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Consumer Attitudes and Labeling Regimes as Determinants of the Market Success of Food Nanotechnology

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Market Report	Yr Ago	4 Wks Ago	2/10/12
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight.	$106.21	$123.56	$123.09
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	148.25	181.06	187.92
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	126.00	154.13	155.95
Choice Boxed Beef, 600-750 lb. Carcass.	169.24	187.92	185.98
Western Corn Belt Base Hog Price Carcass, Negotiated.	81.64	83.01	84.93
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean.	88.80	83.82	85.12
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct.	157.50	148.75	147.13
National Carcass Lamb Cutout, FOB.	352.06	394.24	383.21
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	8.20	5.97	6.10
Corn, No. 2, Yellow Omaha, bu.	6.82	*	*
Soybeans, No. 1, Yellow Omaha, bu.	13.84	*	*
Grain Sorghum, No. 2, Yellow Dorchester, cwt.	11.45	10.09	10.89
Oats, No. 2, Heavy Minneapolis, MN , bu.	4.22	3.05	3.43
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	140.00	155.00	250.00
Alfalfa, Large Rounds, Good Platte Valley, ton.	72.50	137.50	145.00
Grass Hay, Large Rounds, Good Nebraska, ton.	*	100.00	100.00
Dried Distillers Grains, 10% Moisture, Nebraska Average.	203.50	208.00	201.00
Wet Distillers Grains, 65-70% Moisture, Nebraska Average.	69.75	70.25	74.63

***No Market**

In a recent poll conducted by the Institute of Food Technologists, when consumers were asked about their knowledge of nanotechnology and its applications to the food sector, two-thirds said they had heard 'nothing at all' about the technology (Food Safety News 2010). European polls tell a similar story; a 2010 Eurobarometer survey showed that, while public awareness of nanotechnology is gradually emerging, more than half of the respondents knew nothing about the technology, and could not tell whether it would have a positive or a negative impact on their lives (European Commission 2010).

According to the National Nanotechnology Initiative, nanotechnology is "a science that involves the design and application of structures, devices and systems on a nanoscale; that is billionths of a meter." Among early adopting industries of nanotechnology have been high profit margin sectors like cosmetics', sports equipment and apparel. As the development of nanotechnology moves from first-generation (material) to second-generation (component) and third-generation (device) technologies, its potential applications to industrial sectors such as pharmaceuticals, biotechnology, medical devices, energy, national security and defense and the agri-food sector can be limitless (The Nanotechnology Institute 2012).

In the agri-food sector, the use of nanotechnology in all phases of the food cycle – from farm to fork – has the potential to revolutionize the sector by increasing food supply and enhancing food quality and safety. Current and potential food nanotechnology applications include: the use of nanosensors for

monitoring crop growth and pest control and identifying animal and plant diseases; the use of nanoencapsulated additives and ingredients that enable changes in food texture, taste, processability and quality; packaging material that is more durable, light, can repair tears, can respond to environmental conditions (e.g. moisture, light), improve food safety (e.g. use of carbon nanotubes in food packages which were shown to kill e.coli bacteria on contact), signal whether food is contaminated or spoiled or release preservatives that can extend food life (Sekhon, 2010). While the potential benefits of food nanotechnology can be immense, its potential risks are not well understood. Concerns involve the potential toxicity of nanoparticles whose chemical and physical properties can be very different from those of macro particles of the same composition, thus, while the latter may be harmless, the former could be toxic to humans and/or the environment (NanoBio-Raise, 2011). Skeptics worry that nanoparticles may be inhaled by humans during their production or escape from engineered structures into food or the environment.

According to some estimates, hundreds of nanofoods and food packaging applications are already in the market (NanBio-Raise, 2011), and given current regulations, labeling of these products is not required.[1] A recent report by Friends of the Earth finds that "untested nanotechnology is being used in more than 100 food products, food packaging and contact materials currently on the shelf, without warning or new FDA testing" and urges the Food and Drug Administration (FDA) to "stop the sale of all nanofood, packaging and agricultural chemicals until strong scientific regulations are enacted to ensure consumer safety and until ingredients are labeled" (FOE, 2008). Efforts are currently underway in both the United States (U.S.) and the European Union (EU) to regulate food nanotechnology. In the U.S. the Environmental Protection Agency (EPA) is developing a Significant New Use Rule (SNUR) to ensure that nanoscale material receive appropriate review, while the FDA outlines that "the paradigm for regulation of these products is based on the concepts of "risk management," i.e. risk identification, risk analysis and risk control." The EU is implementing a new Classification Labeling and Packaging regulation requiring that the classification and labeling of nanomaterials will be done on a case-by-case basis and based on the precautionary principle. Thus, while the EU proposed regulations mandate labeling for nanotech products, it is unclear whether these products will be mandatorily labeled in the U.S.

Given the tremendous potential of food nanotechnology, scientists and developers of the technology seem determined to not repeat the mistakes of biotechnology (NanoBio-Raise, 2011). Understanding the public's perceptions of the technology and preference for different regulatory regimes will not only point to effective means to communicate its benefits and potential risks, but also affect willingness to pay for the technology and consequently its market success. A 2007 study of risk perceptions of nanotechnology of 1,850 U.S. consumers found that the effect of information on risk perceptions depends heavily on people's emotions and values; people with different values are predisposed to draw different factual conclusions from the same information (Kahan, et.al 2007). This implies that while the provision of information about nanotechnology that is scientifically sound is important, it is even more critical that one could frame this information so that people of diverse values could draw the same factual conclusions from it (Kahan, et.al 2007).

Agricultural Economists at the University of Nebraska-Lincoln are currently working on identifying the determinants of the market acceptance and success of food nanotechnology. The study seeks to specify the exact conditions under which the technology will end up being (a) ineffective, (b) non-drastic, and (c) drastic (Giannakas and Yiannaka, 2012). Research plans include the empirical study of consumer perceptions and attitudes towards nanofoods in general, and nanotech applications that could enhance food safety in particular (e.g., smart packaging), under different information structures. A series of economic experiments (experimental surveys and auctions) will be developed to examine how the labeling regime (e.g. voluntary versus mandatory), the source of information (e.g. government, NGOs, scientific/academic community), the framing of the information provided (e.g. negative or positive) and the nature of the nanotech attribute (i.e. search or credence), affect consumer attitudes and willingness to pay for nanofoods. Research findings will shed light on the impact of different labeling regimes and information provision on the market acceptance and success of food nanotechnology, and should be useful to policy makers in helping them design and implement appropriate food policies. Results should also be useful

to the developers of nanotechnology in helping them understand the factors that affect the market success of their products.

[1] Nanofood is food that has been cultivated, produced, processed or packaged using nanotechnology techniques/tools or to which engineered nanomaterials have been added (Sekhon, 2010). A list of nanofoods can be found in the Nanotechnology Consumer Products Inventory (PEN, 2010).

References:

European Commission. "Europeans and Biotechnology in 2010. Winds of Change?" Available online at: http://ec.europa.eu/public_opinion/archives/ebs/ebs_341_winds_en.pdf

Food and Drug Administration (2011). "FDA Regulation of Nanotechnology Products." Available online at: http://www.fda.gov/ScienceResearch/SpecialTopics/Nanotechnology/NanotechnologyTaskForce/ucm115441.htm

Food Safety News. "Navigating Good Nanotechnology." Available online at: http://www.foodsafetynews.com/2010/08/navigating-food-nanotechnology/

Friends of the Earth (2008). "Nanotech Exposed in Grocery Store Aisles." Available online at: http://action.foe.org/pressRelease.jsp?press_release_KEY=343.

Giannakas K. and A. Yiannaka (2012). "The Market and Welfare Effects of Food Nanotechnology." Working Paper, Department of Agricultural Economics, University of Nebraska-Lincoln.

Kahan, D., P. Slovic, D. Braman, J. Gastil and F. Cohen (2007). "Nanotechnology Risk Perceptions: The Influence of Affect and Values." Cultural Cognitive Project at Yale Law School.

NanoBio-Raise (2011). "Nanotechnology and Food." Available online at: http://files.nanobio-raise.org/Downloads/Nanotechnology-and-Food-fullweb.pdf

Project of Emerging Nanotechnologies (PEN) (2010). "Nanotechnology in Agriculture and Food." Available online at: http://www.nanotechproject.org/

Sekhon, B.S. "Food Nanotechnology - an overview." *Nanotechnology, Science and Applications*, 2010:3-15.

The Nanotechnology Institute. "The State of Nanotechnology." Available online at: http://nanotechinstitute.org/homepage-posts/the-state-of-nanotechnology#more-55

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