

Role of Modern Biotechnology in Sustainable Development; Addressing Social-Political Dispute of GMOs that Influences Decision-Making in Developing countries

*Ademola A. Adenle (United Nations University & University of Oxford, UK), Klaus Ammann (University of Bern)**

Genetically modified organisms (GMOs) technology has been widely used in agriculture in the last years in several regions, and has diverse potentials in addressing the challenges of sustainable development such as pest and diseases, drought, malnutrition and food insecurity, in developing countries. However, controversies surrounding the possible risks of GM technology have also spread on public concern. Despite potential risks, no reported case has been documented regarding negative impact from GMOs in the country since 1996 when GM crops were first commercialized (James C., 2014). This is consistent with a recent study based on 15 years of intense research and risk assessment, that GM crops do not pose greater risks for human health or the environment than traditionally bred varieties (Fagerstrom et al., 2012). Moreover, analyses have shown substantial socio-economic and environmental benefits of GM crops (Brookes & Barfoot, 2012; James C., 2014).

It will be advisable, to reconsider the original definitions of sustainability – strongly interconnected to innovation – which has been advocated since the beginning of the Brundtland initiatives (Brundtland Gro Harlem & NGO Committee on Education, 1987 and 2008). Deplorably, GMO opponents have constructed a rift between GM crop and conventional/organic agriculture, clearly based on political motivation (Ammann, 2012).

GM technology has yet to make any visible impact on food security almost two decades after the first GMO products were released, partly due to lack of consensus as to how to regulate GMO products and controversy surrounding the adoption of GMOs (Adenle et al., 2013). For example, the genetically modified rice called 'Golden' rice, developed 20 years ago, aimed to address the problem of vitamin A deficiency in developing countries including countries in Africa, has suffered another huge

setback due to a recent destruction of rice field trials in the Philippines as vandals claimed that the GMOs represent a threat to health and biodiversity. Still, field trials continue with local landraces with Golden Rice crossed in, it will be available in due time for distribution and free reproduction among the Philippine farmers and later elsewhere in SE-Asia. (Ammann, 2014).

Social-political and scientific dispute between developed nations (e.g., the US and Europe) has influenced the regulation and decision-making on GMO issues in many developing countries. This dispute has spilled over to international regulation of GMOs, with the US aligning its GMO policy with the World Trade Organization (WTO) whilst the EU strictly applies precautionary principle of the Convention on Biological Diversity (CBD) (Dibden et al., 2013). Canada and partly also the USA follow the science based product oriented biosafety assessment with a pre-evaluation of all novel crops including the conventional new traits, and Europe, including the Cartagena Protocol, still follows the process-oriented risk assessment of GMOs alone, which is not based on sound science (Ammann, 2014).

Other important constraints for national regulatory frameworks are the local controversies around GMOs. For example, many African countries are still in an early stage of elaborating their GMOs legal frameworks and face enormous challenges in building adequate capacity to enforce them (Adenle et al., 2013; Makinde et al., 2009). On the other hand, many Latin American countries have developed pioneer and solid regulatory frameworks for GMOs, but its actions and mechanisms are under growing influence by the public perception of risks (Burachik, 2010; Niosi and Reid, 2007). Furthermore, the lack of public investigation in African governments is another problem with

*The views expressed in this brief are the authors' and not those of the United Nations. Online publication or dissemination does not imply endorsement by the United Nations.

regard to GMOs. One of the primary problems in developing countries is that they do not have the capacity or enough knowledge to make their own decision with regard to GMOs, and as a result, many developed nations take advantage of such constraints. Developed nations and their organizations invest money and provide facilities and trainings in developing public investigation —that is the central core of the decision-making process in developing countries with regard to GMOs. However, through such investments they are pointing decision-making processes in the direction of developed nation's interests. For example, donors investments in the development of capacity building in African countries are directing their decision-making towards the EU interests and beneficiaries ((Adenle, 2014; Morris, 2011).

Developing countries are caught in the middle of the debate between the acceptance and rejection of GMOs with regard to consumption, import and export while the sustainability of many developing countries can be measured according to the practiced methods of agriculture. Many developed countries have to respond to the trade pressure from GMOs exporters, meet the import regulations of export markets, and follow the multilateral laws on trade and bio-safety while they are tackling with forming the required policy, legal and institutional frameworks. Therefore, it is important to determine such trade-related issues that significantly influence decision-making processes in developing countries. For instance, many southern African nations primary rejected the GM food aid, partly as a health precaution, and partly on the grounds that it could adversely affect their own crops, thus reducing possible exports to Europe in the future. European NGOs like Greenpeace and GENOK also campaign against the use of GMOs in Africa. And their negative bias toward GMOs continues to undermine possible application of GMOs and organic agriculture all together (Ammann, 2008, 2009). From the US points of view, it is because of the Europe's moratorium on GM foods and seed imports; contributing to more hunger in southern Africa.

Moreover, lack of scientific expertise and limited capacity for risk analysis and safe evaluation of GM cassava has been reported in Africa (Adenle, et al., 2012). Given the lack of clear criteria for determining what represents health or

environmental harm in the presence of scientific data (Kuiper & Davies, 2010; Sanvido et al., 2012), one begins to wonder how scientists from developing countries, particularly countries in Africa will be able to release the clearly beneficial GM cassava, GM Maize, GM sorghum or any GM food in the future.

The application of modern biotechnology such as GMOs and the emerging biotechnology traits based on many new transfer technologies (Ricroch & Hénard-Damave, 2015), particularly, in view of lack of assessment of new innovation, thus, requires urgent attention from policymakers as described below:

- 1) Re-think and more pro-active debate is needed to resolve GMOs issues whilst its potential as a relevant technological innovation to achieve sustainable development
- 2) The development and implementation of new policies related to regulation and risk assessment of GMOs in developing countries within the context of consistent international regulatory framework is required as current scope of precautionary principle is controversial and limits the cultivation and trade of GM crops. A shift towards a product-oriented risk assessment (including process views) is recommended.
- 3) Encourage innovative farming practices that integrate GM, conventional breeding and organic agriculture to address challenges of sustainable development, and develop common ground in all agricultural practices for innovative precision farming.
- 4) Identify the most important contributing factors including public investigation and professional long term discourse to the solution of GMO decisions in developing nations. For example, define the role of public, scientists, social scientists and private sector in policy formulation process and implementation respecting different kinds of experience and knowledge.
- 5) The partnership of national government, UN agencies, NGOs, private sector and other relevant stakeholder group is required in structuring regulatory frameworks
- 6) While important sustainability issues surrounding GM technology adoption in developing countries requires

attention, international movement of GMOs should be governed

References

- Adenle, A. A. (2014).** Stakeholders' Perceptions of GM Technology in West Africa: Assessing the Responses of Policymakers and Scientists in Ghana and Nigeria. *Journal of Agricultural & Environmental Ethics*, 27(2), pp. 241-263. <Go to ISI>://WOS:000333025800005 AND <http://www.ask-force.org/web/Developing/Adenle-Stakeholders-Perception-GM-Technology-W-Africa-2014.pdf>
- Adenle, A. A., Aworh, O. C., Akromah, R., & Parayil, G. (2012).** Developing GM super cassava for improved health and food security: Future challenges in Africa. *Agr Food Sec*, 1, pp. 1-15. <http://www.biomedcentral.com/content/pdf/2048-7010-1-11.pdf> AND <http://www.ask-force.org/web/Developing/Adenle-Developing-GM-Super-Cassava-2012.pdf>
- Adenle, A.A., Morris, E.J., Govindan, P., (2013).** Status of development, regulation and adoption of GM agriculture in Africa: Views and positions of stakeholder groups. *Food Policy*, 42: 159-166. <http://www.sciencedirect.com/science/article/pii/S0306919213001346>
- Ammann, K. (2008).** Feature: Integrated farming: Why organic farmers should use transgenic crops, open source citations. *New Biotechnology*, 25(2), pp. 101 - 107. <http://www.ask-force.org/web/NewBiotech/Ammann-Opinion-Integrated-Farming-20080825-names-links-edited.pdf>
- Ammann, K. (2009).** Feature: Why farming with high tech methods should integrate elements of organic agriculture. *New Biotechnology*, 25(6), pp. 378-388. <http://www.sciencedirect.com/science/article/B8JG4-4WKT50-1/2/1698b7149ed724fd0a49b3ae49f234ab> AND <http://www.ask-force.org/web/Organic/Ammann-High-Tech-and-Organic-2009.pdf>
- Ammann, K. (2014).** Genomic Misconception: a fresh look at the biosafety of transgenic and conventional crops. A plea for a process agnostic regulation. *New Biotechnology*, 31(1), pp. 1-17. <http://dx.doi.org/10.1016/j.nbt.2013.04.008> AND open source: <http://www.sciencedirect.com/science/article/pii/S1871678413000605> AND <http://www.ask-force.org/web/NewBiotech/Ammann-Genomic-Misconception-printed-2014.pdf>
- Ammann Klaus. (2012).** Chapter 27: Advancing the cause in emerging economies, version from 20. June 2012. In Bennett David & Jennings Richard (Eds.), *Successful Agricultural Innovation in Emerging Economies* (pp.27). Cambridge: Cambridge University Press <http://www.ask-force.org/web/CUP-Success-GM-crops/Ammann-Advancing-Cause-Emerging-20120802.pdf>
- Ammann Klaus. (20140414).** A Golden Opportunity. Judge GM crops on their properties, not the technique that made them – and we can start saving lives. *The Biologist*, 61(3), pp. 2. <http://www.ask-force.org/web/Golden-Rice/Ammann-Golden-Opportunity-final-fulltextref-20140414.pdf>
- Burachik, M. (2010).** Experience from use of GMOs in Argentinian Agriculture, economy and environment. *New Biotechnology*, Vol 27 (5) p588-592: <http://www.sciencedirect.com/science/article/pii/S1871678410004462>
- Brookes, G., & Barfoot, P. (2012).** The income and production effects of biotech crops globally 1996–2010. *GM crops & food*, 3(4), pp. 265-272. <http://dx.doi.org/10.4161/gmcr.20097>
- Brundtland Gro Harlem, & NGO Committee on Education. (1987 and 2008).** *Report of the World Commission on Environment and Development: Our Common Future* pp. 318 orig. and 223 print Oslo, Norway: U. Nations ISBN/ISSN Transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment Retrieved from <http://www.un-documents.net/ocf-acr.htm> AND <http://www.ask-force.org/web/Sustainability/Brundtland-Report-Original-19870804.pdf> AND <http://www.ask-force.org/web/Sustainability/Brundtland-Our-Common-Future-1987-2008.pdf>

- Dibden, J., Gibbs, D., & Cocklin, C. (2013).** Framing GM crops as a food security solution. *Journal of Rural Studies*, 29, pp. 59-70. <Go to ISI>://WOS:000315613200007 AND <http://www.ask-force.org/web/Regulation/Dibden-Framing-GM-crrops-food-security-solution-2013.pdf>
- Fagerstrom, T., Dixelius, C., Magnusson, U., & Sundstrom, J. F. (2012).** Stop worrying; start growing. *EMBO Rep, advance online publication*, pp. <http://dx.doi.org/10.1038/embor.2012.59> AND <http://www.ask-force.org/web/Regulation/Fagerstroem-Stop-Worrying-Start-Growing-2012.pdf>
- James C. (2014).** Global Status of Commercialized Biotech/GM Crops: 2014, executive summary. Dedicated to the late Nobel Peace Laureate, Norman Borlaug,. (ISAAA Brief 49), pp. 32. <http://www.isaaa.org/resources/publications/briefs/49/executivesummary/default.asp> AND top ten facts: <http://www.isaaa.org/resources/publications/briefs/49/toptenfacts/default.asp> AND <http://www.ask-force.org/web/ISAAA/ISAAA-Briefs-49-Executive-Summary-2014.pdf>
- Kuiper, H. A., & Davies, H. V. (2010).** The SAFE FOODS Risk Analysis Framework suitable for GMOs? A case study. *Food Control*, 21(12), pp. 1662-1676. <http://www.sciencedirect.com/science/article/pii/S0956713510000721> AND <http://www.ask-force.org/web/Food/Kuiper-Save-Foods-Risk-Analysis-suitable-2010.pdf>
- Makinde, D., Mumba, L., & Ambali, A. (2009).** Status of Biotechnology in Africa: Challenges and opportunities. *Asian Biotechnology and Development Review*, 11(3), pp. 1-10. <http://www.ask-force.org/web/Developing/Makinde-Status-Biotechnology-Africa-2009.pdf>
- Morris, E. J. (2011).** Modern Biotechnology - Potential Contribution and Challenges for Sustainable Food Production in Sub-Saharan Africa. *Sustainability*, 3(6), pp. 809-822. <http://www.mdpi.com/2071-1050/3/6/809/> AND <http://www.ask-force.org/web/Sustainability/Morris-Modern-Biotechnology-Potential-2011.pdf>
- Niosi, J., Reid, S.E. (2007).** [Biotechnology and Nanotechnology: Science-based Enabling Technologies as Windows of Opportunity for LDCs?](http://www.sciencedirect.com/science/article/pii/S0305750X06002154). *World Development*, Volume 35, Issue 3, March 2007, Pages 426-438; <http://www.sciencedirect.com/science/article/pii/S0305750X06002154>
- Ricroch, A. E., & Hénard-Damave, M.-C. (2015).** Next biotech plants: new traits, crops, developers and technologies for addressing global challenges. *Critical Reviews in Biotechnology*, 0(0), pp. 1-16. <http://informahealthcare.com/doi/abs/10.3109/07388551.2015.1004521> AND <http://www.ask-force.org/web/Genomics/Ricroch-Henard-Next-Biotech-Plants-2015.pdf>
- Sanvido, O., Romeis, J., Gathmann, A., Gielkens, M., Raybould, A., & Bigler, F. (2012).** Evaluating environmental risks of genetically modified crops: ecological harm criteria for regulatory decision-making. *Environmental Science & Policy*, 15(1), pp. 82-91. <http://www.sciencedirect.com/science/article/pii/S1462901111001390> AND <http://www.ask-force.org/web/Regulation/Sanvido-Evaluating-Environmental-Risks-2012.pdf> AND <http://www.ask-force.org/web/Regulation/Sanvido-Evaluating-Supplement-2012.pdf>