
Biotechnology and Social Issues in Rural Agricultural Communities: Identifying the Issues

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INTRODUCTION

Biotechnology, and specifically genetic engineering (GE), is promoted as a key to expanded agricultural production and sustainable rural economies. GE is offered as a response to limits encountered in conventional production systems, as a way to overcome environmental and resource quality barriers to increased food production, and as a green response to ecological problems originating both in and outside of, industrial agriculture. Biotechnology is also offered as a set of practices that will reduce the cost of production, increase efficiencies, and keep agrarian economies competitive in world markets. Agricultural biotechnologies are promoted as compatible with, and crucial to, sustainable development of rural agricultural economies — and, by extension, the farm communities involved.

Biotechnology cannot be understood merely as a set of powerful techniques. Rather, the development and application of biotechnologies must be contextualized, and this context is a partnership between scientists and agro-industry firms promoting an industrial agriculture in which high-tech inputs play a pivotal role. This reading of biotechnology was reflected in a brief definition proposed by Hindmarsh (1991): “Biotechnology is the scientific manipulation of organisms at the cellular level in order to produce altered, or novel, organisms that carry desired or programmed functions, invariably to facilitate industrial production processes.”

I will interpret social issues broadly in this discussion of biotechnology research, development, and application. Do the social relations promoted by GE enhance or constrain the achievement of a broad set of societal goals? In rural agricultural communities, the social issues include equitable sharing of costs and gains, freedom from coercion or involuntary participation, participation in decision making, accountability, and the social sustainability of communities, as well as the opportunity for many community members to own agricultural resources and to farm. Production systems that displace and marginalize people and communities should not be easily accepted as sustainable.

Markets and technologies are increasingly viewed as the natural arbiters of development, and criteria of economy and efficiency have been positioned ahead of all others (Levidow, 1993). But most economic issues are also social issues, as are questions of power, information, access, and risk. Ecological issues overlap with social issues because they jointly impinge on health, intergenerational equity, aesthetic values, and the social ecology of sustainable resource management. Ethical, philosophical, political, and cultural concerns are also social issues. I want to focus a portion of this discussion particularly on the cultural implications of agricultural biotechnology.

What rural agricultural communities are we talking about? Although many of these observations would apply to other regions north and south, the prairies of western Canada are uppermost in my mind. Even in this mostly agricultural portion of the rural landscape, farmers are a minority. Rural agricultural communities include many nonfarming households, with or without close connections to agriculture. Communities should be understood as complex phenomena with no single logic underlying their existence. There are ranching and farming communities, Hutterite colonies, Indian reservations, and recreational communities.

Moreover, whether growing or declining, the local settlement is not the only source of community. Its inhabitants may be more closely associated with communities based on shared involvement or interests — in politics, organic farming, holistic range management, exotic livestock, choral singing, nursing, education, or religion. Moreover, community is not assured: many have had to deal with an absence of community, or worse, a community that is unsympathetic to the fates of individuals.

Having opened the door for a wide array of social issues and having signaled that communities are heterogeneous and contingent, I will turn to specific issues arising from agricultural biotechnology research and commercialization. I have focused on ten reasons why agricultural biotechnologies may be, may become, or should be social issues in rural communities. Some of the concerns are long-standing and well documented. Others are new, not commonly articulated, or only latent possibilities. The issues are risks and costs borne by farmers, implications of industrialization and accelerated structural change,

potential impacts on farmer-owned and regional firms, increasing tensions and divisions, loss of independence, changes in the culture of agriculture, loss of control, lack of effective participation in research agenda-setting, narrowing of research agendas, and neglect of alternative conceptions of sustainable agricultural development.

COSTS AND RISKS INCREASE WITHOUT ASSURANCE OF GAIN FOR FARMERS

Although the case for the environmentally friendly character of GE is based, in part, on the promise of reduced need for pesticides, the evidence in terms of use levels is not convincing. Breeding for herbicide tolerance has been a major priority in the industry and is associated with increased reliance on herbicides (Hindmarsh, 1991). As herbicide use continues to increase, farmers, farm workers, and rural inhabitants are exposed. Epidemiological studies are constantly revealing new threats from agrochemicals once regarded as safe.

It is farmers who must deal with the problems of herbicide-resistant weeds, a problem more widespread than commonly acknowledged. It is farmers, also, who face new risks related to the transfer of herbicide tolerance from genetically engineered organisms (GEOs) to weeds — and the prospect that some GEOs will become problem weeds. Of local interest in this respect, the transfer of transgenic herbicide resistance from canola to field mustard has been detected under field conditions (Snow and Palma, 1997).

The use of expensive GE seed does not guarantee a commensurate increase in yields. Crop failure resulting from frost, hail, drought, flood, pests, or pathogens is always a possibility. Moreover, given price elasticities and problems of oversupply, expanded production does not necessarily translate into higher farm incomes at the sector level.

Supply companies and firms licensing particular GEOs are adept at charging what markets will bear. Economic benefits arising from these technologies are likely to be taxed away by those holding the patents. The contracts presented to farmers on a take-it-or-leave-it basis illustrate the unequal character of the relationship. Monsanto's Gene Agreement for Round-Up Ready Soybeans prohibits farmers from saving or from selling or supplying the seed to any person or entity. Growers pay a \$5 per pound technology fee over and above the price of seed and royalties. The company takes no responsibility for performance of the product, but farmers are held liable for damages should they violate any part of the agreement. Monsanto has the right to visit the fields involved, without permission, for a period of three years (Shiva, 1997). In 1996, some Texas farmers who planted Bollgard, a GE cotton that produces Bt to fight bollworm, found themselves spraying for the pest the crop was supposed to repel. Monsanto claimed the plants performed as expected (Shiva, 1997; Commins, 1997).

Agrobiotechnology firms are patenting every process and organism they can and spending large sums litigating the competing claims. Calgene, recently acquired by Monsanto, has patented the production of canola transformed by any means. A Minnesota entrepreneur has patented all nutritive and therapeutic components of flaxseed. Rather than racing to publish their findings, scientists are racing to the patent office. One result is duplicated effort and much time spent trying to figure out what is still in the public domain (Rance, 1997b; Commins, 1997). Producers will end up paying the cost.

INDUSTRIALIZATION AND ACCELERATED STRUCTURAL CHANGE IN THE FARM SECTOR

Biotechnology is being introduced in the context of the increasing industrialization of farming. As a leading aspect of this technical and organizational restructuring, biotechnology cannot be easily separated from the wider set of issues surrounding industrial agriculture. Moreover, biotechnology is important in the development of responses to the environmental, agronomic, and veterinary problems encountered when industrializing livestock and crop production. This may permit further development without addressing fundamental contradictions and inefficiencies.

As is true with many kinds of technology, biotechnologies may have implications for the survival of farmers who have specific attributes such as smaller or undercapitalized farmers, those with less formal education, or those who reject a strictly productivist approach. As has been documented with respect to high-yield or high-response cultivars developed as part of the Green Revolution initiative, technologies may not be resource-neutral even where they are scale-neutral in a technical sense (Bernstein, 1992). Though biotechnology is divisible, the level of investment required, the increased risk, and need for higher levels of management mean that larger and more capitalized farmers will benefit disproportionately.

Biotechnologies are expensive and are likely to be most successful in the market if they can be incorporated as components of production systems that reduce labor inputs and associated costs. Time and cost-saving, not soil conservation, have been the most important impetus for the adoption of zero-till systems (McMillan, 1997). Biotechnologies that allow farmers to expand their operations without adding labor are most likely to find acceptance. In the process, the concentration of agricultural resources in the hands of larger farmers is likely to be accelerated.

RAPID RESTRUCTURING MAY THREATEN FARMER-OWNED AND REGIONAL FIRMS

Biotechnologies are associated with strong economies of scale in research, testing, licensing, and marketing. This has contributed to rapid concentration in the seed and agrochemical industry. It may also mean that farmer

cooperatives — organizations in which farmers retain some measure of control — will find themselves at a competitive disadvantage compared to other firms. Cooperatives have relied heavily on public sector research. The privatization of biotechnology research may limit access to new developments. Given the resources needed and the prior patenting of many key processes, most cooperatives are not well placed to compete in the development of biotechnology. Strategic alliance with input firms is a possible strategy, but even if alliances can be negotiated, there are implications for the character of the cooperatives involved. Moreover, those that fail to make such alliances may face rapid demise (Ransom et al., 1995).

INCREASING TENSIONS

Biotechnologies are likely to create deeper divisions between farmers subscribing to different models or systems of production, between farmers and nonfarm rural populations, and between farmers and the nonrural public. Dairy farmers may be split on the merits of bovine growth hormone (BGH). Beekeepers experience a threat to export markets when genetically engineered crops become part of the local landscape (Tjaden, 1997). There is the prospect for increased litigation as farmers and suppliers contest the sharing of risk and liability and the enforceability of contracts.

Organic farmers may feel even more marginalized and excluded as farming and the rest of agriculture are repositioned to embrace these new technologies, but they may experience some increased demand from consumers distrustful of, or disaffected with, the new conventional forms of agriculture. Debates and groups are likely to become more polarized, despite sporadic efforts to kindle consensus or to find common ground.

FARMERS LOSE INDEPENDENCE IN RELATIONS WITH CONSUMERS

Farmers rely on processors, manufacturers, retailers, and the food service industry to handle relations with consumers. These firms have interpreted consumer preferences and demands in ways that promote flexibility and efficiency from the corporate perspective. Response to consumers has been selective and often proactive — attempting to remake consumers in the image of the food industry rather than to respond genuinely to consumers' concerns and desires. Farmers have relied on value-adding firms to set standards and create new tastes, but these firms have engaged in a long-term project to deskill the consumer with respect to knowledge about quality, nutrition, production, processing, and cooking. Farmers are trapped: if they wish to market their commodities in conventional channels, they must do so via intermediaries, and these intermediaries have great power over production practices.

As farmers become more closely linked to suppliers and processors, consumers are beginning to show signs of rebellion and rejection in the face of the perceived risks of industrialized agriculture. The popularity of

vegetarianism and the precipitous drop in beef consumption in countries affected by mad cow disease are harbingers. Farmers stand to pay the highest price for any agroindustrial mishaps or backlash from consumers. Farmers face a difficult choice: whether to join with agribusiness public relations personnel in dismissing consumers' fears about biotechnology and industrial agriculture or to find new ways to reconnect with consumers who have a genuine interest in the conditions and practices surrounding food production. This is not a minor issue because consumers now far outnumber all other participants in the agri-food sector and the environmental movement is perhaps the most powerful social movement in the world today. If farmers do not want to be sideswiped by the irrational fears of consumers, they have to take more seriously the rational fears, as well as the aesthetic and ethical concerns with respect to livestock, the environment, and human health.

CHANGES IN THE CULTURE OF AGRICULTURE

Farming tends to be organized along patriarchal lines. Men own most productive resources and dominate production decisions. There are signs of change in response to economic exigencies, changing demographics, and the initiatives of women. Nevertheless, the culture of farming and agriculture remains fairly macho and male-dominated. What do this fact and evidence that females are more likely to have reservations about agrobiotechnologies (Brandth and Bolso, 1994), imply for the future of women in farming and the agroindustries? This is not a trivial issue for women, and it is a source of vulnerability for family farming and farm communities. Women may become estranged from the new technologies and less willing to farm. Women and men who cannot relate to the new paradigm will be increasingly alienated, contributing to a loss of cultural diversity in farming and agriculture.

FARMERS TRANSFORMED FROM SUBJECTS TO OBJECTS OF AGRICULTURAL PRACTICE

For many farmers, the cumulative effect of financial pressures, restructuring, and high-pressure promotion of high-tech farming systems leads to a feeling that they have been transformed into the objects of agricultural practice rather than subjects — that is, pawns rather than masters of their own destinies (Lind, 1995). They sense a loss of control, a mismatch in terms of information, and that they are market targets for private sector firms with strong links to public sector institutions.

The proliferation of new varieties may reduce the ability of farmers to make meaningful choices with respect to cultivars appropriate to their regions and cropping systems (Rance, 1997a). A related problem is the loss of information related to genetic diversity. Commonly used genetic materials and varieties promoted as different though they are similar make it harder for producers to exercise strategic choices with respect to diversification of varieties and breed

lines. Moreover, it may be increasingly difficult to know whether it is worthwhile to pay a premium for a new variety. Farmers become more like consumers — less able to distinguish quality because of product proliferation, lack of information, and disinformation.

NO EFFECTIVE PARTICIPATION IN SETTING RESEARCH AGENDAS

Knowledge and information translate into economic and political power. In the world of high-tech inputs, farmers and other rural citizens are increasingly disadvantaged, unable to weigh or debate the merits and implications of proprietary products and processes. This will reduce the prospect for effective participation in the oversight of public research agendas, not to mention decisions related to research and development activities of private industry.

Reorientation toward biotechnology implies a redrawing of the social networks of researchers and changes in the corporate culture of research organizations. Emphasis on products generated in labs, greenhouses, and factories is likely to reduce interaction and identification with primary producers. The culture and concerns of the research community will shift to become more focused on corporate agroindustry partners and fellow scientists and less on farmers and rural communities. Farmers may end up with less access and voice with respect to research priorities and design criteria.

NARROWING OF PUBLIC RESEARCH AGENDAS

The orientation of university research toward biotechnology and funding from the private sector is likely to narrow research agendas to focus on innovations that can be sold at a profit, thereby accentuating the neglect of cultural practices, integrated pest management, alternative cropping systems, and low-input farming. Researchers will need to generate a patentable product that meets criteria for commercial success. Other focused initiatives that might lead to improvements in resource productivity, sustainability, or environmental safety — or to major cost savings for large numbers of producers — will be neglected.

The promotion of biotechnology leads to a lack of diversification in the research portfolio. It can also stifle critics and those interested in other kinds of innovation. The merits and potential of biotechnologies have been presold by politicians, university presidents, and deans of agriculture. Even senior professors may hesitate to admit reservations publicly, or to discuss alternatives.

The narrowing of debates around new developments is a real risk. Recently, North Dakota became the thirteenth state to pass legislation making disparagement of agricultural products a civil offense unless the critic has a reliable scientific basis for the assertion (Kesterton, 1997). It does not take a paranoid person to wonder where this policy might lead with respect to debates over GEOs. Some farmers are willing parties to the promulgation of such restrictive covenants. Others worry about a chilly climate for alternative visions.

NEGLECT OF SUSTAINABLE AGRICULTURE AND SUSTAINABLE DEVELOPMENT

Even when agricultural biotechnologies are targeted at challenging environments, they may contribute to a crisis in resource degradation, whether the challenge comes from water shortage, salinity, climate change, or the concentration of livestock in feedlots. The apparent power of GE strengthens and perpetuates an engineering mentality with respect to nature, agriculture, and rural communities. As Martha Crouch has observed biotechnologies may allow producers to overcome the presenting problem, but they may also contribute to perpetuation of conditions that will lead to collapse (Canadian Broadcasting Corporation, 1994).

Biotechnologies give industrial agriculture a new lease on life. The social and environmental consequences may be serious. The surface success of the biotechnology diverts attention from holistic approaches involving the rethinking and redesign of production and consumption systems. As Crouch suggests, the technical limitations of biotechnologies make them intrinsically reductionist and too one-dimensional to deal adequately with what are mostly whole-system-level issues (Canadian Broadcasting Corporation, 1994).

Peasants in the developing world are often relegated to marginal lands. Should new technologies render commercial production feasible on such sites, historical evidence would suggest a new round of evictions and appropriations by the rich and the powerful. This example reveals the heroic oversimplification involved in claims made with respect to the promise of agrobiotechnology as an instrument to fight hunger (Canadian Broadcasting Corporation, 1994). The challenge in these environments is first of all political, and the need is for broad agrarian reform.

SOME CONCLUSIONS

GE has been compared to earlier breakthroughs in nuclear physics. The atom was cracked for military purposes, the agenda pushed forward by war and the Cold War. The military-industrial complex sought wider public acceptance by promoting the advantages of the atom for peaceful purposes. The gene-splicers working in the university-industrial biotechnology complex are seeking public support for an agenda driven by cold cash and corporate competition. Expensive and ethically challenged research and development efforts are sold to the public via appeals to environmental protection and alleviation of famine. The rationales are often as tenuous as earlier plans to use nuclear explosions for road building.

Many of the heralded ideas of conventional agriculture are now seen as ill-advised. After decades promoting specialization, extension departments have focused on diversification. Chem-fallow, zero-till, and continuous cropping are the new orthodoxies replacing widely promoted conventional fallow practices.

Many pesticides have come and gone as a result of resistance or other side effects. In turn, the claims surrounding agricultural biotechnology will also be modified as we discover limitations, costs, and alternatives. The problem this time, however, may be different. The capacity to introduce biotechnologies on a global scale and their association with an intensified, industrial agriculture mean that their impacts can be threatening to the planet as well as damaging to local ecologies, economies, and communities. Many rural people share such concerns. Their misgivings will not be allayed by public relations, scientific education, or appeals to the integrity of regulatory processes.

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