Essay on gm foods

ASSIGN BUSTER

Moon and Balasubramanian 2001

In contrast, Garkell et al. (2004) contend that it is the perceived absence of benefits and not the assessment of risks that accounts for the low index of acceptance of GM foods by the European public. The authors reviewed the results of an earlier study where they used the Eurobarometer survey on biotechnology (EB52. 1) to ask 1000 respondents in each of 17 European countries their opinions on whether each of 7 biotechnologies was (1) useful (an index of benefit), (2) risky (an index of risk), and (3) morally acceptable (an index of support) (Garkell et al. 2000). GM food was one of the biotechnologies included in the survey. Results of the survey indicate that benefit perception played a larger role than risk perception in the assessment of GM foods, though risk perception appeared to modulate the perception of benefit (Figure 6, Gaskell 2004). Of the total sample of 17, 000 respondents, 18% perceived both risks and benefits associated with GM foods, of whom 52% expressed acceptance of GM foods; 14% perceived benefits with no associated risks, with 81% acceptance; 62% perceived risks but no benefits, with 83% rejection; while a minor group of 6% perceived neither risk nor benefit of GM foods.

Acceptance of GM foods

In the next phase of their analyses, Garkell et al. (2004) examined the different backgrounds and frames of reference of the respondents in each of the first three groups, to determine which factors associated with their relative perceptions of the risks and benefits of GM foods. Five variables were selected for analysis: trust, scientific knowledge, technological

optimisms, education, and gender. The results showed that the group that failed to perceive any benefit of GM foods had the lowest trust, least scientific knowledge, and were pessimistic about technology, whereas the group that failed to perceive any risks associated with GM foods had the highest trust, most scientific knowledge, and were optimistic about technology, suggesting that people bring different cognitive resources to their assessment of the risks and benefits of GM foods. Nevertheless, the results also strongly suggest that efforts to lower the perception of risk while raising the perception of benefits of GM foods may lead to wider acceptance of GM foods in European countries, including the UK.

Factors affecting consumer perception of GM foods

Lusk and Coble (2005) conducted a risk analysis study and found that consumers were willing to pay a higher price for food labeled " GM free" even when they lacked any understanding of its risks or benefits; moreover, they were willing to pay even higher prices for foods labeled " organic" without proof that these products were any safer, indicating a predisposition against GM foods and in favor of organic non-GM foods. However, Huffman et al. (2004) found that such predispositions tend not to be strongly grounded; thus, if the perceived risk of GM is low, a drop in price might sway some customers to buy GM foods over non-GM foods; the reverse would also hold true. Moreover, there is also a strong cultural component at play; McCluskey et al. (2003) found that 86% of Japanese consumers were not willing to buy GM foods even at half the price, underscoring the general aversion to GM foods in the Japanese population. In contrast, in the USA, 30% of customers were willing to pay 15% more for pesticide-free GM foods (Hamilton et al.

2003), in agreement with an earlier study by Boccaletti and Moro (2000), who found that Italians were willing to purchase (WTP) GM foods associated with lower use of pesticides (Table 5, Boccaletti and Moro 2000). This last study is of particular interest as it underscores the complexities of public perception of GM foods. The study consisted of a survey of public knowledge and attitude towards GM foods and found that although 82. 5% of respondents (N= 200) reported insufficient knowledge of biotechnology in general and GM foods in particular they nevertheless rated their attitude towards GM foods as high, with 46% of respondents rating their attitude as positive, and only 27. 5% rating their attitude as negative. Of interest, both groups cited health and environmental issues as influencing their responses.

Lower Use of Pesticides

Improved Nutritional Value

Improved Organoleptic Characteristics

Longer Shelf-Life

Won't buy

Boccaletti and Moro 2000

In addition, all factors being equal, 39. 5% had no preference for either GM or non-GM foods, and 22% reported they would pay even slightly higher prices for GM foods, given the circumstances. The willingness to buy GM foods increased when certain mitigating factors were considered: lower pesticide use, increased nutritional value, improved organoleptic characteristics, and longer shelf life. Table 4 shows a significant increase in

the WTP of GM foods across all parameters. Lower use of pesticides and improved nutritional value had the greatest influence on their WTP.

Economic benefits

Brookes and Barfoot (2004) evaluated the global economic and environmental impact of GM crops from 1996 to 2004 and estimated a substantial increase in economic benefits to farmers, amounting to a total of USD 19 billion (Table 6, Brookes and Barfoot 2004). The largest increase in farm income was seen for GM herbicide tolerant (HT) soybeans, amounting to USD 9. 3 billion, followed by GM insect resistant (IR) cotton at USD 5. 7 billion. GM IR maize accounted for USD 5. 7 billion increase in farm income. These gains represent a substantial amount in crop yields coupled with substantial decrease in costs. The largest impact was by GM HT soybeans in Argentina, GM IR cotton in China, and a range of GM crops in the United States. Developing countries such as South Africa, Paraguay, India, and Mexico also experienced an unprecedented increase in crop yields with corresponding economic benefits, strongly suggesting that biotechnology has had a significant and beneficial impact on agriculture and economic growth, at least in certain parts of the world.
Table 6. Global Farm Income Benefits from Growing GM Crops, 1996-2004 (USD million).

Environmental benefits

The impact of any factor on the environment is very difficult to analyse for it requires value judgments concerning the overall effect of a particular environmental change; also, some factors affect the environment directly,

like pesticides, while others have an indirect effect on the environment, like an organism that suffers genetic mutations within the altered environment and then migrates to another environment (Barton and Dracup 2000).

The impact of GM crop production also needs to be analyzed within the context of non-GM crop production, because it too can have a significant impact on the environment; again, like pesticides, both traditional and biotechnical agricultural practices use pesticides, but bio-agriculture uses significantly less (Dale 2002). In the time period between 1996 and 2004, biotechnology has reduced the use of pesticides by 172 million kg, and the environmental footprint associated with agricultural pesticides by 14% (Brookes and Barfoot 2004). There has also been a significant reduction in the level of greenhouse gas emissions associated with agricultural practices, equivalent to the emissions of five million motor vehicles (Brookes and Barfoot 2004).

Barton and Dracup (2000) suggest that a comprehensive analysis of the effect of GM crops on the environment must consider four critical factors: (1) the effect on human health, (2) the effect on nontarget organisms, (3) potential for gene escape to another species, and (4) the probability that a crop may become an agricultural weed. Even then, the results of a particular evaluation cannot be extrapolated to other environments because each environment is different and the impact of a specific factor may vary widely according to environment. In addition, a prior record with no ill effects should not lead to complacency, and the cumulative impact of GM crops on the environment must undergo periodic assessment. The authors also suggest

that the public should have access to environmental impact records, to foster public understanding of the risks and benefits of GM crop production. Moreover, information on the environmental impact of GM crop production should be coupled with information on the environmental impact of traditional agricultural practices, so that the consumer may appreciate the benefits to the environment of GM crops over traditional non-GM crops.

Poverty and Hunger

A critical issue is the impact of GM foods on world hunger. A comparison between the global prevalence of undernourishment in 1990-1992 to that in 2006-2008 shows a significant decline in the prevalence of undernourishment since the introduction of GM crops (Figure 7 and Figure 8, FAO). However, as the Figures also illustrate, certain countries within the continent of Africa have yet to benefit. There is enough food to feed the world (FAO), but the problem is getting this food into the mouths of those who need it most. The global community needs to develop programmes that channel more GM foods into these areas. Figures 7 and 8 may be accessed online for more detailed information regarding GM crops.

Future trends

Global agricultural yields have increased significantly in the last couple of decades; however, to feed the projected 9 billion world population in 2050, crop production must increase to even higher levels while assuring that ecosystems services are not compromised (Raybould and Poppy 2012). One solution is to increase crop yields in land that is already under cultivation to spare other land from environmental pressure. GM crops are already playing

an important role in sustaining the environment through reduced use of pesticides and land and water resources. However, despite the success of GM crops in many areas of the world, the EU's stance against GM foods remains largely unchanged; while the rest of the world is moving on to explore new types and varieties of GM crops, EU importers and farmers find it very difficult to obtain permission for the import or cultivation of GM foods. Furthermore, EU regulations are also making it difficult if not impossible for agricultural research and development. The EU has based its decision to restrict GM crop cultivation on scientific uncertainty, although there is no evidence that GM crops damage the environment or that GM foods pose a health threat. GM crops are being grown extensively in North and South America and in China, and GM foods are now a part of the normal diet in these countries, and billions of meals consisting of GM foods have been consumed with not one report on any adverse effects related to the consumption of GM food. Thus, the root of the problem appears to be political but it is not clear what agricultural policy objectives the EU is trying to protect by banning the cultivation of GM crops.

Biopolitics Versus the Precautionary Principle

The UK appears to have an ambivalent attitude towards GM foods; e. g. in 2004, the British Medical Association issued the following statement, " The BMA shares the view that there is no robust evidence to prove that GM foods are unsafe" and that " genetically modified food has enormous potential to benefit both the developed and developing world in the long term" (BMA 2004). However, that same year, in reference to GM foods, Prince Charles objected to " taking into the realm of man what rightly belongs in the realm

of God," voicing the concerns of some of his citizens who tend to view GM as " unnatural," or as the tampering of nature by human hands (Burke 2012). Curiously, this objection does not extend to the use of biotechnology for the development of therapeutics, nor does the moral concern consider the plight of others. The negative attitude to GM foods by the EU is having a negative impact on developing countries who resist planting GM crops that could boost their economy out of fear that the EU market would be closed to them (The Economist 2002).

EU countries that grow GM crops, e. g. Portugal, have been reaping the benefits (Chiarabolli 2011). In 2005, Portugal adopted a law for the coexistence of conventional, organic, and GM crop production (Chiarabolli 2011). Under this law, Portuguese farmers have the choice of using any form of agriculture to grow their crops based on their own individual needs as farmers or in response to consumer demand. However, a farmer who wishes to cultivate a GM crop must follow a number of procedures, including undergoing coexistence training, the registration of the area to be cultivated, and written notification of intent to cultivate a GM crop. Portugal is considered a role model in the business of bioagriculture but in the main, Portugal appears to stand alone in the EU in its relationship with GM crop production.

In 2007, the European Commissioner for the Environment rejected applications submitted by Syngenta (Basel, Switzerland) and Pioneer Hi-Bred International (Johnston, IA, USA) to grow two different strains of GM maize, claiming environmental concerns against evidence-based evaluations by the

European Food Safety Agency (EFSA; Parma, Italy) that the GM strains in question would pose no adverse effect to human or animal health, or to he environment (Abbott and Schiermeier 2007). The scientific community saw the Environment Commissioner's decision as an act of contempt for both the EFSA itself and its scientific advisory system (Abbott and Schiermeier 2007) and cited this as an example of how the EU's policy for GM crops is based on biopolitics (Anon 2007). A more rational approach to GM crops would be one based on the EU's policy of the precautionary principle that evaluates GM crops according to their impact on human and environmental health rather than on the process through which the crop was created.

Shane and Spillane (2008) define biopolitics as the process of political risk management whereby policy decisions are based on more than just scientific evidence and suggest that biopolitical influences played a major role in the drafting of EU Directive 2001/18/ to regulate the deliberate release of genetically modified plants into the environment (Directive 2001/18/EC). Because politicians put a much greater weight on public perception of GM products than on scientific evidence, regulatory policy is subject to the pressures of private interests that call for stronger regulations (Meyer-Emerick 2007). While risk assessment should not be entirely based on scientific evidence but instead take into account political, economic, and social factors, it is high time that regulatory bodies drop the pretense of health and environmental concerns and find alternate ways to legitimize risk assessment. According to Delanty (1999) " biopolitics is largely articulated around the politics of knowledge; the politics of the definition and legitimation of risk." Failure to legitimize risk not only undermines the EU's

policy of the precautionary principle but it also leaves the EU in an indefensible position regarding non-GM crops, for there are numerous non-GM-based technologies that can produce similar products. Some of these techniques include chemical- and radiation-induced mutagenesis (REF), various hybridizations (Guo et al. 2004), and heritable epigenetic modifications (Cubas et al. 1999), amongst many other traditional intragenenic, as opposed to transgenic, modifications which ironically are rather more difficult to evaluate in terms of risk assessment; for unlike transgenic modifications where the specific DNA modification is known, the extent of intragenic modification elicited by a particular technique cannot be fully determined. Yet, new crops developed through these techniques could theoretically be released into the environment without having to undergo risk analysis; that is, the EU has no policy in place to mitigate the potential risk of non-GM products. Spillane and Pinto (2002) believe this represents a form of prejudice against GM technology and suggest that the EU should change its regulatory policy to apply its own precautionary principle to all new crops regardless of the technology used to produce them. Moreover, a critical variable that is missing from the risk assessment equation is that there is no policy in place to evaluate the long-term social, environmental and economic costs of not allowing GM crop production.

The issues with GM foods are rather complex, and even the USA has no been without its share of problems. In 2010, concerns over the environment moved a USA District judge to ban the cultivation of Monsanto's Round Up-Ready (RR) sugarbeets, which account for over 50% of the USA production of sugarbeets (Moses 2011). Monsanto was facing a crisis because there were

not enough non-GM seeds available to ensure the current levels of sugarbeet production, and there were concerns that the USA supply of sugar would run short. Fortunately, Monsanto won a stay in the Court of Appeals and was allowed to resume GM sugarbeet production until an Environmental Impact Statement was completed, ruling that there was not enough evidence to indicate that the current crop production of stecklings posed a serious and irreversible threat to the environment.

Nevertheless, despite all the controversy, GM crops are here to stay and countries who refuse to allow GM crop production will be faced with either having to capitulate and allow the import of GM foods into their borders or develop their own GM agricultural concerns.

Future consumer acceptance of GM products

The acceptance of GM products has been gradually increasing around the world. African countries are opening up to the benefits of GM technology to their economies (Adenle 2011), Australia is currently considering GM wheat (Tribe 2012), China is planning to adopt GM rice (Chen, Shelton and Ye 2011); and Japan, a country known for its strong opposition to GM technology, has recently agreed to import GM papayas from Hawaii (Wakui et al. 2004).

Furthermore, for all the opposition to the cultivation of GM crops, European countries, including the UK are currently importing millions of tons of GM feed, without which they could not maintain their livestock industry (McFarlane et al. 2011). In addition, chicken farmers have relaxed their resistance against GM chicken feed.

These data suggest that consumers all over the world may be ready to accept the introduction of GM products into their respective countries. The purpose of this study is to analyze the level of consumer acceptance of GM foods in Medway and to determine whether consumers in the UK are prepared for the introduction of GM products in the marketplace.

Discussion

Despite the lack of evidence regarding the short-term and long-term adverse effects of GM crops and GM foods on human health and the environment serious debate continues regarding the risks and benefits of GM technology and its products (Zhang and Shi 2011). Studies attempting to analyze the level of awareness and perception of GM crops and foods in the UK also remain inconclusive; thus, it is difficult to assess the extent to which consumers will accept GM foods were they to become available in the U. K. (Moses, Abdallah and Prakash 2012).

The aim of this study was to conduct face-to-face surveys to determine consumer awareness and perception of GM foods in Medway and to isolate factors that might correlate with consumer attitudes towards GM crops and foods. These data would provide essential information to policy makers that are developing risk-communication strategies targeting different segments of society to ensure that potential concerns about GM crops and food are addressed and to eliminate some of the concerns surrounding GM technology.

Analysis of factors that affect consumer perception and attitude towards GM foods in Medway showed that age, gender and education all correlated with

consumer willingness to purchase and consume GM food although there was significant variation across segments. Descriptive analysis showed that the majority of people surveyed had good knowledge of the derivation of GM food, but lacked knowledge about the risks, benefits, and governmental oversight of GM foods. Nevertheless, consumers did not perceive that the consumption of GM foods would pose a higher health risk than would non-GM foods, suggesting that the concept of GM foods has gained a certain level of acceptance in Medway. A considerable number of respondents were willing to consume and purchase GM food, especially were the price lower than for traditional non-GM food or if the consumer believed that the GM product might provide a health benefit. Nevertheless, concern for GM foods remains high enough for consumers to demand that the mandatory labeling of GM foods and products be extended to the labeling of honey as a GM product should pollen tests show that the honey in question derived from the flowers of GM crops (Waltz 2011).

In addition to the factors analyzed in this study, there may be other factors that could impact public opinion of GM foods, such as the highly profiled professional anti-GM campaign in the UK against GM biotechnology and its products (Burke 2012). Nevertheless, judging from the data of this study, GM crops, GM feed and GM food are beginning to gain acceptance in the UK.

A quarter of a century has passed since the first introduction of GM foods into the marketplace and there is still no scientific evidence regarding the environmental risks of GM crops or the health risks of GM foods; suggesting,

together with the results of this study, that the commercialization of GM

foods is not likely to receive great resistance from consumers in the UK.

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