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## The Market and Consumer Welfare Effects of the Introduction of Second-Generation GMPs

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# Cornhusker Economics

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## The Market and Consumer Welfare Effects of the Introduction of Second-Generation GMPs

Market Report	Yr Ago	4 Wks Ago	11/26/04
<b><u>Livestock and Products,</u></b>			
<b><u>Weekly Average</u></b>			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight . . . . .	\$101.83	\$84.93	\$88.28
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb . . . . .	114.03	123.69	124.81
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb . . . . .	107.29	114.61	113.45
Choice Boxed Beef, 600-750 lb. Carcass . . . . .	162.06	141.74	138.31
Western Corn Belt Base Hog Price Carcass, Negotiated . . . . .	48.83	71.21	78.04
Feeder Pigs, National Direct 45 lbs, FOB . . . . .	32.32	53.51	54.66
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean . . . . .	55.04	71.15	75.79
Slaughter Lambs, Ch. & Pr., 90-160 lbs., Shorn, Midwest . . . . .	85.00	85.75	88.00
National Carcass Lamb Cutout, FOB . . . . .	209.41	224.12	226.61
<b><u>Crops,</u></b>			
<b><u>Daily Spot Prices</u></b>			
Wheat, No. 1, H.W. Omaha, bu . . . . .	3.96	3.30	3.28
Corn, No. 2, Yellow Omaha, bu . . . . .	2.38	1.68	1.65
Soybeans, No. 1, Yellow Omaha, bu . . . . .	7.46	4.94	5.33
Grain Sorghum, No. 2, Yellow Columbus, cwt . . . . .	3.96	2.71	2.63
Oats, No. 2, Heavy Minneapolis, MN, bu . . . . .	1.52	1.61	1.73
<b><u>Hay</u></b>			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton . . . . .	115.00	115.00	115.00
Alfalfa, Large Rounds, Good Platte Valley, ton . . . . .	67.50	62.50	62.50
Grass Hay, Large Rounds, Good Northeast Nebraska, ton . . . . .	57.50	57.50	57.50
* No market.			

The introduction of genetically modified products (GMPs) into the food system and the significant growth of organic agriculture are among the most notable features of the increasingly industrialized agri-food sector. They have both received considerable attention in the agricultural economics literature, with the main focus being on the optimal regulatory responses as they relate to the introduction of standards for, and labeling of, GM and organic food products.

A recent development in the organic sector that has important ramifications for the entire agri-food system was the introduction of the National Organic Program (NOP) in 2002. In addition to instituting uniform standards for organic-labeled food, an important feature of the NOP is that it explicitly links the markets for organic, conventional and GM food products through the provision that food labeled as organic should be free of GM ingredients. Given the U.S. position of “substantive equivalence” between GM products and their conventional counterparts, there is no mandatory labeling of GMPs in the U.S. Conventional and first-generation, producer-oriented GM products are marketed together as a non-labeled product. Thus, under the current institutional setting, organic-labeled food products provide the only option available to consumers that are averse to GMPs.

Consumer opposition to the first-generation, producer-oriented GMPs has hurt the prospects of the agricultural biotechnology sector, and resulted in efforts by life science companies to develop consumer-oriented, second-generation GMPs with augmented functional properties (e.g., vitamin A enhanced rice, *GoldenRice*<sup>TM</sup>; high oleic acid soybean oil). While first-

generation GMPs are not labeled in the U.S., consumer-oriented GMPs are expected to be voluntarily labeled as their producers need a way to convey information about the products' enhanced characteristics to consumers.

In this setting, what are the factors that could affect the market success of second-generation GM products? What does the introduction of the new-GMPs imply about consumer welfare? What are the implications of the introduction of second-generation GMPs for the organic, conventional and first-generation GM product markets given the interdependence created in these markets by the NOP?

A recent study by Giannakas and Yiannaka (2004) addresses the above questions. In this study, a model of heterogeneous consumers that differ in their willingness to pay for products with different levels of intervention in their production processes was developed to examine the market and consumer welfare effects of the introduction of consumer-oriented GMPs into the food supply chain under the NOP. The analysis focuses on processed food products, where the process attributes of the available products (i.e., organic, GM and conventional) are indistinguishable to consumers in the absence of labels.

The analysis reveals the potential for significant benefits from the introduction of consumer-oriented, second-generation GM products both for consumer welfare and the market acceptance and growth of agricultural biotechnology. A key finding of the analysis is that the introduction of new-GMPs can change the nature of the relationship between the GM and the conventional and organic products from one of vertical to one of horizontal product differentiation.<sup>1</sup> Specifically, unlike the first-generation GMPs that are uniformly quality ranked by consumers relative to the conventional and organic products (i.e., vertically differentiated), the new-GMPs are not uniformly quality ranked, either with the conventional products or with their organic counterparts (i.e., horizontally differentiated).

It is shown that regardless of its market effects, the introduction of new-GMPs has an unambiguous positive effect on aggregate consumer welfare. The magnitude of this welfare increase is shown to depend on the value consumers place on the new product, the relative price of the new-GMPs, the level of consumer aversion to genetic engineering, the preference for organic food, the production share of the first-generation GMPs under the current no-labeling regime and the conditions of entry into the retail market of the organic and non-labeled products. In particular, under free entry in the retail sector the introduction of consumer-oriented GMPs increases the welfare of consumers with relatively low aversion to production process interventions. Interestingly, the consumers who benefit from the introduction of new-GMPs are exactly those who find it optimal to consume the new products. In the absence of free entry into the retail market of these products, the reduced demand for non-labeled products due to the introduction of new-GMPs reduces the consumer prices of both the organic and non-labeled products and results in welfare gains for all consumers.

Finally, the analysis shows that when the value consumers place on the new products is sufficiently high, the introduction of new-GMPs can drive the first-generation GMPs and their conventional counterparts out of the market and reduce the consumer demand for organic products. In this context, while the development of the second-generation, consumer-oriented GMPs can provide the boost desired and needed by the agricultural biotechnology sector, it can eliminate the conventional and first-generation GM products and jeopardize the prospects of the fast-growing organic agriculture.

**Note:** The article is based on Giannakas, K. and A. Yiannaka (2004), "Agricultural Biotechnology and Organic Agriculture: National Organic Standards, Labeling and Second-Generation of GM Products" currently under review in the *American Journal of Agricultural Economics*.

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<sup>1</sup> Products are vertically differentiated when consumers uniformly rank them in terms of a characteristic they possess, i.e., quality. Under vertical differentiation if all products were offered at the same market price all consumers would choose to purchase the same one, namely, that of highest quality. Products are horizontally differentiated when consumers cannot uniformly rank them. Under horizontal differentiation if all products were offered at the same market price consumers would rank them differently and thus all products would obtain a positive market share.