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Genetically Modified Organisms and Innovation Policy are Key Weapons in Fight against Hunger

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Market Report	Year Ago	4 Wks Ago	11/21/14
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight.	NA	170.00	173.96
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	NA	283.74	285.97
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	NA	241.72	244.27
Choice Boxed Beef, 600-750 lb. Carcass.	NA	249.50	254.79
Western Corn Belt Base Hog Price Carcass, Negotiated.	NA	90.60	85.67
Pork Carcass Cutout, 185 lb. Carcass 51-52% Lean.	NA	101.91	93.55
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct.	NA	163.50	142.00
National Carcass Lamb Cutout FOB.	NA	378.40	384.89
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	NA	5.21	5.41
Corn, No. 2, Yellow Nebraska City, bu.	NA	3.05	3.40
Soybeans, No. 1, Yellow Nebraska City, bu.	NA	9.08	9.84
Grain Sorghum, No.2, Yellow Dorchester, cwt.	NA	5.86	6.57
Oats, No. 2, Heavy Minneapolis, Mn, bu.	NA	3.46	3.55
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.		197.50	194.00
Alfalfa, Large Rounds, Good Platte Valley, ton.		85.00	85.00
Grass Hay, Large Rounds, Good Nebraska, ton.		85.00	70.00
Dried Distillers Grains, 10% Moisture Nebraska Average.		120.00	120.50
Wet Distillers Grains, 65-70% Moisture Nebraska Average.		43.00	45.50
* No Market			

The introduction of genetically modified organisms (GMOs) into the food system and the assignment of intellectual property rights (IPRs) for plant genetic resources are among the most notable features of the increasingly industrialized agri-food marketing system of numerous, developed and developing, countries around the world. IPRs have provided innovating firms with incentives to aggressively pursue improvements of crop characteristics (such as herbicide tolerance, insect and virus resistance, drought tolerance, and increased nutritional value) through gene splicing techniques, and the agronomic benefits of the GM products have resulted in their embrace by a significant number of agricultural producers around the world.

In particular, 16 years after their initial commercialization in 1996, GM crops were grown on 170 million hectares worldwide with (i) more than half (52%) of those being planted in developing countries like Brazil, Argentina, India, China, and South Africa; and (ii) a quarter being planted with biotech crops having multiple (i.e., stacked) traits. Seventeen million farmers in 28 countries grew GM soybeans (47% of global biotech area), maize (27%), cotton (14%), and canola (5%) in 2012. GM papaya, alfalfa, squash, rice, and sugarbeet were also cultivated on much smaller areas. The market value of biotech crops in 2012 was $14.8 billion, representing 23% of the global crop protection market and 35% of the global commercial seed market.

Intriguingly, in the midst of this so-called gene revolution, about 1 billion people worldwide are facing malnutrition and hunger, with the majority of these people living in water-constrained regions of Africa and Asia. With GMOs and IPRs being at the epicenter of innovation activity in the agri-food system, the question that naturally arises is: *can GMOs and IPRs help reduce hunger in a water-constrained world?*

Understanding that *hunger can be reduced through access to increased quantities of nutritious food offered at affordable prices*, research in the Center for Agricultural & Food Industrial Organization – Policy Research Group (CAFIO-PRG) at the Department of Agricultural Economics has been focusing on the effects of different GM technologies and IPRs' policies on quantities produced, the quality of production, the prices of food products, and the number of people with access to food in hunger-stricken less developed countries (LDCs). In doing so, the research explicitly considers the empirically relevant (1) heterogeneity in consumer preferences for GM products, (2) differences in producer agronomic characteristics, and (3) imperfect competition in the supply channels of interest.

Research has identified the potential for significant benefits from the development and adoption of appropriate GM technologies for all participants in the agri-food marketing system. In particular, previous research has shown that *properly designed GM technologies* (i.e., technologies adapted to the idiosyncrasies and needs of an area) can facilitate production, increase yields, reduce production costs, and enhance the nutritional value of food products. Key input traits of the GMOs needed in the fight against hunger are *drought resistance* and/or *water use efficiency* of plants, as water has been a key constraining factor in many hunger-stricken countries. The necessary output traits (e.g., vitamin, iron or zink enhancements), will have to be case-specific and dependent on the nutritional needs of the different areas.

Our research shows that important determinants of the effectiveness of these GM technologies in combating hunger are (i) the public attitudes towards GMOs; (ii) the magnitude and distribution of benefits of the GM technology; (iii) the regulatory and labeling regimes governing GMOs; (iv) the structure of the agri-food marketing system; (v) the market power of the innovating companies; and (vi) the strength and enforcement of IPRs in LDCs.

Regarding the level of IPRs' enforcement, it has been shown to affect the welfare of the interest groups involved (i.e., producers, consumers, and innovators), and have important ramifications for the pricing and adoption of the new technology. The weaker is the enforcement of IPRs in a country, the lower the price of the new technology, the greater its adoption by producers, and the greater the number of consumers that have access to this technology.

While GM technologies and certain IPRs' policies *can* result in increased quantities of nutritious food in hunger-stricken LDCs, there are some major challenges in the quest to utilize such technologies in the fight against hunger. These challenges include: (i) the limited availability of suitable GM crops/technologies; (ii) the limited capacity for research and development (R&D) in most LDCs; (iii) the role of non-governmental organizations (NGOs) in shaping public attitudes towards GMOs; (iv) the trade relationships of LDCs with countries hostile to GMOs; and (v) the inefficiency of the regulatory system in most LDCs.

The role of government agencies (like USAID) and Universities, innovating firms, the World Bank, major foundations, philanthropists and NGOs in overcoming these challenges is critical.

This article is based on:

Giannakas K. "Innovation and Policy against Hunger in a Water-Constrained World." In *Food Safety, Security, and Defense: Focus on Food and Water*, Institute on Science for Global Policy, Washington DC, 2014, pp.78-82.

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