



Globalization, biotechnologization of agriculture and farmers

The quasi-employees of the new high technology farms

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481

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Abstract *One of the major changes associated with economic globalization is the increasing importance of intellectual property. In the area of food production, the procurement of intellectual property rights over life forms, particularly seeds, by the new life industry is radically transforming agricultural production relations. One major effect of this transformation is the redefinition of farmers as contract growers by the life industry. This new status of farmers, which is part of a trend that was set in motion with the commodification of food, is making them free-lancing quasi-employees of agricultural businesses, including the life industry.*

Introduction

Intellectual capital, one of the main driving forces behind economic globalization, is also ushering us into a new transition in food production. This is described in this paper as the biotechnologization of agriculture, and is based on genomic intellectual capital derived from genetics and molecular biology. Biotechnologization of agriculture is emerging as one of the primary manifestations of the globalized knowledge-based economy. Besides the deployment of revolutionary new technologies, the new transition in food production also accentuates the transformation of agricultural production relations, and, in turn, a further decline of the farmers' role in the food production system. This process has been ongoing since the "discovery" of agriculture, and especially since the onset of industrialization some two centuries ago. The implications of the biotechnologization of agriculture are not only seen in the introduction of novel genetically modified food, but also in the food production process itself. This paper examines the nature of farmers' transformation into quasi-employees through the biotechnologization of agriculture.

The paper begins with a very brief review of the historical status of farmers prior to the industrialization of agriculture, followed by their transformation from independent self-sufficient food producers to dependent producers, especially during the post-war period of the accelerated industrialization of agriculture. Two interrelated features that made this transformation possible are: the emergence and growth of agricultural businesses and the associated increases in the external dependencies of agricultural production. Attempts to

globalize industrialized agriculture under the banner of the “green revolution” spread this transformation of the farmers’ status beyond the borders of the industrialized world.

I also point out that the biotechnologization of agriculture transition is bound to accelerate the transformation of farmers into quasi-employees within the global agri-food production system. In outlining the key dimensions of this new transition in food production, it should be noted that the biotechnologization of agriculture occurs within the structural context of economic globalization, and therefore, it shares the attributes of economic globalization, including inter-capital competition, as well as the consolidation and vertical integration of industry. Besides, the fact that the biotechnologization of agriculture is emerging within the milieu of economic globalization implies that the changing status of farmers is global in scope.

Historical status of farmers as independent producers in the food production system

The acquisition of food and fibre by human society has gone through a number of transitions since the days when our ancestors roamed the earth foraging for edible plants and hunting game (Macionis and Gerber, 1999; Buttel, 1995; Leacock, 1978; Malassis, 1973). Macionis and Gerber (1999, p. 88) point out that all members of human society were hunters and gatherers prior to 10,000 years ago. Since all adult members of society were “farming” for food from the bounty of nature there was no special category of farmers.

Starting about 10,000 years ago, domestication of crops and animals began to replace the direct harvesting of food from nature in various parts of the ancient world. A new category of farmers, who were either horticulturalists or pastoralists, emerged to focus on food production as a primary occupation, who were still independent operators producing food for themselves and for exchange (Lenski and Lenski, 1995; Malassis, 1973).

The emergence of agriculture as a more deliberate and intensive cultivation of crops and animals about 8,000 years ago marked an important watershed in the status of farmers (Macionis and Gerber, 1999; Thompson, 1995; Winson, 1993). As pointed out by Macionis and Gerber (1999, p. 13), the agricultural transition resulted in the intensification of animal domestication and crop cultivation, which more than the previous transitions prepared the grounds for the generation, creation and concentration of farming wealth.

Industrialization of agriculture and the marginalization of farmers

The industrialization of agriculture, which emerged after the industrial revolution some 200 years ago, has led to a major decline in the farmers’ status (Thompson, 1995; Winson, 1993; Scott, 1984). Winson (1993, p. 8) and others claimed that most of the precipitous decline in the farmers’ status as independent producers emerged primarily as a result of the post-war corporatization of food production, processing and distribution, as exemplified by the emergence and growth of agricultural businesses. Winson (1993, pp. 96-7) points out that the

growth of agricultural businesses in post-war Canada in the areas of food transportation, processing and distribution changed the farmers' status from independent to dependent producers. Production decisions, for example, are highly influenced by the preferences of food processors and large-scale retailers (Raeburn, 1995; Davis, 1980). Thompson (1995, p. 23) concurs, suggesting that the loss of control over the tools of agricultural production by farmers, as well as the dispersal of control over food processing and distribution, have radically changed the relationship between farmers and the food they produce. Buttel (1980) also claims that, since the industrialization of agriculture farmers have ceased to be major players in the food production system, dependence on agricultural businesses for input, as well as for processing and marketing of crops has become a prerequisite for farming "success" in industrialized agriculture. Davis (1980) has thus suggested that farmers are being proletarianized in such systems.

Over the last three to four decades, there has been a growing social movement partly aimed at preventing further erosion of the farmers' status with a related decline of agrarian communities (Shiva, 1997; Buttel, 1995; Clark and Lowe, 1992). Buttel (1995) described this social movement in food production as the environmentalization of agriculture. It is a transition in food production geared towards an overall reduction in external dependencies in farming, thereby protecting the status of farmers and family farms. In addition, it aims at the reduction of environmental related to the industrialization of agriculture (Buttel, 1995; Vail *et al.*, 1994). The environmentalization transition, which gave rise to the organic food movement, enjoyed rapid growth in the last decade (Shiva, 1997). The environmentalization of agriculture and its implications for the farmers' status is now facing stiff competition from the evolving biotechnologization transition, which appears to be leading to further erosion of the farmers' status in the global food system. Against the background of the weakened status of farmers, who operate outside the organic paradigm, the biotechnologization of agriculture is emerging. The impact of the new biotechnologization transition on such farmers, their communities and on food security is the subject of the following sections.

Globalization, biotechnologization of agriculture and farmers

Globalization

Waters (1995) has appropriately described globalization as the key social concept of the 1990s. Globalization has been emerging as a concept with multiple meanings depending on its context (Kiely, 1998). In general, however, globalization is used as a descriptive concept for the major social transformation whereby societies, politics, cultures and economies of the world are coming closer together (Kiely, 1998; Giddens, 1990). At the political level, globalization implies, among other things, the growth of liberal democratic systems all over the world. Culturally, the proliferation of information technologies is increasingly homogenizing popular culture globally. Giddens (1990, p. 64) also pointed out that, as part of globalization, advanced

information and telecommunication technologies have “reduced” both time and distance, which coupled with the increased fluidity of capital movements, has intensified inter-capital competition. The competitive pressures of globalization, in turn, have increased the pace of technological change, industrial consolidation and vertical integration, as transnational companies juggle for global supremacy (Barrel and Pain, 1997).

Besides the inter-capital competition and associated re-structuring of industry, the internationalization of capital, the economic dimension of globalization is also characterized by the merging of markets. One implication of this economic globalization that have attracted a lot of attention in both academic and popular discourse is the use of threats by industry to garner concessions from Western-based labour (Blyton *et al.*, 1998; Wood, 1995; Brecher and Costello, 1994). Wood (1995) claimed that most of the adverse effects associated with this strategy has been experienced by resource industries, and by semi-skilled labour. Another element of economic globalization of particular interest in this paper is the ascendancy of patentable knowledge or intellectual capital as the main platform for generating economic wealth and prosperity (Lind, 1995), making the so-called knowledge-based industries the linchpin of economic globalization. It is becoming increasingly clear that companies of the globalizing world no longer thrive on factories or on other fixed assets, but on their intellectual assets. The actual production of goods under the intellectual property regime is often “out-sourced”, as is the case in the shoe industry, to other smaller firms or free-lancers who may be in a different continent from the headquarters of the corporate owners of the intellectual property.

Within this economic globalization milieu, the biotechnologization of agriculture is emerging. As a key component of economic globalization, the biotechnologization of agriculture is also marked by rapid technological changes, the centralization of intellectual property and its vertical integration to industry. Besides, biotechnology and information technology are currently the central components of the new emerging knowledge-based global economy. The trends in the biotechnologization of agriculture and its linkage to economic globalization are highlighted below. This serves as the background for analyzing how this new transition in agricultural production is accelerating the farmers’ transformation into quasi-employees of agricultural business.

Biotechnologization of agriculture

Biotechnologization of agriculture represents the ongoing attempts to transform agriculture through the commercial deployment of biotechnological innovations, as a result of newly acquired insights in molecular biology and genetics, and, in turn, the development of technological products and processes based on living organisms for commercial purposes. The resulting products and processes are collectively described as biotechnology (*Agbiotech Infosource*, 1999; Grace, 1997), some of which involve the identification and isolation of genes controlling the desired traits, the isolation and copying of

such genes, and their insertion into another organism to produce transgenic organisms or products. Biotechnology also includes cell culture technology, cell fusion technology, enzyme technology and immobilization technology, among others (Rifkin, 1998; Gottweis, 1997). Currently, however, most of the technologies involved in the biotechnologization of agriculture come under genetic engineering, which involves the modification of genes to change the characteristics of a targeted organism. As a source of intellectual property, biotechnology spawned a new agricultural industry, known as the life industry, which primarily consists of restructured agricultural chemical companies, pharmaceutical and seed companies. With the support and encouragement of the state, especially in North America, the life industry is the main institutional force behind the biotechnologization of agriculture.

Trends and pace of the biotechnologization transition

Though at a relatively early stage, the biotechnologization of agriculture has made a strong global impact over the last few years. In 1986, about 25,000 field trials of genetically modified (GM) crops were conducted around the world (RAFI, 1998). In 1996, 1.7 million hectares of agricultural land was devoted to the commercial cultivation of GM-crops globally. By 1997 the acreage devoted to the cultivation of GM-crops had increased to 11 million hectares, which was more than doubled in 1998 to 27.8 million hectares worldwide (RAFI, 1999; Clive, 1998; Krattiger, 1998). Over 70 percent of this worldwide cultivation in 1998 consisted of herbicide-tolerant crops, with insect-resistant crops making up about 28 percent (Clive, 1998). Most of these sharp increases primarily resulted from increases in a few countries growing commercial GM-crops, including the USA, Canada, and Argentina, each of which experienced a growth in commercial cultivation of GM-crops in excess of 100 percent between 1997 and 1998 (Clive, 1998; Nickson and McKee, 1998). This, in turn, also means bigger markets for the “creators” and owners of various GM-seeds. In 1998, for example, the global market of GM-seeds was worth US\$1.3 billion, and is expected to reach US\$2 billion by the year 2000. The world market for all agricultural biotechnology products “is forecast to reach \$50 billion annually by 2005” (*Agbiotech Infosource*, June 1999).

A closer look at the Canadian scene provides further insight into the rapid growth of the biotechnologization transition. Herbicide-tolerant canola was patented and approved in Canada in 1996. In the same year 50,000 acres of Roundup Ready canola was planted in western Canada (*Star Phoenix*, May 1, 1999). Two years later, in 1998, 3 million acres of this GM-crop was grown. The acreage is expected to increase in 1999 to between 5 and 6 million acres. This increase will mean that 45 percent of the canola crop in western Canada, and 70 percent of canola crop in Saskatchewan will be made up of GM-varieties (*Star Phoenix*, May 1 1999). In 1998, about 20 percent of corn planted in Canada, i.e., 240,000 out of 1.2 million acres, were GM-varieties. This is expected to increase in 1999 to 356,000 acres, which will amount to 33 percent of the total corn acreage. The cultivation of other crops is showing similar trends. In 1998, for

example, 100,000 acres of GM-soybean was cultivated in Canada. This is expected to increase by more than 50 percent to 156,000 acres in 1999 (Krattiger, 1998). In Saskatchewan, agricultural biotechnology was estimated to be a \$100-million industry in 1998, representing a 300 percent growth rate over five years.

Life industry consolidation

Besides the rapid pace of commercialization, the biotechnologization of agriculture is also characterized by increasing consolidation and vertical integration in the life industry sector. This is partly a consequence of competitive pressures associated with economic globalization, which is not limited to the life industry (Barrel and Pain, 1997; Veeman and Veeman, 1978). Over the last three years, the key industrial players behind the biotechnologization of agriculture have become fewer and bigger (Shiva, 1999; Hardy and Segelken, 1998; Tokar, 1998; RAFI, July/August 1998; Vidal and Milner, 1997). Examples of recent consolidations in the life industry sector include major acquisitions and mergers undertaken by Monsanto, a leading US-based life industry, which is reported to have spent over US\$8 billion since 1996 to buy, merge or initiate the acquisition of other key players in the industry (RAFI, April 1999). Agracetus, a subsidiary of W.R. Grace, which was purchased in 1996 for US\$150 million is one of the companies which has come under the umbrella of Monsanto. Calgene, the California-based plant biotechnology company that brought us the Flavr Savr tomato, was also purchased by Monsanto in 1996 for US\$340 million (RAFI, July/August 1998; Shiva, 1999). In 1997, Monsanto purchased Sementes Agrocerus, the leading seed corn company in Brazil. These were followed in 1998 with the following purchases: Cargill's seed operations for US\$1.4 billion, Delta and Pine Land for US\$1.82 billion, and De Kalb Genetics for US\$3.2 billion (RAFI, April 1999; Shiva, 1999). Monsanto also owns Holdens Foundation Seeds, a leading player in the US maize seed market, as well as Asgrow Agronomics, a leading breeder and distributor of soybean (Tokar, 1998, p. 259). The significance of these consolidations is illustrated by the fact that De Kalb Genetics is the second largest seed company in the US. Delta and Pine Land, on the other hand, is the largest cottonseed company in the US, supplying seed for 70 percent of US cotton acreage (Robinson, 1998, p. 143).

Other consolidations in the life industry sector include the merger of AgrEvo of Germany, with Rhone-Poulenc of France to form Aventis, which is currently considered to be the world's largest life industry, with annual sales of about US\$20 billion, and control over about 40 percent of agricultural biotechnology R&D dollars in the private sector (RAFI, April 1999). In March 1999 DuPont, another US-based company, announced its plans to acquire the remaining 80 percent interest in Pioneer Hi-Bred, which it did not already own, for US\$7.7 billion (RAFI, January/February 1999). DuPont already owns 20 percent of Pioneer Hi-Bred, the world's largest seed company. Astra of Sweden and Zeneca of UK have also pooled resources to form AstraZeneca, with the aim of

staying competitive in the rapidly declining field. Most observers expect the life industry sector, the driving force behind the biotechnologization of agriculture, to be reduced even further in the near future.

Quasi-employees
of the new high
technology farms

Rationale underlying the biotechnologization of agriculture

The overarching rationale for the biotechnologization of agriculture is that the global food production system is deficient, requiring immediate improvement, which is linked to the fact that human population is growing rapidly around the world. Increasing global population and the existence of widespread hunger, especially in the developing world, have been presented as evidence that global food production needs a boost. Nickson, a co-director of ecological technology for Monsanto, a leading life industry, for example, points out that “the world’s population is projected to double in the next 40 years and the demand for food is projected to triple because of the growing middle class” (quoted in Fischer, 1998, p. 5). Proponents of the biotechnologization transition suggest that the rapid population growth and consequent demand for increased food supply is confronted by a fixed, and in some places decreasing, agricultural land area. As population expands and the rate of urbanization increases, the land available for agricultural production, which is estimated to be about the size of North America, is likely to decrease. Advocates and proponents of the biotechnologization of agriculture claim that the challenge posed by limited cultivable land, coupled with a rapidly expanding population, cannot be met by the current agricultural system. It is, therefore, deemed necessary, and indeed a high priority, to transform agricultural production with the aid of biotechnology (Mikesell, 1999; Krattiger, 1998; Kingsnorth, 1998; Robinson, 1998). The life industry and its supporters claim that the biotechnology will ultimately “enable farmers to produce food in a cost effective, socially acceptable and environmentally sound manner” (Nickson and McKee, 1998, p. 97; emphasis added).

Biotechnologization and the transformation of farmers into quasi-employees

Proprietary claims over genetically modified seeds by the life industry as part of this new transition in the acquisition of food has meant a further erosion of farmers’ control over one of the critical inputs of agricultural product. Farmers in the biotechnologized agriculture are usually promised more effective means for dealing with agricultural pests. As part of the cost of this so-called empowerment over the production process, farmers make contract arrangements with life industries, in which farmers are redefined as “contract growers”. In my view, this redefinition is not a meaningless exercise, but alludes to the redefined status of farmers. Although contract growers literally buy the seeds, and pay an additional technology use (TUA) fee, which is \$15 per acre for Roundup Ready canola in Canada and \$79 per hectare for boolgard cotton in the US, the life industries remain the real owners of the seeds being tied to the patents they hold for the GM-seeds.

The quasi-employee status usually starts with the owners of the GM-seed providing information on the benefits of the new seeds to farmers' forum. Industry also explains effective ways of using the new agricultural technologies, and has pre-set conditions under which farmers can use the seeds if they switch to biotechnologized farms (Reynolds, 1999). Contract growers cannot give seeds away to neighbours, neither are they allowed to save seeds for re-planting. In the case of GM-canola growers in western Canada, the contractual obligations are in force for a three year period, within which the relations between industry and the contract growers includes the auditing of the farming operations of the quasi-employees, and disciplinary measures taken by industry in cases of violation of the terms of the contract. The disciplinary measures taken to date include: asking offending contract growers or patent-infringing farmers to pay the technology fee as well as returning all their profits from the crop to industry. Alternatively, the violator has to plow under the entire crop (Reynolds, 1999; *CBC Magazine*, June 8 1999; *Star Phoenix*, May 1 1999). As Reynolds (1999, p. 85) has pointed out, life industries retain the right to decide about the disciplinary action taken against violators. Violating contract growers or other infringers of patents, for that matter, are barred from publicly disclosing the terms of settlement with industry.

As quasi-employees on the new high technology farms, the "wages" of the contract growers are represented by the promised marginal increases in GM-crop yield over conventional seeds, which, however, are not guaranteed by industry. The quasi-employee contract growers may also be recruited as "spies" for industry on non-contract growers and other contract growers suspected of violating the contract terms. Until recently Monsanto, for example, established a toll-free phone for contract growers to report their neighbours and other farmers suspected of using GM-seeds illegally (Reynolds, 1999; *Star Phoenix*, May 1 1999). The company offered leather jackets in reward for such services (Reynolds, 1999, p. 85).

Biotechnologized farms are becoming competent agricultural production units to which industry can "out-source" food production. Thus, the quasi-employees of the high technology farms share a great deal with the rapidly growing population of self-employed workers. Like other self-employed workers, and quasi-employees in industry, some biotechnologized farmers are also employers of temporal casual labour to help them during planting and harvesting seasons. Their employer status does not, however, change their dependence on the large multinational agricultural corporations, including the life industry. Given the increasing dependence on agricultural businesses, the superficiality of perceived independence of contract growers becomes apparent when disruptions occur in global food market. Like typical quasi-employees, contract growers bear most of the production risks on the biotechnologized farms, including inclement weather and lower commodity prices. These farmers, like conventional employees in organizations, suffer from occupational insecurity as they may sometimes have to incur losses. For example, the farm machinery has to be paid for sooner or later whether there is

crop failure or not. This is illustrated vividly by the relationship between input cost and income for farmers who planted canola (mostly GM), wheat and pulse crops in Saskatchewan in 1998. According to the provincial Department of Agriculture and Food, the total cost per seeded acre, including seeds, fertilizers, chemicals, fuel, repairs and insurance, came to \$185.63. The average income per seeded acre, however, amounted to \$131.25, which represented a shortfall of \$54.38. To make up for such shortfalls, an increasing number of farmers in western Canada have recently resorted to off-farm employment (Lind, 1995).

In a sense, the biotechnologization of agriculture is producing people who work part-time as farmers and part-time as conventional employees in organizations. Such people wear two hats: one as a self-employed person and the other as a conventional employee in an organization.. As employers of part-time/seasonal farm workers, many of them face the challenge of adapting to the employee role.

Conclusion

The biotechnologization transition is fraught with contradictory consequences. On the one hand, farmers are promised empowerment in agricultural production, with the offer of new tools for controlling plant and animal disease, pests, and also for improving farm yields. On the other hand, the new transition in agricultural production is intensifying external dependencies in farming. Intentionally and unintentionally, the new contract growers of the biotechnologized farms represent a further erosion in the status of the food producers.

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Quasi-employees
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