
to economic leverage in all instances.\footnote{See Warren, Antitrust in Theory and Practice, 192-202 (1974).}

If the objective is to maintain significant levels of competition in input supply, FTC and
the Department of Justice should scrutinize all seed industry mergers carefully for anti-
competitive consequences and all practices by seed companies in tying credit, insurance, risk
management or other needed inputs to seed availability. One problem in relying on FTC or the
Department of Justice is that both agencies seem to believe that the agriculture is the last bastion
of perfect competition and is competitive by a comfortable margin. The problem is not one of
diminished competition among producers but among those who supply inputs and process or
handle products from the producing subsector.

**GMO Controversy**

The degree of consumer acceptance of genetically modified organisms (GMOs) will
likely have a major impact on the speed with which consolidation and vertical integration in the
seed business are translated into economic benefit for the major seed companies. Although
resistance to GMOs was presently centered in the European Union, resistance has spread to other
countries—notably Japan, Australia, New Zealand, India and Thailand in terms of imposition of
labeling requirements. Initial steps were taken in Japan in July, 1999, to implement product
labeling in that country. Resistance is expected to spread to products involving GMOs, most notably meat and meat products, in areas outside the European Union.

Continuing consumer resistance would be expected to result in a two-track marketing system with the prospect of some degree of discounting of GMO crops and, concomitantly, discounting of GMO seed.

Widespread consumer resistance could slow perceptibly the move toward consolidation and vertical integration.

**Solutions**

If sufficient public interest and political will are generated, three solutions seem to lie within the feasible set.

*Antitrust oversight.* First, aggressive antitrust oversight at the federal level (and among the states) is the traditional way for proposed mergers and alliances and other anti-competitive practices to be evaluated on the basis of potential anti-competitive effects. The objective should be to insure that all sectors and subsectors have equal, and low, economic power. Because of the importance of food and the policy significance of maintaining a healthy producing sector, it may be necessary for the Department of Justice to be funded specifically to maintain a substantially higher level of oversight over structural shifts in food and agriculture.

*Collective action by farmers.* One possible strategy for farmers is to forge alliances among producers (which is specifically allowed by federal law so long as it does not "unduly enhance" price). The push to achieve such countervailing power was the driving force behind the formation of labor unions a century ago. Historically, however, farmers have been unwilling to accept such a disciplined approach to achieving bargaining power.

Section 1 of the Capper-Volstead Act of 1922 provides protection from antitrust challenge for producers who seek to bargain collectively with seed companies and other input suppliers. A resolution, passed in 1917 by the National Board of Farm Organizations, provided that—

"Producers and consumers are bound together by economic laws which they did not make and which they cannot repeal. Between these two are powerful agencies whose only interest it is to take such toll as they may, as products are passing from producer to consumer. These agencies, by reason of their financial connections, exercise an influence far greater than is warranted by their numbers or the service they perform. We therefore urge upon Congress the necessity of such an amendment to the antitrust laws as will clearly permit farmers' organizations to make collective sales of the farm, ranch, and dairy products produced by their members. Such organizations, with

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19 The group was comprised of the National Cooperative Milk Producers Federation, the National Grange, the National Farmers Union and other farm organizations.
liberty of action, can insist that the agencies engaged in processing and distribution sell such products at prices as low as may be consistent with the cost of production and distribution.

This was the beginning of the drive for legislation to address the perceived problems of agricultural cooperatives. The objectives of the proposed legislation were to remedy two problems encountered under Sec. 6 of the Clayton Act in 1914 (which provided a limited agricultural exemption to antitrust enforcement)—(1) the limitation of the protection in Section 6 of the Clayton Act against antitrust challenges to organizations "not having capital stock" and (2) the failure of Section 6 of the Clayton Act specifically to permit certain cooperative marketing activities.

The Capper-Volstead Act provides that "persons engaged in the production of agricultural products as farmers, planters, ranchmen, dairymen, nut or fruit growers, may act together in associations, corporate or otherwise, with or without capital stock, in collectively processing, preparing for market, handling, and marketing in interstate and foreign commerce, such products of persons so engaged." The Act goes on to allow "Associations [to] have marketing agencies in common; and such associations and their members may make the necessary contracts and agreements to effect such purposes."

To come within the protection of the Capper-Volstead Act, an organization must—(1) be operated for the mutual benefit of its members; (2) either limit each member to one vote regardless of the amount of stock or membership capital the member owns or, if dividends are paid on the basis of members' stock or membership capital, the dividends must be limited to a maximum of eight per cent per annum; (3) not handle a greater amount of products from nonmembers than from members; and (4) not be operated for profit.

The grant of immunity from antitrust challenge was further limited by a provision that if the Secretary of Agriculture finds that an association "monopolizes or restrains trade in interstate or foreign commerce to such an extent that the price of any agricultural product is unduly enhanced thereby he shall issue...an order...directing such association to cease and desist from monopolization and restraint of trade." The key question is whether producers will be willing to sacrifice independence of action in order to bargain collectively for access to seed and possibly, other inputs. The most likely avenue for such collective action is through cooperatives.

More germ plasm in the public domain. Another potential solution is for the public to increase its support for crop breeding by land-grant universities and other public agencies with transgenic hybrids and varieties made available to smaller seed companies. This would restore

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20 7 U.S.C. § 291. See Green v. Associated Milk Producers, Inc., 692 F.2d 1153 (8th Cir. 1982) (transportation of milk is handling activity protected by Capper-Volstead Act; employees of dairy cooperative acting within scope of their authority could not be guilty of conspiracy with cooperative because employees and cooperative are part of same entity; cooperative members and cooperative are considered one entity and incapable of conspiring with each other).
22 Id.
the land grant universities to the role played before the advent of genetic manipulation and the
dramatic increase in private sector funding for new varieties and hybrids.

To a considerable extent, this possible outcome is dependent upon the perception in state
legislatures and the Congress as to the public interest, long-term, in maintaining a greater degree
of competition in seed supply. Legislative bodies are more likely to respond if convinced that
dominance of seed supply by a few large firms, worldwide, could affect food costs by influencing
the supply of food through contractual mechanisms.

Role of Institutions

Arguably what is likely to emerge over the next few years is a heightened awareness of
the efficacy of institutions in limiting or constraining economic activity. To the extent that
institutional intervention is successful, a major concern is how to keep institutions in adjustment
with changing economic circumstances. Markets reflect changes day by day, minute by minute.
Yet, institutions tend to remain in place, frequently producing economic rents for some, until
sufficient momentum is generated to effect change. To a considerable degree, institutions limit
(as well as facilitate) market operations but without the same self-adjusting features as markets.

Objective of Vertically Integrating the Sector?

The moves made by the major players, particularly the seed companies, could lead one to
conclude that the objective is to vertically integrate the sector. Such an objective could be
pursued for several reasons—(1) to gain and maintain greater control over patented products or
products subject to intellectual property protection otherwise; (2) to apply economic pressure on
producers to relinquish functions in favor of the integrator (such as risk management) or to
merely provide an opportunity for risk to be off loaded onto the integrator; (3) to enhance profits
of the integrating firm; or (4) to achieve greater market share on an assured basis.

Some readily concede that an objective of vertical integration is one of the forces driving
the push toward a contract-based agriculture. As one seed company CEO has stated, in
responding to a question of how farmers could back away from the trend toward vertical
integration—"Absolutely nothing, because these are property rights owned by the companies and
so the farmer is going to become more and more at the mercy of the few who own intellectual
properties. Again, it goes back to the shortsightedness of funding basic research in such a
parsimonious fashion. The universities are becoming branches of whoever they can get a
contract from."24 In a follow-up question of how farmers could participate in the upside
associated with specialty crops, the CEO said—"In order for the American farmer to participate,
we have to make sure that intellectual property goes back into the public domain. As long as our
government is so shortsighted that they continue to de-fund basic research at the universities, the
U.S. farmer has a huge problem facing him. Without government funding, companies are going
to fund research and control it."25

24 Jerry Caulder, CEO, Mycogen Corp., in Farm Futures, April/May, 1999, p. 25.
In Conclusion

Agricultural production may never be transformed as dramatically as indicated by the scenario outlined in this article. But, it's well within the range of feasibility. Other scenarios could be posited including—(1) one where producers are left relatively unaffected as the shift occurs to a contract-based transaction system for the agricultural sector and (2) a scenario which producers may benefit from such a shift. The latter, it would seem, is relatively unlikely over the long-term.

In the meantime, the prudent course would suggest careful evaluation of mergers and alliances now occurring in rapid succession and careful consideration of the level of resources flowing into the development of transgenic hybrids and varieties in the public domain.

If economic abuses develop, producers may resort to collective action in acquiring germ plasm needed in their operations. Producer and producer groups have often resorted to lobbying for institutional limits or constraints on the market in an effort to achieve a more favorable (to them) sharing of the economic pie. The key questions are (1) what policy variables would need to be manipulated; (2) what impact that would have on consumers, on economic efficiency and competitiveness globally; and (3) the feasibility of such intervention politically?

II. Thoughts on Farm Policy

Concerns About the 1996 Legislation

The 1996 farm bill represented a significant departure from federal farm legislation since 1933. While the transition away from government programs will likely produce a more rational system of resource allocation, several important implications of the shift deserve mention.

- The loss of protection against low prices is proving to be a serious problem, as we had feared.

More fundamentally, the question is whether the Congress will allow the use of price to reduce supply. In October of 1998, Congress passed an economic assistance package totaling $5.975 billion to insulate partially U.S. farmers from the effects of low prices. Legislation providing an even larger assistance package is expected in 1999. These amounts are in addition to AMTA payments, LDP payments, disaster assistance and marketing loan costs. The total outlay was more than $15 billion in 1998 and could exceed $22 billion in 1999. A major question facing Congress is what U.S. farm policy will be for 2000 and beyond.

While some sectors of U.S. agriculture have enjoyed favorable prices until quite recently, low prices have returned. The result of an increase in supply is a disproportionate drop in price—and in profitability. That means consumers are in a very favorable position, assured of an ample supply of food and fiber at a relatively low cost, long-term. But, it means also that producers periodically endure periods of low prices.
The agricultural sector, in terms of policy, is characterized by two important features:

—First, the number of producers is so great that no single producer can influence price with their output decisions and so they may not cut back on production until price drops below variable costs or they are able to shift to a more profitable alternative crop. This feature makes it difficult for the sector to reduce supply without government assistance.

—Second, although we have become very clever in developing more effective chemicals, better seed varieties, larger and more efficient equipment and improved management, our cleverness still hasn't given us much influence with weather. Year-over-year, weather is the big factor influencing supply of the major crops in this country. Given the enormous capacity to produce, a series of years with favorable weather puts pressure on price. It was to be expected that farm commodity prices will be more volatile than during the era of farm programs. This is important to consumers as well as producers.

• Elimination of the federal farm programs was expected to mean less economic buoyancy from government. While the proportion of farm income coming from government programs has dropped from the relatively high levels of the mid 80s, as shown in Figure 1, elimination of the farm programs has not reduced government outlays as much as anticipated.

• Another significant feature of the elimination of federal farm programs is the shift in land use patterns that will occur over time. Shifts in land use will be dramatic and will be felt across the agricultural sector, but the greatest shift will occur in areas of marginal land.

Under the farm programs from 1933 to 1996, government farm programs attempted to help balance demand and supply by idling land. Depending upon the year, the amount of idled land ranged from none to 70 to 80 million acres. The land was idled in checkerboard fashion, some of the very best land was idled and some of the poorest. This was not economically rational but it spread the burden of adjustment over the entire country and it did not squeeze producers economically as adjustments were made in the productive base.

Under the 1996 legislation, production decisions are left to the market. And the market doesn't adjust production in the same way as government programs. The market squeezes out the thinner soils and steeper slopes, the higher per-unit cost of production areas. With no land idled, production increases, crop prices fall, and land values come under pressure until there is less profitability for crop production on the least productive land than for the next most profitable use for that land. The least productive land then transitions out of intertilled crops to a less intensive use, to another crop or to grazing land. Depending upon the area, some might transition to wasteland. At least, the increase in supply of grazing land would assure that the less productive grazing land would decline in value.

Rather than having 70 to 80 million acres of farm land out of production on a checkerboard-pattern, there could be close to that many acres which would transition to a lower-valued use unless exports are maintained at high levels. However, the more productive land would not be among those acres moving to a lower-valued use. The transition would tend to be
concentrated in areas with highly erodible, lower productivity land that has thinner soils and lower rainfall.

This movement of land to a less intensive use spells economic pain for producers everywhere. Adjustment pain is felt not just by those at the periphery of the core producing areas, but by producers everywhere. Beyond that, those geared up to sell inputs to or purchase outputs from a crop-based agriculture also would have to adjust. Indeed, the transition for farmers is expected to be shielded in part by the Conservation Reserve Program. Little or no adjustment assistance is expected for those who dry, store or ship grain or oilseeds or who sell seed, fertilizer, chemicals and equipment for a row crop-based agriculture as the area transitions to grazing.

After a period of adjustment, the economic returns to labor and capital (unlike returns to land) will likely return to an equilibrium level.

Figure 3 illustrates the fact that, for each major crop, there will be a "core" area of production and a "swing zone" at the periphery.
Figure 3.

**United States: Corn**

- Major growing areas
- Minor growing areas

Legend

- Corn crop calendar for most of the Midwest United States
- Corn crop calendar is typically 3 months ahead across the southern United States

Source: USDA & Dept. of Comm.

Figure 4.

**U.S. Agricultural Imports and Exports**

- Imports
- Exports

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Source: USDA & Dept. of Comm.
That zone of thinner soils and steeper slopes at the periphery of major crop producing areas becomes a swing factor in production. In times of good prices, it swings back into intensive production; when prices fall, it’s squeezed out again. This is the reason now why the most intensive resistance to the 1996 farm bill is in those swing areas where the next best use represents an economic jolt for producers and others involved. And it means another dimension of instability for those areas.

So, while the market is doing its job, the squeeze is felt even by those on the best, most productive, soils as the production of the major crops shrinks into a more compact area with 100 percent of the best land in production.

These land use shifts aren’t likely to be one-time events. As exports rise (or fall), domestic demand rises (or falls) and changes in supply from technology and weather occur, the zone of swing acreage at the periphery of the core areas will see shifts in land use occur.

All of this is rational, economically, but it adds enormous uncertainty for producers; those who supply inputs; and those who store, ship, dry or process outputs.

**Export Trends**

The 1996 farm bill was enacted in a time of optimism in U.S. agriculture. As can be seen in Figure 4, agricultural exports peaked in 1995 and 1996 above $60 billion. Exports have declined since and could go lower with agricultural exports totaling about $49 billion in 1998-99.

As can be seen from Figure 4, U.S. agricultural exports declined about 40 percent from 1981 to 1986. During that time, corn, soybeans and wheat piled up in storage, in barges on the Mississippi river and up and down main street. Government payments shot above $25 billion in the worst of these years. While I am not predicting a 40 percent decline in agricultural exports this time, and I do not believe such a reduction is likely, exports could well go lower than at present.

What impact did the Asian crisis have on world food demand and on U.S. farm exports? For the better income countries, where credit isn’t a major problem, commodity demand for food purposes declined only modestly. But for low income areas—especially where credit is a problem—the impact was much greater.

As the slide in Asian economies has bottomed out, it appears that food demand in that area changed only modestly. So far, increases in demand elsewhere in the world have offset some—but not all—of the decline in Asia.

**Optimism In Export Projections**

Exports have fallen short of projections for several reasons.

- Increases in output in Argentina and Brazil, in particular, have been substantial and may well go higher.
• In countries with higher per-unit costs of production, as trade barriers fall, producers are unlikely to fold their tents and abandon their land. The more likely scenario is that land values will fall in those countries and producers will continue producing so long as they can more than cover their variable costs with the most profitable crop.

After all, land values are price determined, not price determining. Land has value as expected profitability is capitalized into the value of land. Some areas of the world can realistically expect significant declines in land values as trade barriers are demolished.

**IMF Funding**

In my view, it is critically important, not only for farm exports but also for economic stability worldwide, for the International Monetary Fund (IMF) to be funded adequately. IMF-led efforts to stabilize the Asian economies and bring about structural reforms will pay off in generous dividends, long-term.

Without IMF intervention, worldwide agricultural exports will decline significantly and the effects of the Asian crisis generally would have had a much greater impact on the U.S. economy.

**Fine Tuning "Freedom to Farm"**

In testimony in the U.S. Senate on September 15, 1998, I focused on what circumstances would turn crop prices around. Four possibilities were identified—(1) dramatically improved domestic demand (which is highly unlikely); (2) bad weather (which is not something we can count on); (3) better export levels (which, at the moment don't seem to be in the cards); or (4) the operation of the market as low prices eventually squeeze out higher cost producers—probably at the periphery of the major producing regions—with those producers shifting their land to another use, possibly grazing. A fifth possibility—a change in federal farm policy—has received more attention recently.

The action by the Congress in October sent a fairly clear signal that the economic pain inherent in the fourth possibility is unacceptable, politically. The $5.975 package signed into law on October 21, 1998, coupled with the advance of the Spring, 1999, payment into the fall of 1998, along with the regular AMTA payment for 1998 and the cost of LDP and marketing loans boosted the subsidy level to more than $15 billion. The $8.7 billion cash infusion in late 1999 assures that the 1999 payments will exceed $22 billion. That is reminiscent of the subsidy levels of the mid-1980s. And even at that, farm income levels in the Midwest were down for 1998 and 1999.

The troubling scenario is that with no pick up in exports (indeed further weakening appears to be the most likely possibility) and average or better weather in 1999, we could be in worse shape a year from now than we are at present.
That's why it seems prudent to begin to ponder some "fine tuning" options on a contingency basis—if crop prices aren't boosted by bad weather or a pick up in exports. Here's a short list of five items to think about.

• Re-establishing a farmer-owned storage program for major commodities under carefully established rules for release could help to insulate some production from the market. It would make the most sense if the low price problem were to last for only a year or two. While it is important, long-term, not to distort resource allocation unduly, the low crop prices today (which could go lower) suggest that short-term programs to encourage farmer-held reserves may be justified. As noted, in the face of favorable weather and declining exports, producers (and others in rural communities) are vulnerable. A supply-demand balance could well be achieved only at very low price levels. That condition could continue for some time.

I am not unmindful of the budgetary costs of an expanded loan and commodity storage program; however, the social costs of doing nothing could be very significant.

• Variable-term land idling (from as short as three years up to 20 years) designed to be particularly attractive in marginal production areas in the so-called periphery or "swing zones" is one possible shift in policy. The "swing zones" are the regions that are expected to be squeezed out of intensive crop production in times of low prices but get back into the ball game when prices recover. Long-term land idling could help ease the economic and social costs of adjustment in those areas. It would mean less sales of fertilizer, chemicals, seed and machinery and so it would impact the communities. But those communities are hurting now and will suffer from the periodic market adjustments that will characterize their economic life from now on. The contracts could be set to terminate if prices rise above a specified level.

Another alternative would be to allow farmers to bid land out of production on an annual basis with the reward of a higher loan rate on the rest of the farmer's production.26

• If prices of major crops were to remain for a specified period below a designated level (with both aspects determined within a legislative framework) standby authority should be given to the Secretary of Agriculture to implement an acreage set aside program. This is viewed as a last resort measure to cope with pressures on the supply side. One thing we learned decades ago—it is less costly to prevent production than to compensate farmers for lost income once price and profitability have been driven down disproportionately.

What about the argument that idling land spurs production in other countries? First, low prices are affecting producers everywhere. Modest efforts to ease downside pressures are unlikely to have an impact in other countries. Second, it seems imprudent to bankrupt a third of our farmers in an effort to demonstrate that U.S. farmers are not the low cost producers. Finally, the time has come to begin moving toward a global food and agriculture policy with the U.S. using the leverage of financial assistance through various aid programs including the World Bank to secure commitments that major exporting countries will take comparable steps whenever reduction in supply is necessary.

26 I am indebted to Craig Blindert, Salem, South Dakota, and Phil Cyre, Hazel, South Dakota, for these observations.
It is pointed out that virtually every corporation in the world adjusts inventories by occasionally laying off employees and idling production capacity. From 1938 through 1995, the agricultural sector did the same with the Secretary of Agriculture playing a surrogate role to reduce output by idling productive capacity. That possibility was swept away in 1996; U.S. agriculture was disarmed and lost a tool now being used by Deere, Firestone, New Holland and dozens of other U.S. companies.

- To deal with a possible credit crunch in the Spring of 2000, adequate funding for FSA direct lending and loan guarantees for limited resource borrowers is needed.

- Finally, it seems prudent to continue LDP and marketing loans, possibly with a slightly higher loan rate but not higher than the cost of production on marginal lands. We certainly should not induce more production; that would be perverse.

It is important to note that any programs to ease the downside adjustment pressures (LDPs, marketing loans, AMTA payments, additional Congressional appropriations—as in 1998—or any other effort) frustrates the market and prevents the market from doing its thing—squeezing out land and causing the land to shift to a less intensive use.

With bad weather in South America, China, South Africa and Europe, we could see $3 corn and $8 soybeans in a year. On the other hand, we could be scraping by with $1.60 corn and $4.30 soybeans. We simply do not know which scenario will prevail. There is no light at the end of the tunnel.

The prudent approach would be to begin some contingency planning—just in case. After all, any fine tuning will require several months of deliberations in Congress. We can't very well wait until we're in the tank with no assistance forthcoming to begin thinking about options.

Proceeding under the assumption that Congress will provide a cash infusion is fraught with hazards. Sooner or later, the U.S. economy will slump and funds will not be as available as in 1998 and 1999. Moreover, large cash infusions are viewed by some as welfare and are likely to become targets for criticism.

### III. The GMO Controversy

The announcement in mid-April that Archer-Daniels-Midland and A.E. Staley & Co. would not buy genetically modified corn that wasn't cleared for export to the European Union (EU) triggered all manner of concerns in the grain trade and by producers. The announcement led immediately to concerns about seed purchase decisions already made and to grain sales at or after harvest.

Basically, it's a contract issue. Contracts are the instruments of choice for dealing with uncertainty. It's a matter of contract language involved in seed purchase. And it's a matter of
contract terms on sale. Ultimately, the outcome depends, however, on economic forces. Demand and supply conditions will ultimately dictate how the matter is resolved.

Scope of the Problem

In the Spring of 1999, the problem involved seven transgenic corn hybrids which hadn't been cleared by the EU for import. However, the problem has widened in recent months.

Announcements over the past few weeks have confirmed an old adage in open, market-oriented economies. *The Consumer is King.* Whatever the consumer wants the consumer will get. The big concern—no one knows for sure what the King wants. This is a ranking research need that needs to be addressed—yesterday.

Here are several of the more significant developments—

- In July, Gerber and Heinz announced they were planning to drop genetically-engineered ingredients. Particularly instructive is the fact that Gerber is owned by Novartis, a major transgenic player.

- ADM stunned the trade on August 31 with a statement that it was bowing to a perceived change in consumer demand with a statement encouraging their suppliers "to segregate non-genetically enhanced crops to preserve their identity."

- On September 1, Fuji Oil Company, the largest maker of soybean protein food products in Japan, joined some corn processors in that country in switching to non-genetically altered ingredients. The company indicated it was starting the switch to non-GMO soybeans in the October-March period. Fuji uses 80,000-100,000 metric tons of soybeans annually, mostly imported from the United States.

- In late August, Consolidated Grain in Cincinnati, Ohio, announced there will be premiums on "non-GMO crops and certification statements will be requested of producers that they have kept the crops separate from GMO varieties."

- In early August, Japan, Australia and New Zealand announced that foods produced with genetically modified grain or oil seeds would face mandatory labeling. For Japan, the labeling move will be phased in with the requirements formalized in April of 2000 with a one-year implementation period ending in 2001.

- Early indications point to a shift in strategies for the Seattle trade talks later this year with an emphasis on meeting consumer demands in addition to emphasis on demolishing trade barriers.

What does all of this add up to? The most probable scenario is labeling on a world-wide basis within a few years, including the U.S. Food processors are notably cautious when it comes to perceptions about food safety. Memories of serious missteps by manufacturers are fresh in the minds of many in management suites.
**Impact on Producers**

What does this mean for producers? Here's our take on the situation—

- First purchasers of products are likely to be buying GMOs at a discount relative to non-GMOs. How much of a discount isn't yet clear.

- Separate handling and storage of GMO varieties will be necessary except where arrangements are made for selling to a buyer who isn't discriminating between GMOs and non-GMOs. It may be increasingly difficult to locate such non-discriminating purchasers for no reason other than the price discounting for GMO varieties.

- If producers are asked by the first purchaser to promise that the crop is non-GMO, they should be very careful what they sign or even what oral comments are made.

Here's what they can realistically do—

1. State that no seed represented by the seed company as GMO seed was planted.
2. State that seed represented by the seed company as non-GMO seed was planted.
3. State that care was taken in avoiding contamination in bins, augers, dryers and in the combine.

Here's what producers should be careful not to do—

1. State that the crop in question has no GMO germ plasm.
2. State that no contamination has occurred from mechanical handling and storage of the crop.
3. State that no contamination has occurred from pollen drift.

There's another worry—the Uniform Commercial Code imposes implied warranties or promises in some situations. An implied warranty of fitness is imposed on the producer as seller if the seller has reason to know any particular purpose for which the goods are required if the buyer is relying on the seller's skill and judgment in providing the goods. This could very well be invoked against a producer if the conditions are met. You can disclaim or nullify an implied warranty of fitness but it takes a conspicuous, written provision in a contract.

An implied warranty of merchantability is imposed on merchants. Nearly half of the states treat farmers as merchants. One feature of this warranty is that the goods must be fit for the ordinary purposes for which they are to be used. Implied warranties of merchantability can be disclaimed or nullified by the producer as seller if done orally or in writing in language that mentions merchantability.
So What Does This All Mean?

Check immediately with likely purchasers. What are they requiring? Some may not yet know. Once the answer to that question is known, check carefully the language in any statement you're asked to sign. Use caution in responding orally.

Remember, even non-GMO crop likely isn't completely free of GMO germ plasm. But the GMO level may be at an acceptably low level. A key problem—no one has set tolerances. Without tolerances, no one knows for sure where the line will be drawn.

But it will be difficult to pin liability on anyone unless there is testing at every point of commingling of the crop. And that's not in the cards for the 1999 harvest. Indeed, it will be some time before reliable testing is in place.

Sooner or later, the buck will stop with producers. But that's unlikely to be the case in 1999.

For next year's crop, producers should be sure they have firm commitments from financially responsible purchasers before lining up GMO seed.

Winners and Losers

Without a doubt, the big seed companies gambled and rank among the losers.

Technology nearly always benefits consumers. But in this case, many consumers are giving transgenics the cold shoulder. The benefits from this generation of GMOs aren't obvious. And if there's the slightest doubt—in terms of food safety or the environmental impact—consumers tend to say thanks but no thanks.

What about producers? This brand of technology is mostly output increasing or cost decreasing or both. That means early adopters would benefit from a successful introduction but all producers lose in the long run as the technology boosts output with price and profitability dropping disproportionately, in the face of inelastic demand for many products. With bungled introduction, the early adopters lose—but producers generally will be better off in the long-term. That's the case even if the effect is cost-decreasing. Cost decreasing technologies have a built-in profit incentive to boost output at the margin. And that ultimately means lower prices and profits.

Finally, what's the likely impact on structure of the agricultural sector? Disappointing acceptance rates by consumers will slow the trend toward vertical integration of the crop sector—and could derail much of the momentum.
IV. Conclusion

In conclusion, it seems appropriate to ask, "what does the human family expect of its agricultural sector?" I believe the human family expects that movement toward four distinct outcomes will characterize the coming decades—

- An efficient use of resources in food and fiber production, processing and distribution. Efficiency contributes to economic growth which means higher per capita incomes in real terms.

- Production of needed foodstuffs as cheaply as possible, noting that we should be mindful of the externalities of environmental deterioration.

- A safe food supply (by reasonable standards)

- And, while there may be some dissent, an assured access to food sufficient for survival.

Within less than a decade, the world should experience the greatest period of economic growth in the history of the planet. All four of the major production and trading blocs should be enjoying robust growth and rising per capita incomes. That should assure increasing demand worldwide for foodstuffs and a period of greater prosperity for agriculture. However, as noted earlier, those gains will, in the long-run, be reflected in increased land values rather than in better returns to labor and capital other than land.

The dimensions of the transition for world agriculture beyond the 1990s assure a more rational allocation of the world's resources. However, the transition will be economically painful for some and will certainly lead to challenges as producers, processors and consumers adjust to a world of greater price volatility. In the U.S., whether consumers will be tolerant of price increases in times of reduced supplies remains to be seen. Certainly producers will be able to count on less in the way of a safety net during periods of low prices. It is not yet clear whether that is acceptable, politically. Indeed, some significant changes in the 1996 farm bill are almost a certainty.

U.S. agriculture has been a genuine success story. As the winds of deregulation pick up momentum, it is important for the Congress and Parliaments around the world to monitor the consequences for signs that the sector is being propelled in directions that are unacceptable. Certainly consumers will raise their voices if food supplies are inadequate or food costs are perceived as being too high.