

Agriculture in the Twenty-First Century*

³/₄ by Neil E. Harl**

Agriculture in the United States faces four major problems in the new century—(1) formulation and reformulation of price and income policy; (2) the structural transformation of the agricultural sector; (3) consumer acceptance of genetically modified foods; and (4) bioterrorism. In light of time constraints at this workshop, we will examine the first three of the problems.

I. Price and Income Policy

As with most sectors of the world economy, agriculture in recent years 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.

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).

It has been clear for a decade and a half that the debate on U.S. farm policy has been dominated by agribusiness firms. The outcome has consistently been in accord with the objective of most agribusiness firms of encouraging maximum production of crops. Some have even been moved to observe that U.S. farm policy has been “high-jacked” by those who take a very narrow view of what is expected from the agricultural sector and what should constitute the parameters of farm policy.¹

The expenditure of federal funds, which has reached record levels in recent years in support of federal farm programs, should be subject to the same kind of benefit-cost calculus applied for other federal expenditures and that the outcome of such analysis should help to shape federal farm policy. The fiscal pressures of the country underscore the importance of a rational approach to resource allocation in stabilizing the agricultural sector.

Flaws in the 1996 farm bill

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¹ See Harl, “Review for the Journal of Agricultural History of *Policy Reform in American Agriculture*,” Vol. 75, No. 3, Summer, 2001.

The 1996 farm bill, enacted during a brief period of economic euphoria in 1996, stripped the Secretary of Agriculture of all authority to manage inventories and set the stage for all-out production of the major program crops. From 1938 to 1996, the Secretary had been given authority to act, in effect, as the surrogate CEO of agriculture and to do what every other CEO does when inventories come to be viewed as excessive—idle workers and idle productive capacity. Those authorities were swept away despite overwhelming evidence that agriculture's capacity to produce has consistently exceeded the capacity of markets to absorb the production without unacceptably low prices.

The 1996 farm bill represented a significant departure from federal farm legislation since 1933. While the transition away from government programs was expected to 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 has been whether the Congress would 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 was passed 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, exceeded \$22 billion in 1999, rose to \$28 billion in 2000 and totaled roughly the same in 2001. In 2002, the Congress passed and the President signed a very costly farm bill for the period ending in 2007. A major question facing Congress is what U.S. farm policy will be beyond 2007 and, of equal importance whether funding will be available through 2007.

While some sectors of U.S. agriculture enjoyed favorable prices in 1995-96, low prices returned in 1997. 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 that limited supply. This is important to consumers as well as producers.

- Elimination of the federal farm programs was expected to mean less economic buoyancy from government. However, instead expenditures have risen to record levels.
- 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 in theory were 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, it was anticipated that close to that many acres would transition to a lower-valued use unless exports were maintained at high and rising 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.

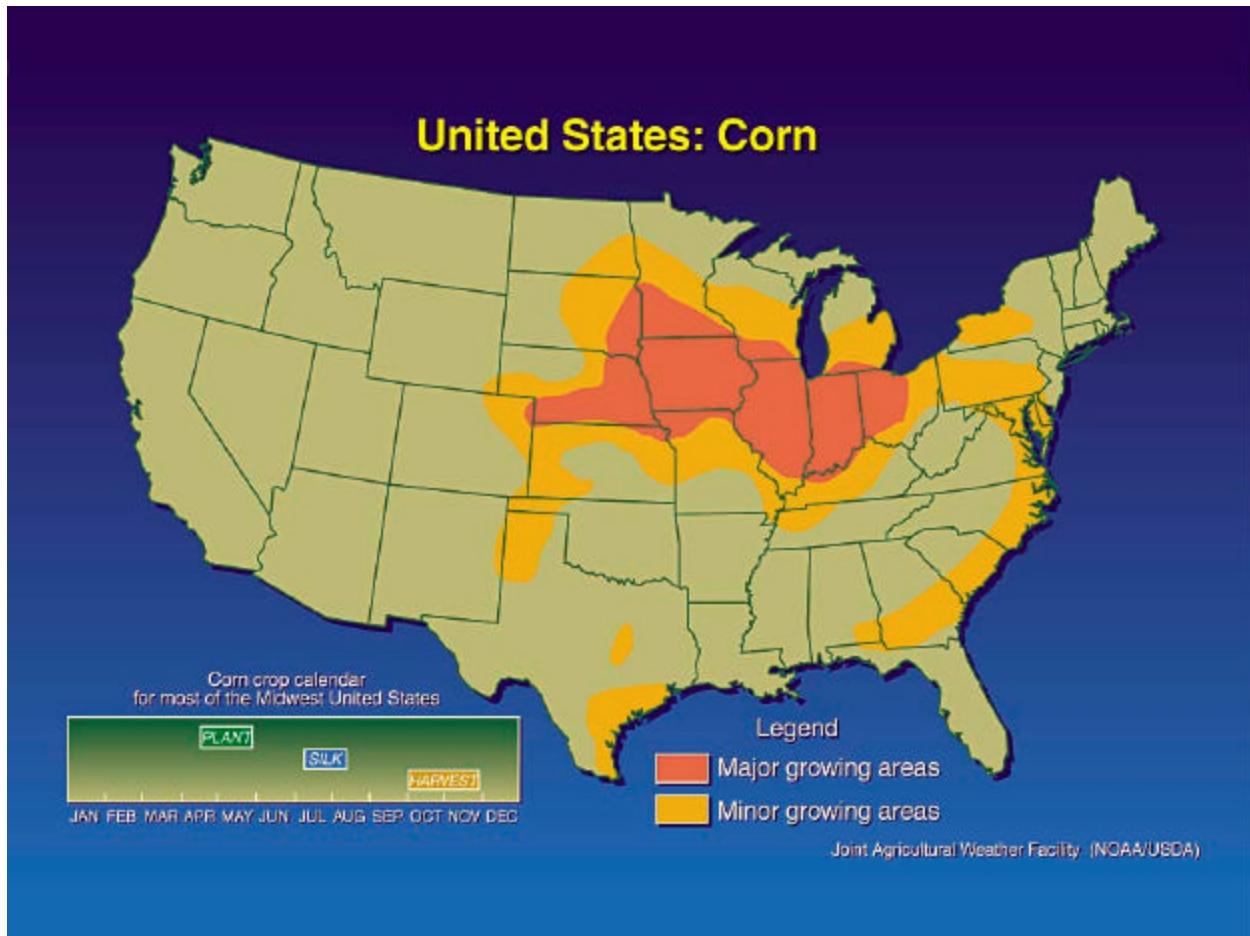
This movement of land to a less intensive use spells economic pain for producers everywhere. Adjustment pain is felt not just by those at the periphery of the core producing areas, but by producers everywhere. Beyond that, those geared up to sell inputs to or purchase outputs from a crop-based agriculture also would have to adjust.

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

Figure 2 illustrates the fact that, for each major crop, under such policies there would be a "core" area of production and a "swing zone" at the periphery.

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

Figure 2.



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.

The implicit mechanism in the 1996 farm bill to adjust production in the face of low prices was economic pain. It should be abundantly clear, by now, that Congress does not like models of adjustment based on economic pain. That is precisely what the 1996 farm bill was designed to do—adjust output by inflicting economic pain on producers. The wheels fell off that

wagon at the first turn, with low prices in 1998. Even though Congress voted, by a narrow margin, to enact the 1996 farm bill, by an even larger margin the Congress has cheerfully provided massive cash infusions since, in 1998, 1999, 2000, 2001 and 2002 and the Congress has delivered a generous amount of cash in the form of direct payments in 2003 (prices in 2003 have been sufficiently high to eliminate or minimize the other community farm program payments). Perhaps to save face, Congress has been willing to do that rather than to face up to the inherent shortcomings in the 1996 legislation. The authors of a recently published policy text acknowledge the flawed nature of the FAIR Act in explaining that, “the 1996 law was an internally inconsistent policy mix, based more on compromise and convenience than on conviction. It led to larger outlays rather than smaller government outlays for agriculture and was market oriented for some crops but not others.”² That passage would suggest that the authors may be in agreement with this commentator who has stated publicly on more than one occasion that the 1996 farm bill was the second most irresponsible Congressional act in the twentieth century. The authors of that text rail at distortions from 1933 to 1996 but say little about the distortions of huge amounts of cash into the farm sector, much of which has been capitalized into, or propped up, cash rents and land values and dropped the cost of feed and other commodities to purchasers, in some instances to levels well below the cost of production.

Benefits delivered to consumers

The dynamic of our food production system has assured that, as technology and other factors increased the supply of food, the nature of the demand-supply relationships delivers the benefits to consumers. The percentage of net income devoted to food purchases in this country has fallen steadily over the last several decades and stands at less than 10 percent today. The primary reason for that is the inelastic demand for most food commodities as shown in Figures 3-7. As supply increases, principally from technology, the producer is rewarded with a disproportionate drop in price and in profitability. Thus, producers (other than early adopters) are squeezed and consumers benefit in the form of lower and lower food prices.

Choices in farm policy

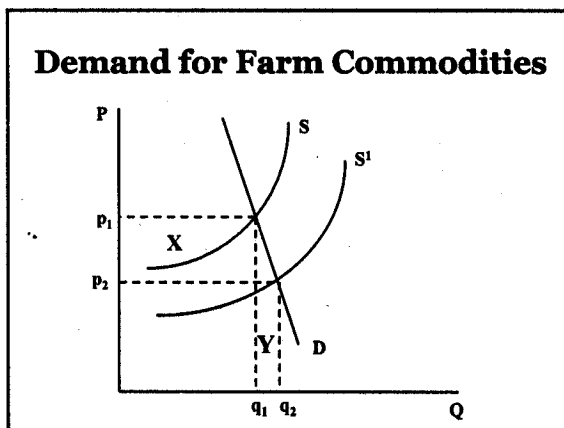
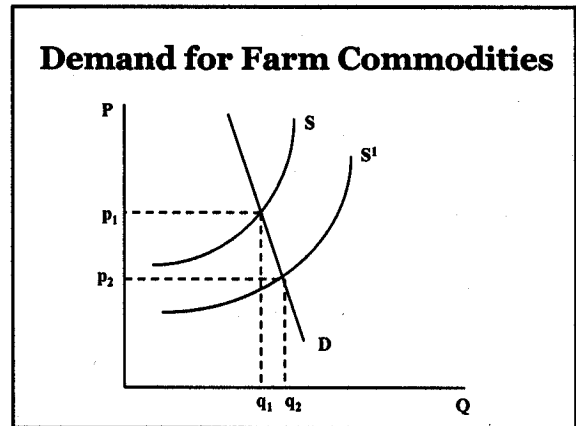
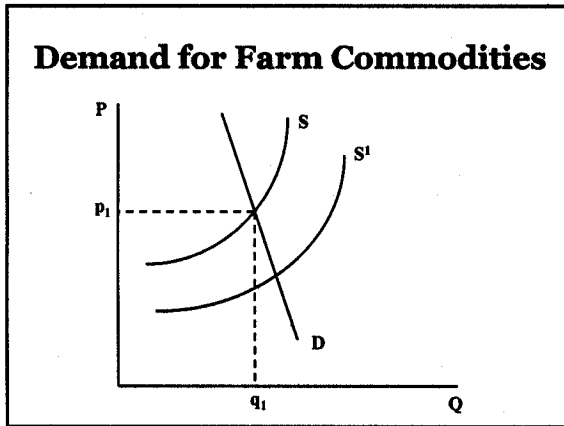
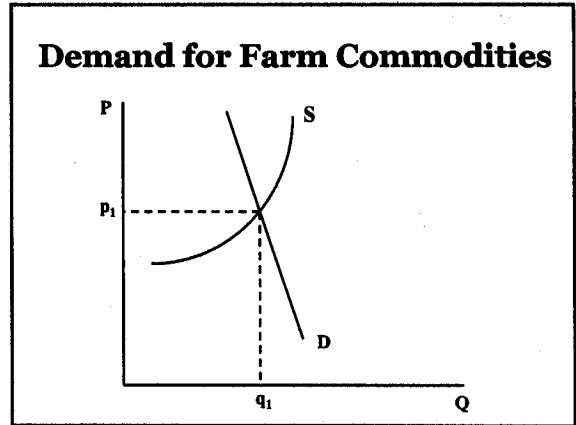
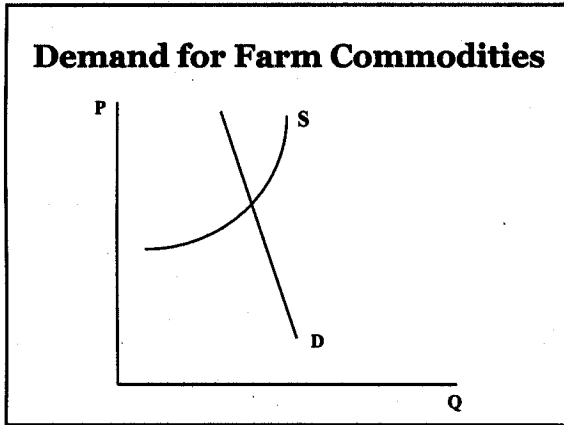
Three choices. Congress faces three choices on how to proceed in the face of low commodity prices, high levels of budget outlays at the federal level and continuing economic problems on the part of producers.

- One possibility is to continue the heavy subsidization that has become the hallmark of the 1996 farm bill for the “program” crops. While the \$28 billion plus for the 1999-2000 federal fiscal year was a modest fraction of the country’s food bill, as was \$32 billion in 2000-2001, those figures are large enough to be visible budgetary targets.

If the country is in an economic downturn, as has been the case in recent quarters, that level of expenditure looms even larger. With the budget in deficit territory, less money is sloshing around Washington and additional appropriations for agriculture may be more difficult to obtain. This suggests that agriculture’s rations are likely to be less.

² Orden, Paarlberg and Roe, Policy Reform in American Agriculture 216 (1999).

Figures 3-7.



It appears virtually certain that the level of subsidy of the agricultural sector received in recent years will be unattainable on a long-term basis.

Another hazard is a change in priorities in the budgetary process with a majority in Congress concluding that other programs merit more funding and agriculture less in support. Again, the terrorist attacks have consumed the attention of the Congress which has dropped agriculture's priority position to a lower level.

- A second possibility would be to reduce—or eliminate—federal subsidies for agriculture. That would likely result in a reduction in land values. Much of the subsidies is being bid into cash rents and capitalized into land values. One cannot justify present land values on the basis of existing commodity prices. If investors were to develop an expectation of less federal funding—or none at all—land values would likely decline, perhaps by as much as 25 percent. The drop would be severe if withdrawal of subsidies is abrupt. After all, land values are based heavily on expected profitability of the dominant crops in the area plus expected government payments.

Some have argued for a withdrawal of all subsidies with land values falling to a new lower level. Equilibrium would eventually be re-established for returns to labor and capital near present levels. But returns to land would almost certainly be re-established at lower levels on a more or less permanent basis. While that might be appealing to some, the ride down would be rough—possibly a greater decline in some areas than experienced from 1981 to 1986.

Yet, the awesome part of this is the growing vulnerability of the sector to just such an adjustment.

Even with the sharp declines in land values, pressure on prices would continue as supply fluctuates but with technology likely pushing the supply curve to the right faster than demand is likely to increase.

Those who point to high land values as a factor in international competitiveness are wide of the mark, however. It's been clear since repeal of the corn laws in Britain more than a century and a half ago that land values are price determined, not price determining. Land values are not properly viewed as a cost of production but as the result of expected profitability. Producers in every country are expected to bid profitability into cash rents and capitalize the amounts into land values. Land values in the United States are influenced by—(1) expected crop profitability, (2) the anticipated level of government payments and (3) other factors including development pressure. Thus, higher land values in the United States than in Brazil should not be viewed as a problem. What will drive down land values is a decline in expected profitability.

Warnken³ has discussed the factors affecting soybean development in Brazil and does not mention U.S. farm policy. He does list, as important factors, the 1973 U.S. soybean embargo, the fact that acclimated soybean varieties were made available by the U.S., the training of soybean breeders and other scientists in the U.S., the massive government allocation of capital

³ Warnken, *The Development and Growth of the Soybean Industry in Brazil* (1999).

and credit to the soybean sector (estimated at \$4 billion from 1970-1990), input subsidies, tax breaks, including the lifting of taxes on exports and guaranteed minimum price policies.

Thus it is believed that modest steps to address the downside of commodity prices are not likely to have much effect on production in South America. Indeed, the amount of land brought into production in Brazil from 1996-2000 (a period of lower world price for soybeans) was greater than from 1992-1996 (when soybean prices were higher).

- The third possibility is to return to the Secretary of Agriculture some of the authorities swept away in the brief period of economic euphoria in 1995-1996. That would enable the Secretary to act as the surrogate CEO of agriculture and to manage inventories as other CEOs do. Many companies occasionally experience excess inventories—Deere, Intel, Boeing, General Motors, indeed virtually every firm in the world. The time honored solution is to idle people and idle productive capacity.

If that is the direction the country takes in its farm policy, the programs should be designed to encourage resource idling at the periphery and to do so in a market-oriented manner. Programs should take into account the clear trend for technology to boost supply faster than demand is likely to increase.

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 production when prices recover. Long-term land idling could help ease the economic and social costs of adjustment in those areas. It would mean reduced 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.⁴ That option would be market-oriented and, under one proposal, would give farmers an option of idling up to 30 percent of their corn, soybean, wheat, cotton or rice acreage. For corn, soybeans and wheat, each one-percent set aside would be rewarded with a one percent loan rate increase. An analysis by the Food and Agricultural Policy Research Institute indicates that the program would boost farm income by \$5.4 billion per year at a budget cost of \$2.5 billion.

While there appears to be strong and growing support for additional conservation funding, it is important to maintain a reasonable balance between commodity programs and conservation programs. Tilting too far in favor of conservation would likely result in an increase in value of highly erodible land and a drop in value for the least erodible (or otherwise environmentally vulnerable) land as federal subsidies are likely to be promptly capitalized into land values (or reductions in payments result in decapitalization).

⁴ The author is indebted to Craig Blindert, Salem, South Dakota, and Phil Cyre, Hazel, South Dakota, for development of the "flexible fallow" program.

The fiscal realities of the country suggest strongly that stabilization of the agricultural sector will have to be accomplished with less federal subsidization. That will have to be accomplished with resource idling to reduce supply. Once that is in place, the available funds must be administered with a firm cap on payments if public support for the program is to be assured.

The 2002 farm bill

The 2002 farm bill, the “Farm Security and Rural Investment Act of 2002,” was signed into law on May 13, 2002. The legislation largely continues the pattern of all-out production and maximum planting flexibility from the 1996 FAIR Act. As shown in Table 1, the legislation sets the loan rates for corn at \$1.98 (\$1.95 for 2004-2007), soybeans at \$5.00 (the same after 2003) and wheat at \$2.80 (\$2.75 after 2003). In addition to the loan rate (which is used to determine loan deficiency payments or marketing assistance loans), the legislation provides for a direct payment for each of the program crops annually and a counter-cyclical payment which is the difference between the loan rate plus the direct payment and the target price.⁵

Table 1. Commodities

Loan Rates, Direct Payments and Target Prices for Covered Commodities					
	Loan Rate		Direct Payment	Target Price	
	2002-2003	2004-2007	2002-2007	2002-2003	2004-2007
Corn (bu)	\$1.98	\$1.95	\$0.28	\$2.60	\$2.63
Sorghum (bu)	\$1.98	\$1.95	\$0.35	\$2.54	\$2.57
Barley (bu)	\$1.88	\$1.85	\$0.24	\$2.21	\$2.24
Oats (bu)	\$1.35	\$1.33	\$0.024	\$1.40	\$1.44
Wheat (bu)	\$2.80	\$2.75	\$0.52	\$3.86	\$3.92
Soybeans (bu)	\$5.00	\$5.00	\$0.44	\$5.80	\$5.80

The 2002 legislation provides for an updating of the crop base for each farm and for an updating of yields. Both direct and counter-cyclical payments are based on 85 percent of the base acreage for the farm.

For the dairy program, the Milk Price Support Program is authorized from June 1, 2002 through December 31, 2007, at a rate of \$9.90/cwt on a 3.67 percent milk fat basis. In addition, the legislation establishes a national payment program using a payment formula under which participating producers will receive monthly payments equal to 45 percent of the difference between \$16.94 and the price per hundredweight of Class I fluid milk in Boston under the applicable federal milk marketing order. Producers on a “single dairy operation” may receive payments on no more than 2.4 million pounds of milk marketed per year.

⁵ For a summary of the Farm Security and Rural Investment Act of 2002, see www.econ.iastate.edu/faculty/harl and click on “Papers of Interest.”

Under the 2002 Act, the total direct and counter-cyclical payments to a “person” for corn, grain sorghum, barley, oats, wheat, soybeans, minor oilseeds, peanuts, cotton and rice per crop per year may not exceed \$40,000 and \$65,000, respectively. The legislation does not impose a limit on the use of commodity certificates (which effectively avoids the payment limitations) or forfeitures of commodities under loan to the federal government.

The 2002 Act also contains a limitation based on “adjusted gross income” which specifies that an individual or entity is not eligible for any program benefit during a crop year if the average adjusted gross income of the individual or entity exceeds \$2,500,000 unless not less than 75 percent of the adjusted gross income of the individual or entity is derived from farming, ranching or forestry operations. The benefits affected by the AGI limitation are direct payments, counter-cyclical payments, marketing loan gains and conservation.

The 2002 legislation does not contain a ban on packer ownership and control of livestock but does contain a ban on confidentiality provisions on livestock contracts.

A more rational approach

The apparent trend in thinking in recent years has been to evaluate farm policy solely on the basis of the cost of food at the farm gate and by the amount of resources utilized in the production of food and fiber. Regardless of which school of welfare economics one belongs, it would seem appropriate for policy reform in agriculture to embrace a greater range of policy objectives at least to the extent the expenditure of public monies is concerned.

For well over a half century, the expenditure of public funds for improvements in waterways, cancer research, environmental cleanup and numerous other federally-funded project areas has been subjected to the discipline of a benefit-cost calculus. In general, the benefits and costs considered have been all of those reasonably stemming from the project. That has not been the case with farm policy. As a consequence, the anticipated impacts on producers, rural communities, the environment, and taxpayers have not been taken into account. Moreover, relatively little effort has been made to provide useful policy-making information as to the impact on consumers in an increasingly concentrated world of input supply and output processing and handling firms.

It is disheartening to see the singular focus on the issue of how to squeeze the costs for commodities to first purchasers to the lowest possible level with no attention whatsoever to the other consequences which are both real and visible. Moreover, when federal funds are involved, as they most certainly are, it seems not only appropriate but essential that funds be expended in such a manner as to produce the greatest possible benefit to the human family. Seventy years ago, flood control projects were selected heavily on political bases. Legislation in 1936 and later has elevated the decision making process to a higher level such that political considerations, although still present, do not dominate the process as was once the case.

The same brand of discipline should be imposed on farm policy. Indeed, there is little reason not to do so. The great surprise is that farm policy has continued to be a highly political process, dominated in recent years by agribusiness firms with huge amounts of cash to influence

the policy process. As Schertz and Doering stated, in their recent book, *The Making of the 1996 Farm Act*,” a consortium of agribusiness firms amassed a huge war chest to influence the analysis, shape the message and convince members of Congress to support their farm policy agenda.

As the authors stated—

“The idea that farm programs had gone too far in withholding cropland from production was given a substantial boost with the preparation and astute promotion of a study sponsored by the National Grain and Feed Association through their foundation. The study, released in May 1994, concluded that ‘American farmers and the U.S. economy stand to reap substantial benefits from expanding crop area and production.’⁶ Over 185 companies, most of whose profits are geared substantially to volume of commodities handled or processed, were involved in supporting the study prepared by Abel, Daft, & Earley, a consulting firm in the Washington, D.C., area. ...

The key conclusion of the study was that 38 million of the then 65 million acres of cropland held out of production at that time under the Acreage Reduction Program (ARP), the Conservation Reserve Program (CRP), and other, but smaller, programs could, under expected demands and yields, be brought back into production between 1994 and 2002 and commodity prices *would not be less than they were at the time of the study*. Politically, that is a powerful conclusion for there is a strong preference among politicians not to be accused of taking action which leads to lower producer prices. Central to this proposition was the conclusion that demands for U.S. farm commodities would increase enough so that farm commodity prices in the prospective future would not drop below then current levels, even if U.S. farm production increased as hypothesized. The implication for farm income was obvious—more production at the same or higher prices meant more income.”

If a proposed flood control project were to decimate a community, that would be viewed as a project cost. However, if a rural community is diminished economically by the farm bill, or farmers are harmed by the legislation, those costs are ignored and left to be dealt with, if at all, by other programs. The result is a dissociation of benefits and costs which distort economic reality. The country deserves better in the area of farm policy just as it deserved better before the landmark 1936 legislation on flood control.

A global food and agriculture policy

Farm policy debate in the United States in the 1920s was largely about whether it was appropriate to have a national food and agriculture policy.⁷ To a considerable extent, the decision was in the negative until 1933.

In many respects, farm policy today poses a similar question: should efforts be directed toward a global food and agricultural policy? In the opinion of this commentator, the answer is yes.

The globalization of food supply and demand and the position of the United States suggest that food and agriculture policy analysis should shift to a new level to encompass global

⁶ Abel, Daft, and Earley, *Large-Scale Land Idling Has Retarded Growth of U.S. Agriculture*, prepared for the National Grain and Feed Foundation (Alexandria, VA: Abel, Daft, & Earley, May 1994).

⁷ See Taylor, Henry Charles, *A Farm Economist in Washington, 1919-1925* (1992).

food and agriculture issues. Such a policy would likely take years to accomplish and would require skillful diplomatic efforts, but the logic behind such an approach to policy is clear.

A global food and agriculture policy should have several components—

- First, and probably foremost, is support for Third World economic development. With relatively high income elasticities of demand for food (70 percent or more of each additional dollar of income is likely to go for food purchases in some of the countries), it is clear that the last frontier for increasing food demand is the Third World. Moreover, adequate nutrition, worldwide, has the support of a wide array of groups and individuals.

If the poorest countries could be nudged into the development queue, with investment in education, health care and infra structure, plus progress in implementing more open and democratic governance systems, the long-pursued goal of elimination of world hunger could be within reach. Gifting food to low income countries, while laudable from a humanitarian point of view, destroys their internal agricultural economy.

- The issue of food safety, including animal diseases as well as genetic modification of foods, should be addressed in a global food policy.

- Food security should be a component of a global policy.

- Fair and equitable sharing of germ plasm should be assured. This could help allay fears of some countries that their germ plasm is being appropriated without compensation by First World countries.

- Trade in agricultural products and commodities is an obvious candidate for inclusion in a global food and agriculture policy as a supplement to negotiated trade agreements.

- Agreed-upon policies committing major food producing countries to managing excess inventories could be a part of a global food and agriculture policy. Countries would be urged to take action in unison whenever disastrously low food prices occur worldwide with comparable steps taken to reduce food production. The flow of development funds from the United States into the World Bank and IMF and in the form of direct assistance could be used to leverage such responses from other countries.

Export trends

The 1996 farm bill was enacted in a time of optimism in U.S. agriculture. Agricultural exports peaked in 1995 and 1996 above \$60 billion. Exports have declined since with agricultural exports totaling about \$49 billion in 1998-99, rising slightly in 2000-2001 and expected to reach \$57 billion this year.

As can be seen in Figure 8, 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.

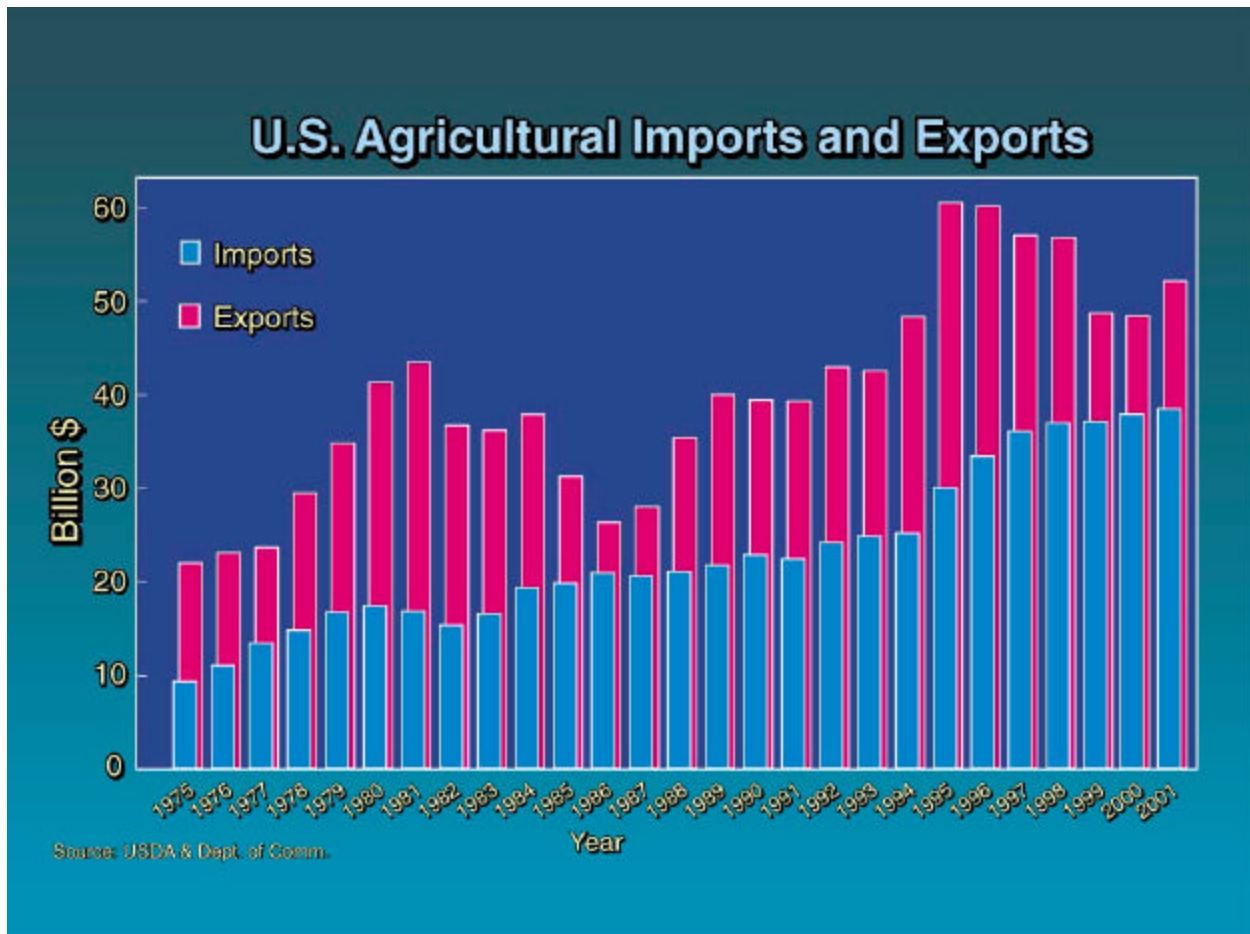
After all, as noted above, land values are price determined, not price determining. Land has value as expected profitability is capitalized into the value of land. Some areas of the world can realistically expect significant declines in land values as trade barriers are demolished.

In conclusion

Most farmers and landowners would prefer to make their own production decisions and to produce flat out. That is the first best solution for many.

But the first best solution has produced such budgetary consequences that it is no longer attainable. If that is the case, what is the second best solution? Let land values fall? Or to try managing inventories for a change?

Figure 8.



II. The Structural Transformation of Agriculture

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

Structure of the agricultural sector

With the dramatic increases in concentration in recent years of input supply and output processing firms and with striking increases in the level of vertical integration (the proportion of slaughter hogs sold under some type of marketing or production contract approaching 70 percent for example), it is important to assess the implications for producers. Such a structural transformation of a subsector is not unknown—the broiler industry went that direction several decades ago—but it is a first for the Middle West.

The critical question: is it important to farmers—and to society—whether agriculture is populated by independent entrepreneurs or serfs? The structural change now occurring will determine which direction agriculture takes. A producer without meaningful competitive options is a relatively powerless pawn in the production process.

The evidence is overwhelming that the agricultural sector is undergoing the greatest structural transformation in the history of the sector. *Without much doubt, low commodity prices have contributed to the structural transformation of the sector.* A low risk, low return choice looks attractive if the alternative is bankruptcy.

Competition is the most critical element of a price oriented, market economy. Without competition, firms become complacent, are less likely to innovate, tend to become arrogant and indifferent and are inclined to produce less and obtain a higher price for their output.

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
- A system of market protection (or antitrust) to penalize collusion and to prevent undue concentration of economic power.

The era of contract agriculture. The signs of increasing use of contracts are commonplace—especially on the production side of agriculture.⁸ Specialty grains, feeder livestock, milk production, 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?

⁸ See, e.g., Harl and Lawrence, "Long-term Marketing Contracts with Packers...A Journey Through the Downside," *Iowa Pork Producer*, Sept., 1998, pp. 5-7.

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.⁹

Concentration in input supply and output processing companies. Mergers, alliances, and various other types of arrangements are reducing the number of players in input supply and output processing and handling and increasing the level of concentration. 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 five years in the seed business, some at price levels difficult to justify under present economic conditions, suggest 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 those who control the germ plasm involved in food production.

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, 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, the Monsanto acquisition of Delta and Pine Land Company (since terminated) and the formation of Syngenta by Novartis and AstraZeneca are recent examples of how the ownership and control of genetic material in crops are 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.

- 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.¹⁰ In addition to the federal Plant Variety Protection Act (PVPA),¹¹ the Plant

⁹ See generally Harl, “Contract Agriculture: Will It Tip the Balance?” 10 *Leopold Letter* No. 4 (1998); Harl, “Agriculture in the Twenty-First Century,” <http://www.econ.iastate.edu/faculty/harl/> (papers of interest).

Patent Act of 1930¹² and simply shrouding research efforts with secrecy, the ability to patent life forms provides a powerful tool to keep competitors at bay. On December 10, 2001, the U.S. Supreme Court examined the scope of plant patenting¹³ and held, in a 6-2 decision, that the intellectual property in seeds for new plants developed through genetic engineering or other breeding techniques could be protected under federal patent law. The court held that the Plant Patent Act of 1930¹⁴ and the Plant Variety Protection Act of 1970¹⁵ were not the exclusive means to protect intellectual property rights in seeds. The court ruled that seeds could be patented under general utility patent law which does not have a “saved seed” exemption and no research exemption.

While a major concern is over concentration in seeds and chemicals, there is also concern over concentration in livestock slaughter, grain handling and shipping, farm equipment manufacture and food retailing. Indeed, rapidly rising concentration in food retailing may be the most worrisome development in recent years.

Recent research by Hendrickson and Heffernan¹⁶ indicates that the top four firms have 60 percent of terminal grain handling, 80 percent of soybean crushing and 61 percent of flour milling. The top three firms control 81 percent of corn exports and 65 percent of soybean exports. Cargill and ADM are in the group for all five categories of concentration.

One of the drivers in the trend toward greater concentration in almost all sectors of the U.S. economy is increasing concentration in markets *into which products are being sold*. Thus, the rising tide of concentration in food retailing leads to consolidation by suppliers to match the buying power of the retailers. The driving force is an increase in negotiating power, not necessarily an increase in efficiency.

Example: In late July, 2000, the merger announcement by Pillsbury and General Mills noted that a major reason for the merger was to position the resulting firm to better do battle with the major players in food retailing. The importance of getting shelf space at the retail level is another critical factor in food production and distribution. Concentration in food retailing leads to concentration among those who sell to the big food retailers which leads to concentration among those to sell to those who sell to the big food retailers and so on down the scale to the powerless producer. In early 2001, the president of Tyson Foods was quoted as saying that the proposed merger with IBP “should give us 100 feet of shelf space at Wal-Mart.”

Just how concentrated is food retailing? In 1992, the five leading food retail chains controlled 19 percent of U.S. grocery sales. By 1998, the five largest chains (Safeway, Albertson’s, Kroger, Ahold and Wal-Mart) controlled about 33 percent of U.S. grocery sales

¹⁰ *Diamond v. Chakrabarty*, 447 U.S. 303 (1980) (bacterium having unique genetic characteristics is patentable subject matter under the general patent statute).

¹¹ Pub. L. No. 91-577, 84 Stat. 1542 (1970), 7 U.S.C. §§ 2321-2581. See generally 12 Harl, *Agricultural Law*, Ch. 110 (2002).

¹² Pub. L. No. 71-248, 46 Stat. 376 (1930); 35 U.S.C. §§ 161-164.

¹³ *J.E.M. Ag Supply v. Pioneer Hi-Bred International, Inc.*, 534 U.S. 124 (2001).

¹⁴ See note 12 *supra*.

¹⁵ See note 11 *supra*.

¹⁶ University of Missouri-Columbia.

with that figure at 42 percent in 2000 and expected to approach 50 percent this year. Unless mergers are curbed, that figure is expected to reach 60 percent within three years.

Effect of contracts. An important question is the effect concentration 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, each offering inputs of roughly equal productivity and cost and each marketing option equally attractive, 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 options, 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. 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, for example, 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.

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

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.

The "deadly combination." Without much doubt, the greatest economic threat to farmers as independent entrepreneurs is the deadly combination of concentration and vertical integration. Producers are vulnerable to a combination of high levels of concentration in input supply and output processing and high levels of vertical integration from the top down.

Example: let's assume concentration in hog slaughter continues to increase (the four largest firms now control about 60 percent of hog slaughter compared to more than 80 percent for steer and heifer slaughter, as show in Table 2.) and the hog slaughtering firms vertically integrate in the manner pioneered by Smithfield. Before dropping the Tyson merger, Smithfield would have controlled about 68 percent of its hog slaughter. Let's say we're down to two huge firms and each is 90 percent integrated. A producer with a five-year contract with one of the two major firms comes to the end of the contract. The new contract is considerably less attractive than the expiring contract. The producer is told—take it or leave it. If the closest competitive

option is 900 miles away—and is also heavily integrated—the producer seeking another option for hogs is highly vulnerable. If the producer had made a heavy commitment to facilities, the vulnerability is greater yet with significant barriers to exit. Clearly, a producer in that situation is likely to be squeezed.

Table 2. Four firm packer concentration ratios (in percent)

<u>Year</u>	<u>Cattle</u>	<u>Steer & Heifers</u>	<u>Cows/Bulls</u>	<u>Hogs</u>
1980	28	36	10	34
1985	39	50	17	32
1990	42	55	18	33
1995	69	81	28	46
1996	66	79	29	55
1997	68	80	31	54
1998	70	81	33	56
1999	70	81	32	56
2000	69	82	32	56

Source: International Agricultural Trade and Development Center, University of Florida.

As is well known, in addition to pressure on suppliers, monopoly generally leads to prices higher than competitive levels plus the use of technologies that are less efficient than could have been used.¹⁷

As a group of Purdue agricultural economists has stated, “We see evidence of increased concentration to the point where public vigilance is warranted. Concentration indices are high and may be reaching the point where markdown pricing on hogs will be significant and place producers at a clear disadvantage.... Two major policy options are anti-trust activity on the one hand and increasing the market power of hog producers on the other.”¹⁸

In short, whoever controls the limiting factor or controls the “hold-up” points in any process is in a position to exert influence over the entire process and, if the level of concentration is high, exact a hefty charge against the fruits of production. In hogs the limiting factor is not capital or labor or buildings; the limiting factor is slaughter capacity or “shacklespace.” In food generally, an important limiting factor is shelf space.

Vertical integration. The moves made by the major players, both input suppliers and output processors and handlers, 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

¹⁷ See, e.g., Holmes and Schmitz, “Competition at Work: Railroads vs. Monopoly in the U.S. Shipping Industry,” *Quarterly Review*, Federal Reserve Bank of Minneapolis, Vol. 25, No. 2, Spring, 2001, pp. 3-27.

¹⁸ Paarlberg, Boehlje, Foster, Doering and Tyner, “Structural Change and Market Performance in Agriculture: Critical Issues and Concerns About Concentration in the Pork Industry,” Staff Paper #99-14, Purdue University, October 1999, submitted as testimony to the U.S. House of Representatives, Committee on the Judiciary, October 20, 1999.

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 reduce costs (particularly acquisition costs for raw materials) of the integrating firm; (4) to achieve greater market share on an assured basis; or (5) to deliver with greater precision what consumers want. The latter point is debatable. In an early example, seed/chemical companies misjudged consumer acceptance of genetically engineered foods and stumbled badly in the process.

Although vertically integrating a sector or subsector may produce economies—including reduced costs for acquisition of raw materials—vertical integration by powerful integrators can have decidedly negative consequences. Among those negative outcomes is the demolition of open, transparent, competitive markets and replacement of those markets with negotiated prices. With a huge difference in bargaining power, as between the parties, the outcome is predictable. The party with the weaker market power tends to be the loser. Unless producers act collectively, producers tend to be the weaker party.

Are economies from vertical integration likely to be passed on to consumers? With a high level of concentration, that's doubtful. Actually, several possible outcomes could be occurring in the merger/vertical integration movement.

- If the structural transformation now being observed reflects efficiencies, lower costs could be passed to consumers *if competition is present and the competitive system is functioning well.*

- In the event gains from efficiency are not passed to consumers, but are passed to shareholders or used to pad costs within the firm, the trend is objectionable even though some would argue that system-wide gains in efficiency should be permitted even in the face of anti-competitive conditions.

- The third scenario, which is concerned with the distributional effects of competition policy, does not recognize gains from efficiency as a positive offset to an otherwise anti-competitive merger unless the gains are passed on to consumers.

Clearly, the higher the level of concentration and vertical integration, the greater the risk of unacceptable market conduct.

What all of this adds up to is this—*if farming is to be made up of independent entrepreneurs as producers, it is absolutely essential for producers to be assured of meaningful competitive options.* To assure that outcome, it is necessary to—(1) limit concentration in input supply and output processing or handling and (2) possibly limit the extent of vertical integration.

Reform of contract practices. The great disparity in market power tends to lead to contracts with oppressive features (as viewed by the weaker party), retaliatory practices by the stronger party and vulnerability of the weaker party in terms of securing payment. The Producer Protection Act, which has been proposed and endorsed by 17 State Attorneys General, would take several steps as a matter of state law towards providing full information to the producer and lien protection to the producer to secure payment of amounts due and reducing the probabilities of economic retaliation in producer-processor contract relationships.

The proposed legislation contains six parts—

- Require contracts to be stated in plain language and disclose material risks;
- Provide contract producers with a right to review and a three-day cancellation period;
- Prohibit confidentiality clauses;
- Provide producers with a first priority lien for payments due under the contract;
- Prevent capricious or retaliatory termination of the contract; and
- Prevent retaliation against producers who participate in producer organizations.

Although the proposal has been criticized,¹⁹ the provisions all have precedent in other areas of the law, such as consumer protection legislation and trade regulation, and all are based on basic principles of fairness, full information and equity which are common throughout the law.²⁰

The Family Farmer Cooperative Marketing Amendments Act of 2001, which was introduced in the U.S. House of Representatives, would have addressed some of the same issues at the federal level.²¹

The 2002 farm bill (The Farm Security and Rural Investment Act of 2002)²² contains a section dealing with confidentiality provisions in contracts for the production of livestock or poultry or in any marketing agreement with a term of one year or more.²³ The 2002 Act also includes “swine contractors” as a covered entity under the Packers and Stockyards Act of 1921.²⁴

Position of small firms

A major issue is whether smaller input (and processing and handling) firms are likely to be able to compete. Certainly some of the small seed firms have survived 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. In most cases, the small firms have survived by becoming licensees of the giant firms or by becoming part of their marketing arm.

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

¹⁹ See Boehlje, Schrader, Hurt, Foster and Pritchett, “The Producer Protection Act—Will It Protect Producers?” 18 *Agric. Law Update* No. 2, pp. 4-6 (2001).

²⁰ See Harl, Stumo, McEowen, Heffernan and O’Brien, “The Producer Protection Act—Will It Protect Producers? A Rejoinder,” 18 *Agric. Law Update* No. 3, pp. 1-7 (2001).

²¹ H.R. 230, 107th Cong., 1st Sess. (2001).

²² Pub. L. No. 107-171, 107th Cong., 2d Sess. (2002).

²³ *Id.*, Act § 10503.

²⁴ *Id.*, Act § 10502, amending Sec. 2(a) of the Packers and Stockyards Act of 1921, 7 U.S.C. § 182(a).

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.

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, tying contracts 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 significant 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.

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.

Price fixing, as one of the per se offenses, is the most heinous crime that can be committed against a free market-oriented economic system. A 2002 decision by the Seventh Circuit Court of Appeals in Chicago has eased substantially the task of proving price fixing.²⁵ In February of 2003, the United States Supreme Court refused to hear an appeal in the case which cleared the way for the case to go to trial. The case involved alleged price fixing of high fructose corn syrup by several firms. The Seventh Circuit pointed out that Section 1 of the Sherman Act is broad enough to encompass price fixing that did not involve any actual communication among the parties to the agreement. As the court noted, “if a firm raises price in the expectation that its competitors will do likewise, and they do, the firm’s behavior can be conceptualized as the offer of a unilateral contract that the offerees accept by raising their prices.” The case, particularly if successful, will encourage more individuals and groups to bring price-fixing actions. Successful plaintiffs in antitrust actions may be eligible for treble damages.

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.²⁶ 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

²⁵ *In re High Fructose Corn Syrup Litigation*, 295 F.3d 651 (7th Cir. 2002), *cert. denied*, 2003 Lexis 1114-1116 (February 24, 2003). See also, Harl, Neil E., “Price Fixing in Agriculture,” 13 *Agric. L. Dig.* 121 (2002).

²⁶ See generally Neale, *The Antitrust Laws of the United States of America* Ch. XI (2d ed. 1970).

demonstrated that the product in monopoly status wouldn't work as well with other firms' products. And, that is rarely the case.

Some economists have criticized the antitrust treatment of tying contracts as not leading to economic leverage in all instances.²⁷

If the objective is to maintain significant levels of competition, FTC and the Department of Justice should scrutinize all agribusiness mergers carefully for anti-competitive consequences from the standpoint of producers (as well as consumers) and all practices by companies in tying credit, insurance, risk management or other needed inputs to potential items. 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.

The approaches used by the Antitrust Division of the Department of Justice and by the Federal Trade Commission (FTC) in analyzing mergers have traditionally focused on the probable impact on consumers. That has been the principal concern of the antitrust system. For agriculture, however, the concern is the impact on *producers*—assuring producers competitive options. Consumers may ultimately be affected but that is down the road. That's why a different approach is needed in the evaluation of agribusiness mergers if there is a shared vision of maintaining a sector of independent entrepreneurs as producers. Unless that vision is articulated by the Congress and the Administration, the chances of meaningful actions by the antitrust system are slight.

Another competitive concern is discrimination in distribution of inputs. As an example, one major seed company provides up to a 21 percent discount for volume purchases. Legislation adopted in 1914 and amended in 1936 (the Robinson-Patman Act) outlaws the practice of price discrimination. Under that provision, it is unlawful for any "person" engaged in commerce, either directly or indirectly, to discriminate in price between different purchasers of commodities of like grade and quality where the effect of the discrimination "may be" to substantially lessen competition or tend to create a monopoly in any line of commerce or to injure, destroy or prevent competition with any person.²⁸ Exceptions are provided where differential prices are cost justified or used in good faith to meet an equally low price of a competitor.²⁹

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.

²⁷ See Warren, *Antitrust in Theory and Practice* 192-202 (1974).

²⁸ Robinson-Patman Act, § 2(a), amending Clayton Act of 1914.

²⁹ *Id.*, § 2(b).

- Also, in the seed/chemical industry, 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 certificates or the duration of a patent over processes by which genetic manipulation occurs.

Ending packer ownership of livestock. A necessary step, if agriculture is to be comprised of a sector of independent entrepreneurs, is to ban packer ownership of livestock. An effort was made, in the 2002 farm bill, to legislate such a ban in the form of the Johnson Amendment (Amendment No. 2534)³⁰ included in S. 1731, the Senate-passed farm bill. The statute, with the amendment, would have read as follows—

It shall be unlawful for any packer with respect to livestock, meats, meat food products, or livestock products in unmanufactured form, or for any live poultry dealer with respect to live poultry, to:

(f) Own, feed, or control livestock directly, through a subsidiary or through an arrangement that gives the packer operational, managerial, or supervisory control over the livestock, or over the farming operation that produces the livestock, to such an extent that the producer is no longer materially participating in the management of the operation with respect to the production of livestock, except that this subsection shall not apply to—

(1) an arrangement entered into within 14 days before slaughter of the livestock by a packer, or a person that directly or indirectly controls, or is controlled by or under common control with, the packer;

(2) a cooperative or entity owned by a cooperative, if a majority of the ownership interest in the cooperative is held by active cooperative members that—

(A) own, feed, or control livestock; and

(B) provide the livestock to the cooperative for slaughter; or

(3) a packer that is owned or controlled by producers of a type of livestock, if during a calendar year the packer slaughters less than 2 percent of the head of that type of livestock slaughtered in the United States....³¹

That amendment would have made it unlawful for a meat packer to own or control livestock intended for slaughter for more than 14 days prior to slaughter. Cooperatives or entities owned by them would have been exempt if a majority of the ownership interest in the cooperative was held by members who own, feed or control livestock that they provide to the cooperative for slaughter. Also, the amendment would have exempted packers slaughtering less than two percent of each species of livestock annually. Under the amendment, arrangements would not be illegal if the producer materially participated in the management of the operation with respect to the production of livestock.

The bill introduced in 2003 (S. 27) is the same as the 2002 version except that—(1) the time the packer is allowed to own livestock prior to slaughter has been reduced from 14 to 7

³⁰ The provision would have amended the Packers and Stockyards Act of 1921, 7 U.S.C. § 192. See generally, McEowen, Carstensen and Harl, “The 2002 Senate Farm Bill: The Ban on Packer Ownership of Livestock,” 7 *Drake J. of Agr. Law* 267 (2002).

³¹ S. 1371, 107th Cong., 2d Sess. (2002).

(plus weekend) days; and (2) the size limitation (below which the legislation would not apply) is made consistent with the Mandatory Price Reporting legislation (125,000 annual cattle slaughter, 100,000 hogs per year).

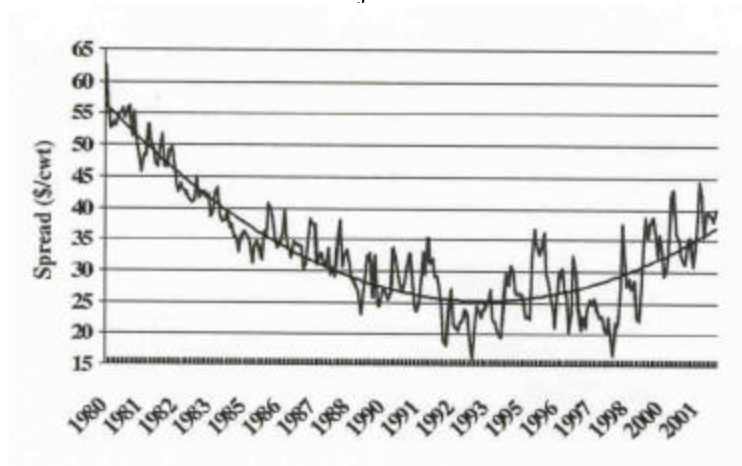
A compelling reason for taking action to ban packer ownership of livestock is the behavior of the farm-to-wholesale price spreads in beef. In a competitive market, the farm-to-wholesale price spread should decline as per-unit slaughter costs decrease. Figure 9 shows that was, indeed, the case through the mid-1990s. However, since the mid-1990s, the F-W price spread has trended strongly upward. This trend is inconsistent with what would be expected in a competitive market. This is confirmed by the higher profit levels being reported by the dominant firms in meat packing in recent years.

It is noted that Iowa has long had a ban on a processor of beef or pork “to own, control or operate a feedlot in Iowa in which hogs or cattle are fed for slaughter.”³² Minnesota³³ and Nebraska³⁴ (as well as South Dakota³⁵) impose similar limitations.

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).³⁶ 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 1922³⁷ provides protection from antitrust challenge for producers who seek to bargain collectively with processors, handlers and input

Figure 9. Farm-to-Wholesale Price Spread for Beef
USDA data adjusted for inflation



³² Iowa Code § 9H.2 (2003).

³³ Minn. Stat. § 500.24(3) (2001) (livestock feeding considered to be farming and thus covered by corporate farming statute).

³⁴ Neb. Rev. Stat. § 54-2602.

³⁵ S.D. Const. Art. XVII, §§ 21-24.

³⁶ Capper-Volstead Act, 7 U.S.C. §§ 291, 292. See generally 14 Harl, *Agricultural Law* § 137.04 (2003).

³⁷ 7 U.S.C. §§ 291, 292.

suppliers.³⁸ 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.”³⁹ 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.”⁴⁰

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 percent per annum; (3) not handle a greater amount of products from nonmembers than from members; and (4) not be operated for profit.⁴¹

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.”⁴²

The key question is whether producers will be willing to sacrifice independence of action in order to bargain collectively for access to inputs and for greater market power in marketing their products. The most likely avenue for such collective action is through organizations specifically created for that purpose.

The time may be near when that will be the only practical alternative to vulnerability and serfdom.

Need for enabling legislation. It is unlikely that countervailing power can be achieved in one grand move to get large numbers of producers to bargain collectively for inputs and for the sale of commodities. Rather, greater market power is likely to be achieved, if at all, by bargaining groups of relatively modest size and comprised of producers committed to collective marketing and committed to producing commodities at a quality level desired by processors and on a schedule consistent with the purchaser’s capacity.

To facilitate the formation and operation of such collective marketing (and input supply) groups, enabling legislation at the state (or federal) level is needed to assure that—(1) agribusiness firms would be required to bargain in good faith; (2) would assure that

³⁸ See generally 14 Harl, *Agricultural Law* § 137.04 (2003).

³⁹ 7 U.S.C. § 291. See *Green v. Associated Milk Producers, Inc.*, 692 F.2d 1158 (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).

⁴⁰ 7 U.S.C. § 291.

⁴¹ *Id.*

⁴² 7 U.S.C. § 292.

recriminatory behavior would not be allowed by agribusiness firms; (3) members of the unit would be required to be producers (to bring the group within the exemption from antitrust strictures found in the Capper-Volstead Act)..

A level playing field. The provisions in the Producer Protection Act, proposed by 17 State Attorneys General, would constitute a modest first step toward leveling the field of contracting. Indeed, serious consideration should be given to adding such provisions to federal antitrust law.

More germ plasm in the public domain. Another potential solution for concentration in seed supply 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. *However, it should be made crystal clear that germ plasm from public funds should go into the public domain and not be channeled to the giant transgenic seed producers on a basis of exclusivity.* This would restore 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 the extent that public funds are used, however, the results should be in the public domain.

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.

Conclusion

More than a century ago, the United States rejected the idea of unfettered economic activity by firms in highly concentrated industries. The wisdom of that conclusion has never been more clear and the need for aggressive implementation of that philosophy has never been more obvious.

To assure competition, the lifeblood of our economic system, it is vital that steps be taken now to increase competition in all areas where high levels of concentration exist and particularly in areas where high levels of concentration exist in tandem with efforts to integrate vertically the production and processing functions from the top down. The trend toward demolishing free,

open, transparent and competitive markets as the even-handed referee in those markets must be halted if farmers and ranchers are to exist as independent entrepreneurs rather than as serfs.

III. Consumer Acceptance of Genetically Modified Foods

The production of foodstuffs on this planet has never in the history of the human family been subjected to change that has been as dramatic and far-reaching as the change wrought by genetic modification of crops. Consumers, lulled into complacency by centuries of incremental and almost imperceptible change in the production of commodities, are now confronted by fundamental changes in the crops entering the food chain directly or the processing of crops into consumable products. Most of the changes are difficult, if not impossible, for consumers to evaluate. The problem has been compounded, in some countries, by lack of confidence in the regulatory processes.

Moreover, consumers, confronted by articulated concerns over food safety and environmental complications, typically have no reason to favor genetically modified foods. Foods that have been genetically modified typically carry no price advantage and, thus far, do not offer a taste, appearance or other desirable feature to offset any concerns about food safety or the environment. Therefore, any significant concerns are translated into a tendency to discount the perceived value of genetically modified foods. If labeling of genetically modified foods on a mandatory basis were to become widespread, consumers would be in a better position to register their preferences, as noted below.

A. Adoption of Genetically-Modified Crops

The genetic modification of crops, principally corn, soybeans, cotton and canola, has proceeded with striking success as a new technology during the past five years. Grower adoptions of crops resistant to potent herbicides (the “Round-Up Ready” crops) and crops resistant to the European Corn Borer (the so-called Bt crops) have been very rapid.

Moreover, the genetic modification of plants to produce pharmaceuticals (so-called “biopharming”) such as proteins designed as a vaccine for hepatitis B, are well within the realm of reality over the next few years and some are in production currently. One industry observer has stated a belief that in 10 years as much as 10 percent of the acreage devoted to corn in the United States could well be used to produce pharmaceuticals, although, as discussed below, the production of biopharmaceuticals in crops has encountered a stiff headwind. Some firms are betting that genetically modified plants could be used to produce substances that would reduce the cost of making chemicals used in plastics, detergents and construction materials.

The phenomenon of genetic modification is not limited to crops. Professor Patrick Bateson, of the Royal Society, the UK’s unofficial academy of sciences, and chair of the society’s working group on genetically modified animals, recently highlighted a list of benefits that could become reality. Those benefits included cures for intractable diseases, relief from suffering for millions of patients, genetically modified hogs free of intestinal disease and genetically modified cattle immune to foot and mouth disease.

B. Resistance to Genetic Modification

Consumer resistance

Unlike other technologies, which were adopted in agriculture and in processing with relatively little consumer resistance, genetic modification of foods has encountered a stiff headwind in several countries, particularly in Europe and in Asia, and has led to consumer support for food labeling. Indeed, even in the United States polls have indicated that substantial numbers of consumers favor food product labeling to reveal use of genetically modified ingredients. In April of 2001, the Pew Charitable Trust released the results of a poll conducted by the Trust which indicated that 75 percent of respondents in the United States indicated that they wanted to know if their food contained genetically modified ingredients. About 58 percent reportedly stated that they were opposed to the use of such ingredients in food. Other polls have indicated similar findings. Concerns in several other countries in Asia, Europe and the Southern Hemisphere have led to labeling or plans for labeling with as many as 48 countries embracing labeling or likely to embrace labeling.

Quite clearly, the trend has been toward more consumer resistance, not less.

Traditionally, consumers have been the major beneficiaries of technology in agriculture. Consumers may ultimately benefit from agricultural biotechnology if the technology leads to increased output and lower prices or to better nutritional qualities to the extent those developments would not have occurred otherwise and *to the extent the benefits are passed through to consumers*. Thus far, consumers in the U.S. have been largely unimpressed and many abroad, particularly in Europe and parts of Asia, have been somewhat antagonistic to genetically modified foods.

The reasons behind consumer resistance are not difficult to fathom. If consumers do not see a benefit to them, either in the form of lower priced food or in the form of food with superior qualities, any concern about food safety leads to consumer discounting of the value of foods with genetically modified ingredients and a preference for foods that have not been genetically modified as noted above.

Environmental concerns

Interest groups focusing on what they perceive as environmental concerns have identified several potential risks linked to genetically modified plants and animals. Concerns have been voiced over the spread of traits from genetically modified crops into other plant species, the emergence of resistance in plants to control measures, the production of superviruses, the inadvertent suppression of immune systems in animals which could have decidedly negative effects on animal populations and the inadvertent suppression of immune or reproductive functions in animals. More fundamentally, some argue that the subtle and delicate relationship between the genetic material of living things and the ecosystems in which they inhabit could be upset with dramatic changes from genetic modification.

A National Academy of Sciences panel in February, 2002, stated that the U.S. Government had allowed food manufacturers to market genetically modified crops without fully probing their potential environmental impact.

Production of biopharmaceuticals and other chemical materials

Public attention has recently been drawn to the production of biopharmaceuticals in the United States. USDA has stated that biopharmaceutical crops were grown on 34 sites in the United States in 2002.

In Iowa, for example, corn was produced in 2001 and 2002 with traits that would benefit those suffering from cystic fibrosis. The corn was produced under permit from the U.S. Department of Agriculture. The corn was reportedly produced for Meristem Therapeutics, a French company.

To minimize pollen drift, the biopharmaceutical corn was planted 30 days after conventional plantings to avoid cross pollination with regular corn.

Critics worry about pollen drift from volunteer corn despite the precautions; from pollen drift to conventional corn a substantial distance away if conditions (temperature, humidity, wind direction, wind speed and lack of barriers) are favorable for drift to occur; from spread of the genetically modified corn by rodents, birds and insects; and about mechanical contamination in farm equipment and storage facilities.

The Animal and Plant Health Inspection Service, an agency of the U.S. Department of Agriculture, released to the public in May of 2002 rules governing the production of biopharmaceuticals. The agency had been setting restrictions for field tests on a case-by-case basis. The rules generally prevented pharmaceutical corn from being planted within a half-mile of any other corn to prevent cross-pollination. The agency permitted, in 2002, an exception to the half-mile limit if the biopharmaceutical corn was surrounded by buffer crops. The agency says that it would “discourage” the use of buffer crops beginning in 2003. The rules also required the biopharmaceutical corn to be planted at least three weeks before or three weeks after other corn in the area to further guard against cross-pollination. Regular corn grown for seed had to be kept at least a mile away from the biopharmaceutical plots. Even those 2002 rules indicate that a clear need exists for careful and systematic checking to insure that pollen drift from biopharmaceutical crops is not occurring.

In mid-September, 2002, the *Sunday Times of London* reported that genetically modified germ plasm was found in beehives two miles from the site where genetically modified oil-seed rape was being grown under government supervision.

In November of 2002, two instances of problems with the production of biopharmaceuticals involving Prodigene, Inc. surfaced in Iowa and Nebraska. On November 12, the Food and Drug Administration reported that it had impounded 500,000 bushels of food-grade soybeans exposed to volunteer drug-producing corn growing in the same field in Nebraska. The following day, the Animal and Plant Health Inspection Service of the U.S. Department of Agriculture revealed an incident in September in Iowa which required the destruction of 155 acres of contaminated corn. The violations of federal regulations led to a \$250,000 fine against the company plus an estimated cost of more than \$2 million to dispose of the 500,000 bushels of soybeans contaminated in Nebraska from volunteer corn from a 2001 biopharmaceutical plot. The Biotechnology Industry Organization urged a moratorium of further biopharmaceutical

production in major corn-producing regions but that recommendation was withdrawn under political pressure with the matter now left to federal regulation to prevent gene flow from biopharmaceutical crops.

New regulations were issued by APHIS in early March, 2003, calling for more frequent inspections of plots producing biopharmaceuticals, a one-mile separation distance for biopharmaceutical corn from fields producing corn for conventional food and feed uses (one-half mile if tassels are bagged), a restriction on land used for the production of biopharmaceuticals from being planted with a food or feed crop the following year, a requirement that farmers must maintain separate planters and harvesting equipment used for biopharmaceutical crops and dedicated storage facilities for those items of equipment and a requirement that tillage equipment must be cleaned. Biopharmaceutical corn must be planted not less than 28 days before or 28 days after any conventional corn up to one mile away.

In April of 2003, a report commissioned by the Pew Initiative on Food and Biotechnology and prepared by Resources for the Future⁴³ was released. The report concludes, with respect to adequacy of regulatory oversight, that—

“We want the system of postmarket regulatory oversight to foster compliance with conditions of use or other restrictions imposed during the premarket review process; detect noncompliance and unforeseen health and environmental problems; take appropriate enforcement action to correct and penalize noncompliance; and manage follow-up investigations, market disruptions, and other consequences of noncompliance and unforeseen problems.

“Our research casts doubt on the preparedness of the current postmarket oversight program to achieve these traditional objectives. For the products it has deregulated, APHIS lacks a regulatory handle to require systematic data collection by sponsors to detect unforeseen plant pests or environmental problems. EPA and its regulatory partners in the states have no program to provide direct oversight and enforcement of environmentally important PIP use restrictions, and EPA is still working out with the biotech industry how to ensure the effectiveness of the compliance programs that PIP registrants are required to establish through their private contractual relationships with growers. FDA has no affirmative compliance and enforcement program for biotech crops or foods and lacks some of the basic analytical tools to test whether the biotech products already on the market are in compliance with applicable regulatory requirements.”⁴⁴

Quite clearly, if consumers lack confidence in the rules and in the oversight process, further momentum will build for food labeling and the stage will be set for even faster growth of certified organic commodities.

C. Consequences of Resistance

The concerns voiced by consumers and environmentalists predictably have led to quite different societal responses.

Environmental response

⁴³ Taylor, Michael R. and Jody S. Tick, “Post-Market Oversight of Biotech Foods: Is the system Prepared?” Pew Initiative on Food and Biotechnology and Resources for the Future, April 2003.

⁴⁴ *Id.* at 85.

The articulated concerns over environmental or ecosystem threats have led principally to calls for more effective regulatory oversight. The Environmental Protection Agency, with lead responsibility for environmental matters, has ramped up its regulatory agenda to include studies of potential threats to the environment. A study by the National Academy of Sciences of animal cloning was recently published. The Food and Drug Administration will use the results of the NAS study to decide whether cloned animals will require regulatory approval before sale of meat and milk from cloned animals. In the meantime, biotechnology companies involved in cloning have been asked to keep cloned livestock out of the food chain until the agency completes its review, although there is some question whether that is occurring. Among the questions being pondered by FDA is whether cloned animals should be treated as genetically engineered animals, which are regulated, or like animals bred through in vitro fertilization which are normally not regulated. One scientific concern is whether mass animal cloning could lead to breeds that are more susceptible to disease.

Food safety concerns

Concerns about food safety have led to calls for more effective regulatory oversight and for labeling in order for consumers to know what they are consuming. While some doubt the value of labeling, it is likely that the move toward more labeling of foods containing genetically modified ingredients will continue with widespread, if not universal, labeling within three years.

One complication of labeling is that estimates indicate that up to 70 percent or more of all processed foods contain genetically modified ingredients. Regulatory agencies have determined that genetically modified foods are as safe as conventional foods but some consumers still want to know which foods contain genetically modified ingredients. Unfortunately, much of the testing has been conducted by or funded by the commercializing companies. Independent third party verification would help industry achieve a higher level of public confidence.

As an indication of concern even in the United States, which has embraced genetic modification of foodstuffs more enthusiastically than any other country, in the State of Oregon a measure requiring the labeling of food and food additives appeared on the November general election ballots. That measure was defeated but supporters are preparing for another initiative in 2004.

In Australia, the label law, implemented in December of 2001, requires packaged food containing measurable genetically modified ingredients, to carry an identifying label. Critics of that and similar measures argue that the law may run counter to World Trade Organization rules.

In the EU, the Agriculture Council (comprised of European Union agricultural ministers) agreed in 2002 by a majority decision that food containing more than 0.9 percent genetically modified material would have to be labeled as containing genetically modified organisms. The agreement also introduces for the first time requirements for the labeling of animal feed and cooking oil containing genetically modified ingredients. The agreement was approved by the European Parliament on July 2, 2003.

One highly important feature of the debate is that the consumer is king (or queen). In the types of open, transparent, market-oriented economic systems which now dominate the world,

the consumer, through the exercise of consumer choice, provides a continuing plebiscite over every feature of the food supply. The consumer may be right or wrong, informed or misguided, flippant or serious-minded. Nonetheless, it is consumer choice that drives the entire food system. If significant numbers of consumers register their preferences on a food feature or trait, and that preference is negative (or positive), the results are quickly transmitted through the food chain to the producer. For that reason, it is the consumer that sits in judgment over agricultural biotechnology along with the regulators. It is important to note that consumer choice can trump the regulatory process in that a product deemed safe and environmentally benign may, nonetheless, be rejected by consumers. At the same time, regulators can only trump consumer choice by limiting or banning products before entering the food chain.

In reality, however, the consumer is not always the moving force behind rejection or acceptance of foodstuffs. Processors look after the “king” and devote a great deal of time and resources to anticipating consumer response. No processor wants to be on the wrong side of consumer preference. For that reason, the more dramatic developments in the last three years over genetically modified foods have come from processors which ostensibly were anticipating consumer reaction. The Frito-Lay decision on genetically modified raw material for its chips; the decision by Novartis (through its babyfood subsidiary, Gerbers) not to use genetically modified commodities in processing; the move by various brewers in Japan and in Mexico to reject genetically modified ingredients; the announcement by McDonalds to use non-genetically modified materials in its potatoes; and the announcement that Calbee Food Co. had recalled its popular Jagariko line of snacks in Japan because of the discovery that the snacks were made from genetically modified potatoes; all were taken well in advance of the emergence of consumer pressure directed at the firms. As Carole Burke, editor of Japan’s Food Industry Bulletin has stated, “all leading food-processing companies in Japan are very conscious of consumers’ fears of GM foods. Market leaders in all segments of the food industry are demanding GM-free commodities, and the menus of major restaurant chains note their foods are GM-free.”

D. Impact on Trade

Predictably, resistance to genetic modification of foodstuffs has produced clear and unmistakable impacts on trade patterns. U.S. corn and soybean exports to the EU, and corn exports to Japan have been adversely affected by the inability to assure suppliers of non-genetically modified commodities.

The European Union has had a tough labeling law for some time, requiring food containing more than one percent of a genetically modified ingredient to include a label that warns consumers. The current proposal, to reduce the percentage to 0.9 percent, and to extend labeling to animal feed, is discussed above. The EU stance is backed by strong consumer sentiment. A study by the National Consumer Council in Great Britain indicated that 80 percent of consumers believed that meat from animals fed genetically modified feed should be clearly labeled as genetically modified.

A 2003 Iowa State University study by Dr. Robert Wisner concluded that there was a “high risk” that the United States wheat industry *would lose 30 percent to 50 percent of its*

business with foreign markets for spring wheat if genetically modified wheat is released for planting.

Monsanto announced in August, 2002, that it could take until at least 2005 to gain regulatory approval in Europe for its genetically modified products. On April 26, 2002, the Governor of North Dakota signed into law a moratorium on the introduction of genetically modified wheat in the state until August 1, 2003.⁴⁵ That action was a response to concerns voiced on a number of fronts including concerns about possible impacts on trade.

Although there is evidence that Brazil's exports are not completely free from genetic modification, Brazil has officially positioned itself as a reliable source of supply for non-genetically modified corn and soybeans. The country achieved that reputation principally by banning the import of all genetically modified seeds and commodities. Brazil's status as a reliable source of non-genetically modified crops was a key factor in South Korea's recent decision to import Brazilian, rather than U.S., corn. In Asia, Thailand has been particularly well positioned to serve the non-genetically modified market. More than three years ago, the Government of Thailand banned the import and cultivation of commercial seeds which had been genetically modified. While there have been experimental field trials of genetically modified cotton in Thailand and the government-funded National Centre for Genetic Engineering and Biotechnology has conducted research into genetically modified tomatoes, cucumbers and papaya, there has been concern that the field trials might not continue.

The May 28, 2001, edition of *Feedstuffs* reported that Australia's Industrial Suppliers Office had "identified the non-genetically modified (non-GM) status of Australia as a possible advantage over other soybean producers, such as the U.S., which has more than half its soybean crop sown to GM varieties." A May 21, 2001, news report stated that a delegation from India, sponsored by the Soybean Processor's Association of India, met trade officials in Italy, Spain, France, Germany, the Netherlands and Britain to attempt to persuade buyers that their soybean meal is non-genetically modified, unlike that of other export competitors. The report indicated that India was already exporting 2.5 to 3 million metric tons per year of non-genetically modified soybean products to Asia.

To the extent the market for non-genetically modified commodities is met without discount or premium, the situation does not pose a serious economic threat to exporters of genetically modified crops. However, a continued trend toward greater demand for non-genetically modified food ingredients could lead to serious problems for those countries dominated by the production of genetically modified commodities.

E. The Future of Agricultural Biotechnology

The controversy over genetic modification of crops is expected to be resolved on the basis of three economic relationships—(1) the demand for GMO and non-GMO crops; (2) the supply of GMO and non-GMO crops; and (3) the costs for maintaining a two-track or multiple-track production, marketing and handling system and who bears those costs.

Demand for GMO and non-GMO crops

⁴⁵ H.B. 1338, North Dakota General Assembly, 2002.

The demand for GMO and non-GMO crops promises to be highly important to the future of agricultural biotechnology. That factor is squarely in the hands of consumers, worldwide, and in the hands of processors which continually endeavor to anticipate consumer demand.

Arguably, the labeling of foodstuffs as to the GMO status of ingredients will make more precise the demands of consumers. As noted earlier, consumers will ultimately get what they want. On May 3, 2002, the U.S. Food and Drug Administration closed a comment period to ascertain if the public wants genetically food labeled as such.

Some see in the estimated 20 percent per year growth in the organic food market in recent years (estimated to total close to a \$10 billion market in a March, 2001, report by Solomon Smith Barney) evidence that, absent labeling, consumers will seek organically grown foods. Regulations under the National Organic Standard Program, authorized in the 1990 farm bill, were recently finalized, reviewed by Congress and became law on April 21, 2002. The regulations, which became effective October 21, 2002, increased the minimum percentage of organic ingredients in products labeled “Made With Organic Ingredients” and imposed limits on genetically modified foodstuffs in certified organic foods.

On April 5, 2001, the *Wall Street Journal* published a study of genetically modified foods. Twenty food products labeled as “non-GMO” or “GMO-free” were tested by a prominent food laboratory on behalf of the *Journal*. Of the 20, 16 contained evidence of genetic material used to modify plants. As the *Journal* article stated, “the problem, regulators say, is that some genetically modified crops—which have been designed to resist disease, pests and chemicals—can cross-pollinate freely with regular crops, passing along their altered traits to the next generation.”

Supply of GMO and non-GMO crops

The supply of GMO crops and non-GMO crops, the second critical economic variable in the future of agricultural biotechnology, is squarely in the hands of producers, worldwide, as producers make decisions about seed selection each year.

Notwithstanding the rapid adoption of corn resistant to the European Corn Borer and crops resistant to potent herbicides, the evidence is clear that, in the long-run, producers rarely benefit from new technologies and often suffer economically from their adoption.

As has been known for several decades, only early adopters benefit economically from output increasing technology—such as fertilizers, chemicals and better seed, such as Bt corn. That’s the type of corn that creates a substance toxic to the European Corn Borer so the technology increases yields.

Why do farmers not benefit from output increasing technology? As noted earlier, with inelastic demand for most agricultural products, increases in output in the aggregate reward producers with a disproportionate drop in price and in profitability. That’s been known and documented for decades. Farmers have been on a treadmill. They have to adopt technology to be competitive but they are rewarded by lower prices and profits if they do.

Even cost decreasing technologies, such as Roundup Ready Soybeans, are ultimately output increasing as such technology enables crops to be grown in areas where production would be uneconomic were costs higher. Thus, cost decreasing technology, also, ultimately leads to an increase in output which means a disproportionate drop in price and in profitability for the producer.

In recent years, the pace of adoption of new technology has been so swift both here and abroad as to leave little benefit for producers, even for early adopters.

The stream of output increasing and cost-decreasing technology has been a major reason why producers, particularly crop farmers, have been under economic pressure much of the time over the past 70 years.

The cost of maintaining segregated crop supplies

A major problem faced by the U.S. and other producers of genetically modified crops on a widespread basis is the feasibility and cost of a two track or multi-track marketing and handling system. For crops that are particularly susceptible to gene flow (such as corn because of pollen drift), the tolerance level (amount of GMO germ plasm in non-GMO crops) is critically important. Contamination can occur from several sources—(1) contamination of GMO germ plasm in non-GMO seed coming from the seed companies; (2) pollen drift in the field; (3) physical contamination in planter boxes, combines, augers, elevators, wagons and bins on the farm; and (4) physical contamination at the elevator or other handler of the commodity after it leaves the farm. Research indicates that the cost of segregation rises exponentially as the tolerance level is reduced.

The experience with StarLink™ corn in 2000 illustrates how widely unacceptable supplies of crops can become diffused throughout the food system. In that case, StarLink™ was approved for feed use but not for food use by the Environmental Protection Agency. As the terms of the registration stated, “none of the seeds, plants or plant materials in the StarLink™ plot, or within 660 feet of the field, may be used for food uses or may enter international commerce.” EPA was concerned that the CRY9C protein in StarLink™ possessed qualities that could cause allergic reactions in humans (although the Centers for Disease Control and Prevention, in mid-June 2001, announced that it was unable to conclude that reported illnesses were the result of the StarLink™ corn). After traces of the protein were found in various food products, starting with taco shells, an effort was made to locate and dispose of supplies of the StarLink™ corn from the 2000 (and earlier) crops.

Unfortunately, not all producers acquiring StarLink™ seed were advised of the limitation on use and disposition of the crop. The 11 licensees of the seed from Aventis Crop Science were the actual sellers of the StarLink™ seed and apparently, in some instances, did not advise producers of the limited registration and the possible consequences if other corn was contaminated with the StarLink™ germ plasm. Therefore, contamination occurred inadvertently at planting and harvest, pollen drift produced gene flow into non-StarLink™ fields and the StarLink™ crop was commingled with other corn in on-farm storage and at elevators. While the number of acres planted to StarLink™ totaled only 340,908, the number of bushels containing

the StarLink™ protein was several times the production from those acres actually planted with StarLink™ seed.

EPA cancelled the registration on October 12, 2000. Aventis Crop Science moved quickly to isolate the corn containing StarLink™ and offered producers 25 cents per bushel premium over the October 2, 2000, market price for corn; agreed to compensate growers producing corn within 660 feet of StarLink™ corn with the same price premium; assured elevators that the company would pay elevators for “additional transportation, demurrage and testing costs incurred by a grain elevator because of commingled corn;” and agreed to “work with” elevators to address problems related to discounts in value of StarLink™ contaminated corn.

Even with the aggressive efforts by Aventis Crop Science, augmented by pressure from state Attorneys General in several states, but particularly in Iowa and Missouri, the StarLink™ crop promised to continue to flow through the food chain for several months. The announcement by the Centers for Disease Control that StarLink™ was not the cause of allergic reactions may allay some of the concerns.

In late winter, 2000-2001, the U.S. Department of Agriculture asked 280 seed companies to test their seed supplies for traces of the StarLink™ protein and offered to purchase the seed supplies failing the test. Some lots were found to contain StarLink™ and USDA reportedly set aside \$20 million to purchase that seed. However, about one-fourth of the seed companies did not respond. The possibility is that part of the 2001 corn crop was planted with seed containing StarLink™ germ plasm.

This highlights a shortcoming of the oversight process over foodstuffs in the United States. The federal government lacks recall authority, on a mandatory basis, over commodities or other food ingredients. This lack of authority is especially notable if—(1) the crop is visually indistinguishable (which it was) and (2) there is a perception of value on the part of the producer.

The StarLink™ controversy focused attention on civil liability in such situations.

- A commercializing company or licensee that fails adequately to warn producers of limits on the production or marketing of the resulting crop could be liable to growers who suffer damages. Licensing agreements would presumably address problems of liability in this area.
- A producer who knowingly ignores limits on registration could be liable for damages suffered by owners of neighboring fields to which pollen drifts (for those crops susceptible to pollen drift).
- A producer who delivers a crop contaminated with unacceptable germ plasm could be liable to the elevator for damages suffered. Farmers who are deemed to be “merchants” under the Uniform Commercial Code are subject to—(1) express warranties made orally or in writing about the crop; (2) implied warranties of merchantability about the crop passing without objection in the trade; and (3) implied warranties of fitness that the crop is fit for the purpose for which it is to be used, if known to the seller.

- Firms processing, manufacturing and distributing food products could complain of damages to those who sold them ingredients unsuitable for use, presumably elevators and grain handlers and shippers. Claims could include actual damages from product recalls, increased handling and manufacturing costs and damages to brand identities and reputations.
- Consumers who suffer damages could have a claim against food suppliers and manufacturers if injury can be established and if damages can be proved.
- Finally, producers may have a claim, against the commercializing company or companies, if it can be proved that the offensive germ plasm resulted in a discount for the crop generally in the country. Several class action lawsuits have been filed in the United States alleging that corn producers in general were damaged by the StarLink™ episode even though there was no contamination of their crop by the CRY9C protein. In the first of these cases, on July 11, 2002, *In re StarLink Corn Products Liability Litigation*, the federal district court for the Northern District of Illinois dismissed the claims related to labeling but did not dismiss allegations relating to public and private nuisance, negligence and possible violation of the Tennessee Consumer Protection Act. A \$110,000,000 settlement was reached in early 2003 which will provide modest payments to producers suffering economic loss.

Possible outcomes

The development and production of transgenic crops is known to be a costly process. The process can only be supported, economically, if there is a robust revenue stream from sales of resulting products.

If consumer resistance stabilizes or wanes, the three economic relationships are likely to produce—(1) niche markets for non-GMO crops, in part on a country-by-country basis where gene flow from pollen drift and from mechanical contamination can be rather easily controlled; (2) a modest premium for non-GMO crops (sufficient to produce the supply to serve that market); and (3) disputes over trade rules imposed by countries which restrict GMO seed and commodities as to whether such rules constitute barriers to trade.

In the event consumer resistance increases, the countries with high rates of GMO plantings will be confronted with the choice of—(1) relinquishing the non-GMO market to other countries; (2) gearing up for simultaneous production of GMO and non-GMO crops (and maintaining acceptable levels of segregation of the crops); or (3) reducing GMO plantings. The outcome is almost certain to be resolved on an economic basis, in light of the three basic economic relationships outlined earlier. Any one of the three outcomes is likely to produce a reduced revenue flow to the commercializing companies.

F. Solutions for Countries With Multi-Track Aspirations

With the odds currently favoring increasing consumer resistance, exporting countries with substantial plantings of GMO crops and a reputation as a GMO supplier are expected to gear up for simultaneous production of GMO and non-GMO crops with intensive effort devoted to (1) maintaining acceptable levels of segregation of the crops and (2) developing a reputation,

worldwide, as a dependable supplier of both GMO and non-GMO crops. For countries nudged in that direction, several steps can be taken to facilitate the task.

- One superficially attractive solution is to zone a country for crops on the basis of genetic modification. This is expected to be unworkable for several reasons. No area within a country wants to be on the losing side of an evolving market. Moreover, such a move is antithetical to the time-honored tradition of producers being given free rein to produce what they want.

What could emerge, is a form of de facto zoning as producers, on a local basis, voluntarily agree to limit their plantings to non-GMO crops in order to be positioned to take advantage of non-GMO markets. This would require buffer areas unless natural barriers (such as rivers or mountains) limit sufficiently gene flow from pollen drift for crops for which that can be a problem.

- Another step that could be taken is for the regulating agencies to require the ultimate purchasers of seed that has not been approved for all uses and approved for export as well as domestic use, to advise in writing well in advance of planting all producers within at least one mile (or more) from every field planted to the limited registration crop. The requirement should also require the grower planting the limited registration crop to obtain the approval of all other growers within the specified distance to signify approval of the planting of the limited registration crop which could involve negotiated payments.

- A multi-track system of crop production, involving both GMO and non-GMO varieties, will likely produce acceptable results only if there is low cost, quick and reliable testing of the presence of GMO germ plasm at every point of commingling of the crop. This is clearly not possible at present and is likely to be unattainable in the near term although the development and implementation of testing protocols could be accelerated in the face of economic pressure brought on by loss of markets for crops.

- As an interim measure, a certification procedure, of the type developed in the autumn of 1999 by Iowa State University and the Office of the Iowa Attorney General would provide a helpful paper trail albeit with some shortcomings. The Iowa “Uniform Certification Procedure,” involves a pre-delivery certification segment which requires a declaration of the particular varieties planted, where they were planted and the seed lot (for tracing any gene flow problems in the production of the seed); that reasonable care was utilized in planting, harvesting, handling and storage of the crop; and a disclaimer of implied warranties of merchantability and fitness. The post-delivery portion is completed upon delivery and associates the scale tickets (and any sample identification for samples obtained for later testing) with the pre-delivery portion of the certification. The obvious shortcomings are—(1) a stack of certifications does not assure that the crop is uncontaminated (particularly in light of misrepresentations in a market environment of significant premiums for non-GMO crops); and (2) once samples are tested, and the load has already been dumped into a bin based on the representations made, the potential exists for large-scale contamination.

USDA, in late August, 2002, indicated that the agency was considering setting up a voluntary certification program for corn and soybean exports. The program would be limited to certifying the process involved, not the purity of the crop.

G. Are Genetically Modified Crops Needed to “Feed the World?”

The statement is often heard that genetically modified crops are necessary to feed a burgeoning population. The data are clear that shortages in the supply of crops have rarely been the problem in modern time and certainly not in recent decades. Moreover, the supply response to price incentives is substantial.

The problems of hunger and malnutrition are not related to the adequacy of food supplies but rather in the ability of low-income consumers to access food in a market-oriented system of food distribution. The three most important factors in solving the problems of hunger and malnutrition are income, income and income. Those genuinely concerned about the problems of adequate nutrition for the world’s poor should be supportive of efforts at enhancing, as rapidly as possible, the pace of Third World economic development.

The major food producing countries are prepared to feed the world—at least so much of the world as can afford to be fed adequately.

In late August, the World Bank announced a new international consultative process on the risks and opportunities of using agricultural science “to reduce hunger and improve rural livelihoods in the developing world....” The initiative will focus on “a broad range of issues, such as organic agriculture, traditional plant breeding techniques, new farming technologies, and biotechnology.”

H. Conclusions

Clearly, every group involved significantly in producing, handling, processing and distributing foodstuffs as well as the regulatory agencies with oversight responsibility need to be fully aware of the highly dynamic nature of the problems posed by the introduction of genetically modified hybrids. The problems of being able to mask the identities of some genetic features to avoid detection in testing adds to the concern and complicates the public policy response.

Moreover, every group with an interest in the operation of the food system should be aware that the outcome ultimately depends upon the three basic economic relationships outlined above.

Obviously, the prudent course would be to adopt some contingency plans with an eye to a less-than-best case scenario, at least in countries with heavy plantings of GMO crops.