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# What's Ahead For Agriculture?

## *One Ag Dean's View*

by Michael V. Martin

The last few years have seen dramatic change in the policy environment for American agriculture. The completion of a multilateral trade agreement, implementation of the provisions of the North American Free Trade Agreement, various bilateral arrangements and, of course, the 1996 Farm Bill.

A number of organizations, agencies and observers are tracking closely the affects of changes in policies, trade relationships and program adjustments. My purpose is to take a larger, more systematic view of six issues which will certainly shape and reshape American agriculture in the 21st century.

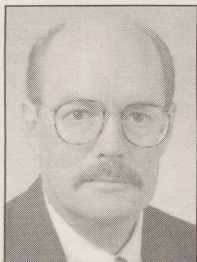
First, however, a modest disclaimer is required. My views on these issues are shaped by training as an economist and recent service as an administrator at a large Midwest land-grant university. These two experiences have ground the lens through which I see the world. Having said this, let me turn to the issues at hand.

### **Structural Change**

We are witnessing dramatic structural change at the farm level, particularly in livestock agriculture. The poultry industry, of course, went through a period of consolidation some time ago. The swine and dairy industries are now experiencing similar change.

In the Midwest, we've seen the number of farms decline while the number of animals has remained constant or increased.

This consolidation and restructuring is engendering a spirited debate over family vs. factory farming. There are many who believe that the emergence of largescale livestock operations, while understandably based on economic considerations, may have significant social and environmental impacts. The controversy over siting or expanding large animal production units is creating conflict within and between rural communities. In Minnesota we have four counties which have banned or are considering limiting expansion of livestock farms. More will surely follow suit. The legality of these actions is still in question. The environmental concerns are, at least theoretically, measurable and ulti-



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mately, solvable. The social considerations are much less specific and accent the intense differences in values. As a consequence, no obvious solutions are available.

Consolidation in livestock production has also highlighted differences, or presumed differences, in state-to-state environmental regulations. Shifts in production between states are often attributed to significant differences in environmental regulation. For example, leaders of Minnesota's swine industry are convinced that North Carolina's emergence as a major swine producer is primarily the result of over regulation at home and/or under-regulation in North Carolina. The accuracy of this assertion can be analytically verified. Still, it has been used as a means of pursuing regulatory reality and assistance in the Minnesota legislature.

Land-grant universities are caught in this controversy as well. If we conduct research aimed at mitigating the negative environmental externalities of largescale livestock units, we are accused of advocating consolidations. If we avoid these issues, we are accused of abandoning commercial agriculture and ignoring significant social concerns. It's a tricky situation indeed.

Dramatic structural change is also occurring in critical parts of the agricultural input sector. Of particular importance is the rapid consolidation, even oligopolization in private sector agricultural biotechnology research and development.

A few large firms have acquired or are acquiring ownership of core biotechnology. While they may bring substantial economies of scale to research and development, they may also conduct business in a profit-maximizing but, some might argue, socially unacceptable manner. They might, for example, withhold some new technologies to maximize sales of some current products or processes.

The ability to own and control powerful, living technologies offers great promise but also prompts great concern. Ensuring that the public interest is protected is a serious public policy matter. Which leads me to a second force shaping the future of American agriculture.

## **Emergence of Biotechnology**

The biotechnology revolution is only just beginning. Still, it holds the promise for enormous change in agricultural production and productivity. Traditional crop breeding and animal improvement programs are giving way to genetic manipulation and engineering. Plant and animal disease control, new product development and environmental protection may be altered substantially through the applications of biotechnologies.

Biotechnology is changing public-private research relationships. The extremely high cost of biotechnology research is leading to two or maybe three levels of

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### *Dramatic change is also occurring in critical parts of the agricultural input sector.*

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land-grant university status: (a) those who have the means and can realize the benefits of this research, (b) those in ancillary roles to the first tier research institutions, and (c) those left behind.

The public institutions which remain central players in biotechnology research will do so because they have struck appropriate and functional partnerships with private sector firms. They will be legally complex, scientifically interrelated and politically hazardous.

Applications of biotechnology may exacerbate problems of international inequality and conflict. Recent decisions by the European Community to block imports of biotechnology enhanced agricultural products may be a harbinger of things to come. Differences over biotechnology may become another form of non-tariff trade barrier. Further, nations that control biotechnology may dominate those who do not. There is no certainty that biotechnology will not lead to further global inequities.

And, as already suggested, biotechnology is accompanied by a very complex

and controversial set of ethical, legal and environmental questions. Unfortunately, the science is sprinting ahead at a pace much faster than our ability to develop policies to manage it.

### **System Sustainability**

The terms "sustainable" and "sustainability" carry considerable baggage in some circles. Still, it is clear that we must develop technologies, management approaches, strategies and policies which will allow for the intergenerational transfer of an economically viable, socially stable, environmentally sound and highly productive agricultural system. Moreover, this broad definition of "sustainable" must be applied across a complex agricultural input, production, processing and distribution system.

Pursuit of sustainability must fully appreciate the complex web of global linkages and dependencies of the agricultural and food system. Policy change and technological innovations in one part of the world impact sustainability – environmental and human – elsewhere. We have yet to fully understand all these profound relationships.

A systems approach to sustainability will require continuous change, innovation and adaptation across all activities and functions of food, fiber and energy production.

### **Rural Infrastructure Constraints**

Among the major constraints to continued growth and development of American agriculture is a rural infrastructure, physical and institutional, under considerable strain. Rural roads, bridges and communication technologies will demand substantial investment and reinvestment if we are to remain competitive in global markets and enhance rural socio-economic viability.

Needs for physical infrastructure are fairly easy to identify and quantify. Though they are very expensive, needs for social or institutional infrastructure are much less obvious but no less important. Farmers and other rural citizens require access to education, healthcare, information and social services. Twenty-first cen-

tury information and communication technology are becoming as important to farming and agri-business as fertilizer and processing equipment. For all the well known reasons, provision of such infrastructure is a major fiscal and logistical challenge.

### **A Shortage of Human Capital**

As agriculture, broadly defined, moves through substantial change and transformation, perhaps the single most binding constraint to genuine progress will be a shortage of well educated, adaptable professional managers. A complex set of social and demographic factors have given rise to a very steep decline in the number of young people entering the work force with "farm backgrounds." In our case at the University of Minnesota, less than 25% of the students entering the College of Agricultural, Food, and Environmental Sciences are from farms. Very few intend to return to production agriculture. Many seek opportunities only peripherally related to agriculture.

Over the past five decades, agriculture has released an enormous management and work force to other sectors and industries. We may now have reached a point where some reverse flow must occur.

We understand the daunting challenges associated with remaining globally competitive, environmentally sound and technologically advanced in agriculture. We will need managers across all functions of the agricultural and food system who can meet these challenges. Failure to supply a cadre of well-trained, creative and progressive managers will do serious harm to this essential sector.

### **The Urgent Need for a National Agricultural Research Policy**

American agriculture has benefited from a long-term commitment to research and technology transfer. A system which dates back to 1862 has performed remarkably well.

But, we are at a turning point in U.S. agricultural research. There is a pressing need for a new comprehensive agricultural research and technology transfer policy.

Land-grant universities, The U.S. Department of Agriculture's (USDA) Agricultural Research Service (ARS) and other research institutions are competing for the declining pool of public research funding. Agendas of USDA, the National Science Foundation, The National Institutes of Health and other research funders are uncoordinated and lack common themes and objectives.

As the private sector sponsors a larger share of university-based food and agricultural research, public and proprietary interests become intertwined. Increasingly, private funders are "leveraging" public funds for primarily private benefits. This represents an inversion of a long-standing relationship.

We have reached the point where a comprehensive agricultural, food safety and nutritional, environmental and international research policy must be developed. It must set out a larger research framework and identify resource needs.

Recent legislative initiatives have focused on increased oversight and accountability but have focused little attention on the broader directions and goals – the

larger research. I fear we are being held more accountable for less meaningful outcomes.

### **Summary and Conclusion**

We know that agriculture is now adjusting to a new policy regime under the 1996 Farm Bill and the accelerating globalization under NAFTA, GATT and other agreements. Over the next few years, we will see the consequences of policy deregulation. At the same time, pressure from environmental interests, animal rights groups, preservationists and others will force changes in management at the farm level and elsewhere.

In the longer term technology development, transfer and adoption along with other more fundamental investments, will be a central force reshaping the complex agricultural sector. The ways it will be reshaped cannot now be determined. But, real change is occurring and will continue. The future will most assuredly look quite different from the past. And the six forces outlined above will influence how different it will look. ▲