

*Full Length Research Paper*

# Acceptance of biotechnology and social-cultural implications in Ghana

Wilhemina Quaye<sup>1\*</sup>, Ivy Yawson<sup>1</sup>, Robert M. Yawson<sup>1</sup> and Irene Entsi Williams<sup>2</sup>

<sup>1</sup>Food Research Institute (CSIR) Box M20, Accra, Ghana.

<sup>2</sup>Department of Statistics, University of Ghana, Legon, Ghana.

Accepted 23 February, 2009

Despite major scientific progress in the application of biotechnology in agriculture, public attitudes towards biotechnology in general and genetically modified food (GM food) products in particular remain mixed in Africa. Examining responses on acceptance of GM food through a stakeholder survey in Ghana, it was established that half of the 100 people sample interviewed were not in favor of GM foods. To this group acceptance of GM foods would make farmers loose focus on the traditional ways of cultivation, putting the whole nation at the mercy of profit driven foreign companies who produce GM foods. In order to have clear and unbiased attitudes towards agricultural biotechnology in Africa, there is the need to substitute dominant ideologies in the way biotechnology research and dissemination are conducted in developed countries with tailor-made methodologies in developing countries. This paper emphasizes the social dynamic force of food focusing on the need for social shaping of biotechnologies to reflect local and regional needs. Respondents' perceptions of GM foods suggest that food is seen as not just a commodity to be consumed but food has both cultural and national identities. Generally, people are identified by their consumption and nutrition lifestyles and therefore take pride in what they eat. A proposal is made to set biotechnology research agenda in the context of social choices; social scientific coalition of biotechnology with endogenous development pathways' as opposed to 'exogenous biotechnology research'. Also there is the need for adequate capacity building of the existing regulatory institutions to handle ethical and moral issues associated with biotechnology research since survey findings showed lacked of public confidence in them.

**Key words:** Biotechnology, survey, acceptability, social shaping, Ghana.

## INTRODUCTION

The current debate on biotechnology/GM foods is at best, confusing even to the better informed sections of the public. There are advocates for and critics against biotechnology/GM foods. The application of biotechnology in the production of food, fiber and pharmaceutical is a major development of the late 20th century. This emerging technology is often viewed as the next revolution which has the potential to fundamentally alter the way the society organizes its production and distribution of food. Many GM products (rice with enhanced vitamin A, long lasting fruits and vegetables) have already entered the world's food distribution networks. These products have the potential to not only meet our basic needs, but also

bring a wide range of economic, environmental and health benefits. Biotechnology advocates emphasize the potential benefits to society via reduction of hunger and malnutrition, prevention and cure of diseases, and promotion of health and general well being (Isserman, 2001; UNDP, 2001). Despite its promise to bring significant benefits to society, public acceptance of food biotechnology has been with mixed feelings (Einsiedel, 1997; Gamble et al., 2000).

It has been argued that modern genetic technologies may allow developed countries produce commodities that are currently imported from developing countries. Such developments, it is claimed, will have significant negative effects on poverty situation in the third world and lead to global instability (Junne, 1991; Galhardi, 1995). Critics of biotechnology/GM foods insist that such foods could pose risks to health and the environment though genetically

\*Corresponding author. E-mail: [quayewilhemina@yahoo.com](mailto:quayewilhemina@yahoo.com).

modified crops produce better yields. "Most testing is carried out by the very biotech companies that have the most to gain from results that say "GM food is safe". Growing GM crops also threatens wildlife and the production of GM-free foods. What's more, some GM crops could allow more pesticides to be used with its attendant risk to the environment. Opponents view its use as a needless interference with nature that may lead to unknown and potentially disastrous consequences (Rohrmann and Renn, 2000). Some resist the use of genetic technologies in agricultural production alleging (perceived) risks to humans and environment, while others oppose it citing moral, ethical and social concerns (Waterfeldt and Edwards, 1984). Biotechnology is often criticized on the ground that its use in plants and animals, especially gene transfer across species, take us to "realms of God" and against "Law of nature". Some argue that since genes are naturally occurring entities that can be discovered (not invented), granting patent ownership to genetic findings and processes is morally and ethically untenable (Hallman et al., 2002).

Africa is emerging as one of the frontlines in the battle for acceptance (or otherwise) of agricultural biotechnology. For Africa, the debate is occurring at a crucial time when incidence of food insecurity, poverty and malnutrition are particularly devastating (IFPRI, 2007; FAO, 2003). The local policy makers who will ultimately decide on the future of biotechnology, including genetically modified foods, are being pushed and pulled in both directions. Only a few countries, namely Burkina Faso, Egypt, Kenya, South Africa, Uganda and Zimbabwe are involved in some form of biotechnology research or (at least for South Africa) commercial use, especially in crop agriculture (African Agricultural technology foundation, [www.aatf-africa.org](http://www.aatf-africa.org)). Given the significance of the subject, full understanding of public interests and concerns is needed to arrive at sound private and public decisions pertaining to food biotechnology.

A lot of research has been done on public perception of agricultural biotechnology in industrialized countries (Yawson, 2004; Juma, 2002; Shanahan et al., 2001; Gaskell et al., 2000; Kalaitzandonakes, 2000; Sagar, 2000; Wanatabe, 1985) however, the same cannot be said about developing countries. This paper generally presents some aspects of survey findings on the level of acceptance of biotechnology/GM foods in Ghana. In the discussion emphasize has been placed on the social dynamic force of food focusing on the need for social shaping of biotechnologies to reflect local and regional needs. The objectives of this paper are as follows:

- i.) To investigate the level of public acceptance of biotechnology/GM foods and the social implications.
- ii.) To examine the extent of usefulness of biotechnology in solving problems of Research and Development in Africa as perceived by the public.
- iii.) To establish the level of interest in biotechnology

debates among the public.

iv.) To recommend ways to improve public acceptance of biotechnology.

## METHODOLOGY

A total of 100 people were interviewed from a target sample frame of Ghanaian adult civilian population (18 years or older). The different stakeholders or consumer segments covered include academia, Non-governmental organizations, business community, government (people from areas such as food research institute (FRI), Ghana standards boards, food and drugs board, and Nuguchi memorial institute for medical research (NMIR) who deal with biotechnology on daily basis) and others. Percentage distribution of respondents by occupation is shown in Figure 1.

Purposive sampling was used to select interviewees to ensure that people who are expected to be knowledgeable about the subject are captured in the survey.

The approach used allows conducting a survey on public risk perception in a country with low awareness of agricultural biotechnology. A structured questionnaire was designed for data collection on the set objectives which include level of acceptance of biotechnology, perceptions of its usefulness, level of interest in biotechnology issues and suggestion on how to improve the level of acceptance among Ghanaians. All the respondents were located in the Greater Accra Region of Ghana.

Statistical package for the social sciences (SPSS) and microsoft excel were used to analyze the data collected for discussion.

## SURVEY FINDINGS AND DISCUSSION

### Level of public acceptance of biotechnology/GM foods

In order to confirm that right people are targeted in this survey a question was asked on whether the respondents have any knowledge on biotechnology and GM foods. The response to the question on the knowledge of biotechnology and GM foods was 100 and 95.3 percent respectively. This was very impressive, suggesting that respondents were in good position to give good judgment/views on the research topic and did not depend on hearsay.

On the issue of whether Ghana should accept biotechnology and specifically GM foods, close to 50% of the sample interviewed were not in favour as depicted in Figure 2. Disaggregating responses by consumer segment, a cross tabulation analysis showed that more people in academia were against the idea of Ghana accepting GM foods while the reverse was true for respondents from government institutions such as food research institute (FRI), Ghana standards boards, food and drugs board, and nuguchi memorial institute for medical research (NMIR) who deal with biotechnology on daily basis.

Perceived health and economic benefits mentioned by respondents in favour of Ghana accepting biotechnology/GM foods include the following:

- i.) GM technology is used to develop better tasting fruits

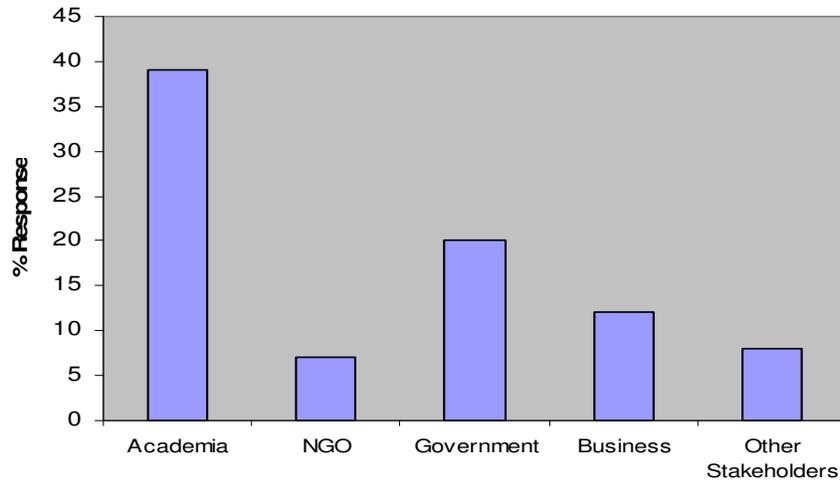


Figure 1. Percentage distribution of respondent by occupation.

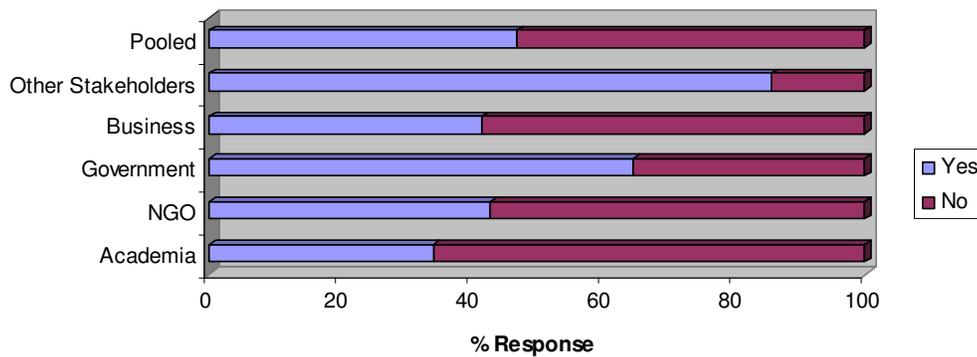


Figure 2. Level of acceptance of biotechnology/GM foods in Ghana.

and vegetables,

ii.) GM technology is used to develop less expensive foods,

iii.) GM technology is used to develop insulin for diabetic patients, and

iv.) GM technology is used to develop rice with enhanced vitamin A

Those who were not in favour of GM foods intimated that farmers will loose focus on the traditional ways of cultivating putting the whole nation at the mercy of profit driven foreign companies who produce GM foods "This would be disastrous for the economy". Some actually commented that African does not need GM foods to achieve sustainable food security in the region. Again, research institutes are not well equipped to deal with the issues concerning GM foods. Another fear mentioned was the issue of farmers in the developing country being adversely affected by foreign seed dependence syndrome. Farmers would have to buy seed every year for cultivation of GM crops. This group believed that farming will become extremely capital intensive out of reach of

the small scale farmer in Africa. They added that GM companies are only driven by profit motive (Figure 3). When asked whether they believe that GM products created by scientists are public driven there was neither a strong agreement nor disagreement.

As indicated in Figure 4, apparently less than 20% rejected the idea of Ghana going in for GM foods based on religious background. All consumer categories were not willing to accept GM technology if it's against nature despite the advantages

### Social-cultural implications

The big question that needs to be answered is how are these biotechnologies/GM foods developed? From the on-going findings it could be deduced that the general assumption is that biotechnologies are developed in advanced countries while their applications are supposed to be universal. One therefore wanders if such technologies could be tailor-made for specific environment such as Africa. A technology, which is perceived not just as an

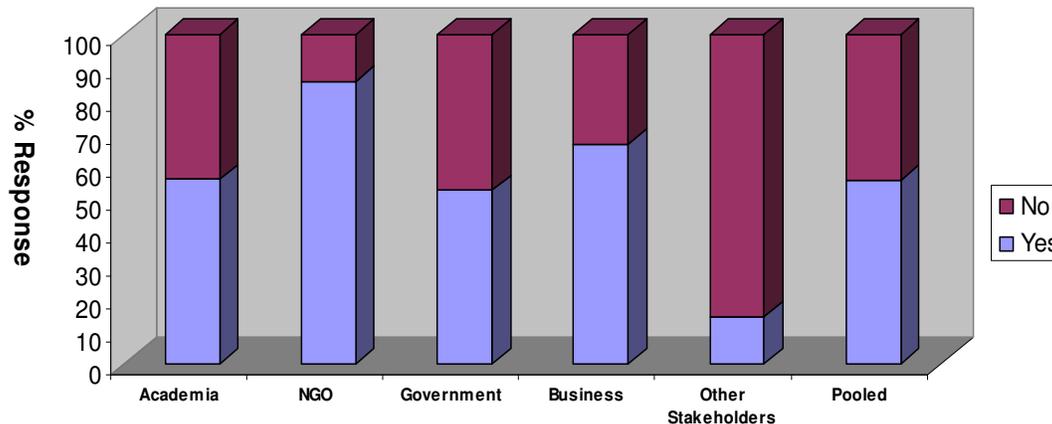


Figure 3. interaction of GM food companies as perceived by respondent.

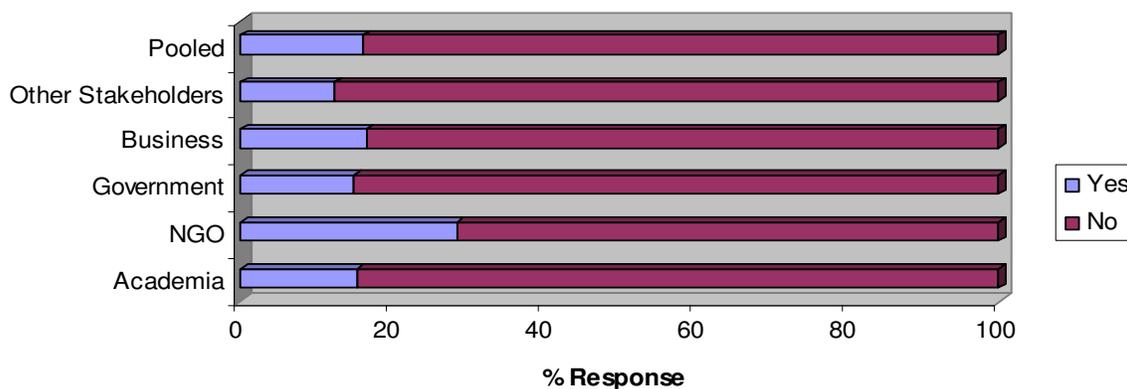


Figure 4. Rejection of biotechnology/GM foods on religious grounds.

imported technology but also as a fruit of the country's own research and development, tends to be more accepted in developing countries. Thus, it is not just the perception of the risks and benefits that matters with regard to the introduction of high technologies in developing countries, but also national interests and nationalist feelings. Biotechnologies need to be developed with the intended users and tailored to the needs of the communities in developing countries. A study on stakeholder perceptions towards agricultural biotechnology in the Philippines in 1997 and Mexico in 2000 tended to confirm the importance of nationalist aspects in the public debate on agricultural technology in these countries (Aerni, 1999, 2001).

The use of biotechnology/GM foods encourages production-consumption disconnections caused by globalization (Ruivenkamp, 2005; Feenberg, 1999, 2002 and 2005). This will not only adversely affect local production by rural economies but also socio-cultural benefit derived from consumption of locally grown foods. Farmers need to be empowered to produce and consumers encouraged consuming locally grown food. Those against GM foods

think that developing taste for foreign foods put money in foreign economies. Majority (84.9%) believed that any decision on GM foods at the governmental level should be supported with a thorough research base.

Respondents in favour of GM foods argued that such technologies should be developed with intended users. From food sovereignty perspective (Quaye, 2007), community-based food technologies has become crucial as people easily adopt technologies that are developed together with them as a sign of sovereignty and having complete power over decisions that affect them, the social dynamic force of food focusing on the need for social shaping of biotechnologies to reflect local and regional needs (Schuurman, 2005). Respondents' in favour of GM foods perceive food as not just a commodity to be consumed but one with cultural and sal. One therefore wanders if such technologies could be tailor-made for specific environment such as Africa. A technology, which is perceived not just as an imported national identities. Generally, people are identified by their consumption and nutrition lifestyle and therefore take pride in what they eat. Biotechnology need to be

developed in the context of social choices, social scientific coalition of biotechnology with endogenous development pathways' as opposed to 'exogenous biotechnology research'. The growth in world population, the rising demand for high quality food, and the growing awareness of sustainability issues has increased the need for food technologies/genomics that help to feed humanity while making a balanced use of natural resources. Another issue of concern is the nutritive value and food safety issues.

### **Extent of usefulness of biotechnology in solving problems in research and development**

The results of the survey showed that respondents recognize biotechnology as having a significant potential to solve the problem of lack of research and development, pest infestation, plant disease and other important agronomic problems such as, reduced soil fertility and high use of pesticides. After all, developing countries should have a strong desire (Figure 5) to get access to these technologies in order to increase productivity, relieve the pressure on natural resources and stimulate economic growth.

### **Level of interest in biotechnology debates among the public**

There was very high positive response to participation in GM public debate as shown in Figure 6. Approximately 80% of the sample interviewed showed interest in participating in public debate on GM related issues as illustrated in Figure 4. This shows the level of importance the public attach to this subject. Respondents were of the view that GM risks are not being exaggerated and therefore strongly recommended extensive awareness strategies to educate the public. Respondents suggested TV and radio as useful media for the dissemination of information concerning this issue.

Most people in developing countries are not well informed to make meaningful contributions to on-going debate on biotechnologies/GM foods. Considering the current soaring prices of foods in the world market place one can not remain indifferent about issues of biotechnology and GM foods in particular.

### **Confidence in government regulatory system**

Lack of confidence in government regulatory system in the area of biotechnology was a worry to the majority of respondents. Most of respondents were of the view that the government institutions are not well equipped to handle GM technology hence the high positive response to the need to establish a special body to regulate ethical and moral issues associated with biotechnology research. Close to 50% of the sample interviewed lacked

confidence in research institutions in handling GM foods. The pattern of response is well illustrated in Figure 7.

Some of the above findings lend support to literature on the subject under discussion. For instance in a study done by Moon and Balasubramanian (2001), findings revealed that consumer acceptance of biotechnology was significantly related not only to their perceptions of risks and benefits associated with GM products, but also to their moral and ethical views. Further, public views about multinational corporations, trust in government, and knowledge of science and technology also influenced their attitudes towards biotechnology. Baker and Burnham (2001) found that consumers' cognitive variables (e.g., levels of risk aversion, opinions about GM foods) influenced their acceptance of GM food products. People's social, political, religious and moral/ethical views are likely to affect their perceptions of biotechnology and acceptance of GM food products (Hamstra, 1998; Wanskin and Kim, 2001).

### **Conclusions and recommendations**

There have been tremendous breakthroughs in genomics/biotechnology research and development in the recent times especially in the advanced countries. The application of biotechnology in agriculture has become a hot issue for public debate in the wake of current sharp increases in the world food prices. Public attitudes towards biotechnology in general and GM food products in particular remain mixed. On the one hand, the public remains optimistic about the prospect of new and improved food and fiber that can bring a wide range of health and economic benefits. On the other hand, they are concerned about the perceived health, safety and environmental risks as well as socio-cultural implications often associated with the use of this technology particularly in Africa. In an attempt to investigate the level of public acceptance of biotechnology/GM foods in Ghana, a stakeholder survey was conducted and some aspects of the findings presented in this paper. Key issues raised in this paper borders on public perceptions with respect to acceptance of GM foods in Ghana and the socio-cultural implications. Conclusions and recommendations made are outlined below:

- i.) On the issue of whether Ghana should accept biotechnology and specifically GM foods, close to 50% of the sample interviewed were not in favour.
- ii.) The use of biotechnology/GM foods encourages production-consumption disconnections caused by globalization.
- iii.) The results of the survey showed that respondents recognize biotechnology as having a significant potential to solve the problems of lack of research and development, pest infestation, plant disease and other important agronomic problems such as, reduced soil fertility and high use of pesticides.

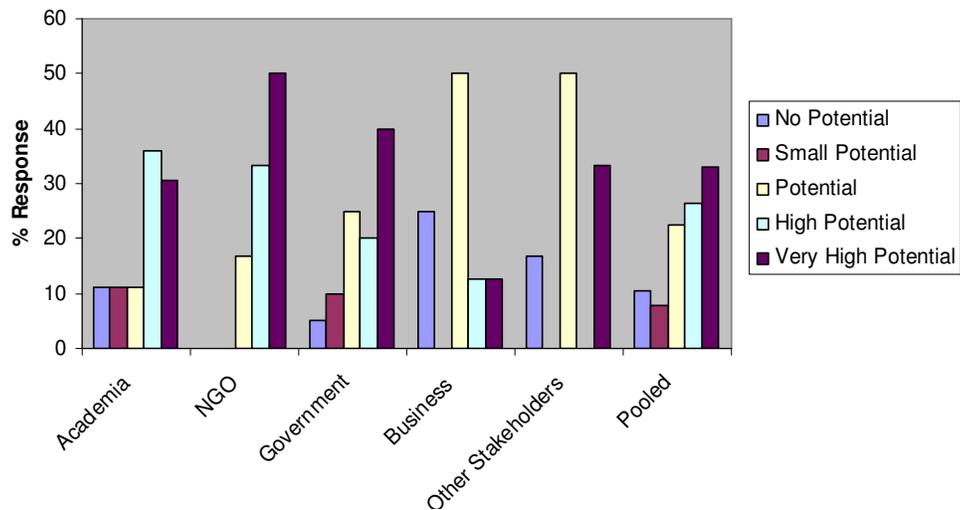


Figure 5. The level of potential of biotechnology in solving problems in R and D in Africa.

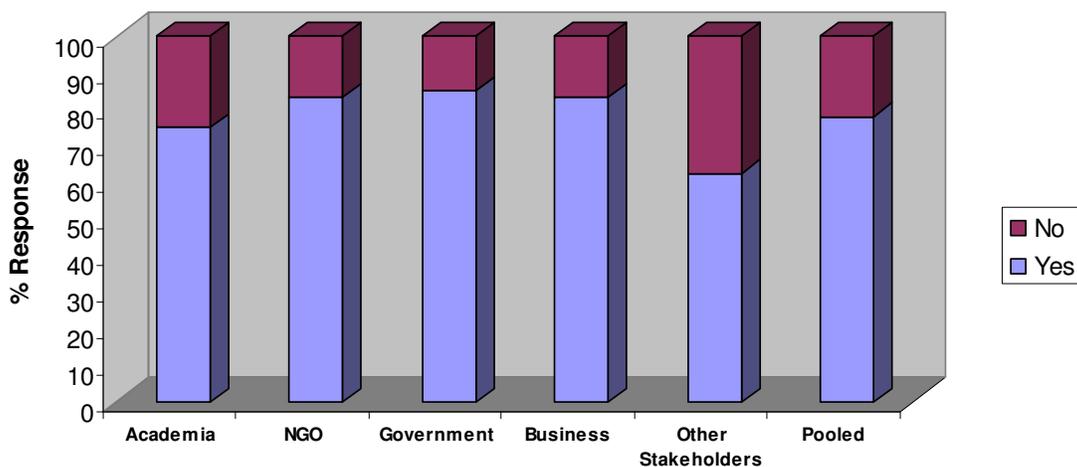


Figure 6. Willingness to participate in public debates on GM technologies

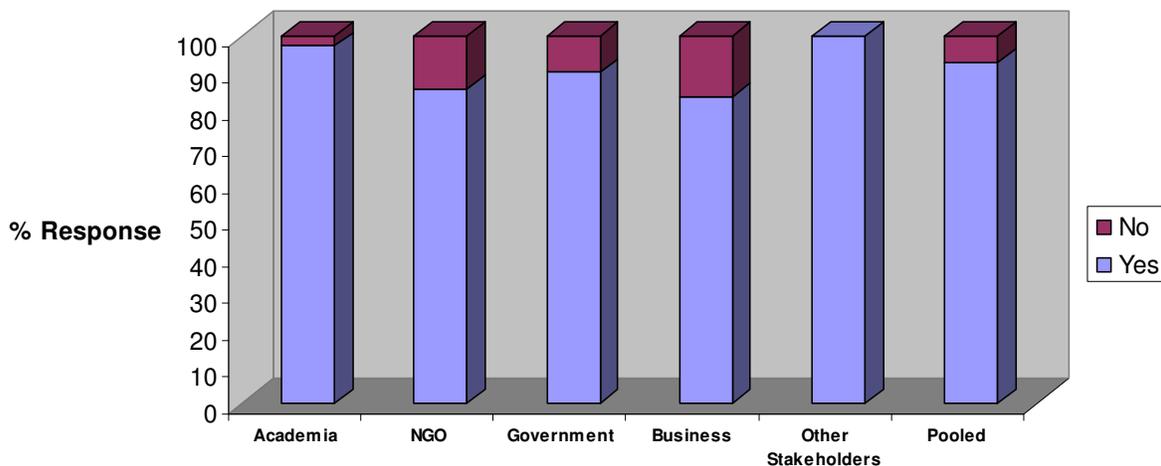


Figure 7. Responses on the need for strengthening government regulatory body.

iv.) Respondents were enthusiastic and very much interested to participate in GM public debate in order to increase the level of awareness of biotechnology/GM foods in Ghana.

v.) Majority (84.9%) believed that any decision on GM foods at the governmental level should be supported with a thorough research base.

vi.) On the whole, confidence in Government regulatory system is very low since majority believed these regulatory system are incapable of regulating GM technology, thus they are in support of the establishment of a special body to regulate the ethical and moral issues associated with biotechnology research.

vii.) Awareness creation and educational campaigns at schools, public debates with extensive media coverage were strongly recommended to help the general public make well informed decisions and become actively involved in the decision making process.

viii.) A regulating body should be placed over large genetic companies for proper control and to avoid monopoly or exploitation of the potential market. Measures should be taken to uplift the image of the existing regulatory systems so as to boost public confidence in them.

ix.) Research agenda setting in the field of biotechnology/GM Foods and its applications should also consider the socio-cultural implications. Choices should address social needs of endusers by involving them in research; social scientific coalition of biotechnology with endogenous development pathways' as opposed to 'exogenous biotechnology research'.

## REFERENCES

- Aerni P (1999). Public Acceptance of Transgenic Rice and its Potential Impact on Future Rice Markets in Southeast Asia. Ph.D. Dissertation. Zurich: Swiss Federal Institute of Technology.
- Aerni P (2001). Public Attitudes towards Agricultural Biotechnology in Developing Countries: A Comparison between Mexico and the Philippines. Science, Technology and Innovation Discussion Paper No. 10. Cambridge, MA, USA: Center for International Development, social choices; social scientific coalition of biotechnology with endogenous development pathways' as opposed to exogenous biotechnology research' Harvard University. [http://www2.cid.harvard.edu/cidbiotech/dp/discussion\\_aerni.pdf](http://www2.cid.harvard.edu/cidbiotech/dp/discussion_aerni.pdf)
- Baker GA, Burnham TA (2001). Consumer Response to Genetically Modified Foods: Market Segment Analysis and Implications for Producers and Policy Makers. *J. Agric. Resour. Econ.* 26: 387-403.
- Einsiedel FF (1997). Biotechnology and the Canadian Public. Report on a 1997 National Survey and Some International Comparison. University of Calgary, Calgary, Canada.
- FAO (2003). Food and Agricultural Organization of the United Nations. The State of Food and Agriculture, Rome, Italy.
- Feenberg A (2005). Critical theory of Technology: An Overview: Potentialities, Actualities and Spaces 1(1): 47-64
- Feenberg A (2002). Transforming Technology, New York. Oxford University.
- Feenberg A (1999). Questioning Technology, New York: Routledge.
- Galhardi RM (1995). Employment Impacts of Agricultural Biotechnologies in Latin America: Coffee and Cocoa in Costa Rica. In *Assessing the Impacts of Agricultural Biotechnologies*, edited by B. Herbert-Copley, Proceedings of Meeting of International Development Research Center (IDRC), May 15-16, Ottawa, Canada.
- Gaskell G, Allum N, Bauer M, Durant J, Allansdottir A, Bonfadelli H, Boy D, de Cheveigne S, Fjaestad B, Gutteling JM, Hampel J, Jelsoe E, Jesuino JC, Kohring M, Kronberger N, Midden C, Nielsen TH, Przystalski A, Rusanen T, Sakellaris G, Torgersen H, Twardowski T, Wagner W (2000). Biotechnology and the European public. *Nat. Biotechnol.* 18(9): 935-938.
- Hallman W, Adelaja A, Schilling B, Lang JT (2001). Consumer Beliefs, Attitudes and Preferences Regarding Agricultural Biotechnology. Food Policy Institute Report, Rutgers University, New Brunswick, New Jersey.
- Hamstra IA (1998). Public Opinion about Biotechnology: A Survey of Surveys. European Federation of Biotechnology Task Group on Public Perceptions on Biotechnology, The Hague, The Netherlands. p. 19.
- IFPRI (2007). International Food Policy Research Institute. Sustainable Solutions for ending hunger and poverty. The Future of Small Farms for Poverty Reduction and Growth. Vision 2020 Policy Briefs.
- Isserman AM (2001). Genetically Modified Food: Understanding the Social Dilemma. *Am. Behav. Scient.* 44: 1225-1232.
- Juma C (2002). The Global Sustainability Challenge: From Agreement to Action. *Int. J. Global Environ. Issues* 2(1-2): 1-14.
- Junne G (1991). The Impacts of Biotechnology on International Trade. In *Biotechnology in Perspective: Socio-economic Implications for Developing Countries*, Edited by A. Sasson and V. Costarini, Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO).
- Kalaitzandonakes (2000). Agrobiotechnology and Competitiveness. *Am. J. Agric. Econ.* 82(5): 1224-1233.
- Quaye W (2007). Food Sovereignty and combating poverty and hunger in Ghana. *Tailoring Biotechnol.* 3(2): 101-108.
- Rohrmann B, Renn O (2000) Risk Perception Research. An Introduction. In: Renn O, Rohrmann B (eds) *Cross-Cultural Risk Research. A Survey of Empirical Studies*. Dordrecht: Kluwer Academic Publishers
- Ruivenkamp G (2005). Between Bio-Power and Sub-Politics Tailoring Biotechnologies: Potentialities, Actualities and Spaces 1(1): 11-32.
- Sagar A, Daemrich A, Ashiya M (2000). The tragedy of the commons: biotechnology and its publics Commentary. *Nat. Biotechnol.*, Vol 18.
- Shanahan J, Scheufele D, Lee E (2001). Trends: Attitudes about Agricultural Biotechnology and Genetically Modified Organisms. *Public Opinion Quarterly*, 65(2): 267-81.
- United Nations Development Program (UNDP) (2001). Human Development Report: Making new technologies work for human development. New York: Oxford University Press.
- Wanatabe S (1985). Employment and Income Implication of the Bio-Revolution: A Speculative Note. *Int. Labor Rev.* 124: 227-247.
- Winterfeldt von D, Edwards W (1984). Patterns of conflict about risk technologies. *Risk Anal.* 4: 55-68.
- Yawson RM (2004). Agricultural Biotechnology, Poverty Reduction and Food Security in Ghana. *Biotech. Ghana Vol. 3 No. 1 ISSN 0855-6245 pp. 7-8 CSIR-FRI/MP/YRM/2004/003*