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Co-existence of GM and non-GM Crops: Implications for Africa

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A survey[1] on the application of and experience in the use of socio-economic considerations in decision-making as provided for in Article 26 of the Cartagena Protocol on Biosafety revealed co-existence of living modified organisms as one of the top five issues. Although Europe and North America have debated and developed co-existence regulations and strategies respectively, most developing countries have yet to do same. Consequently, the increasing global adoption of genetically modified (GM) crops has engendered debate on the feasibility of successful co-existence between GM and non-GM[2] crops in Africa. Co-existence, with its possible implications for national economies, requires management to ensure different cropping systems operate in tandem without interfering with or excluding any other agricultural production method. In distilling policy options that provide safeguards for successful co-existence, this brief analyses measures for managing the growing demand for different foods in the global market place.

Co-existence is not specific to the production of GM crops. It has been managed for many years to protect specific harvests, such as colour of maize product and drift of pesticides or fertilizers onto organic fields. Lessons can be learned from these traditional practices to help ensure practical and affordable co-existence measures for new agricultural products.

Principles and Rationale for Co-existence

Co-existence in biotechnology refers to GM, conventional and organic agricultural production systems that operate in proximity without mixing of produce or compromising their economic value. The key principles of co-existence are: context (relative agronomic and commercial importance of different crop production systems); consistency (adhering to established standards); proportionality (science-based and non-discriminatory); equity (fairness), and practicality (based on scientific, legal, and workable realities)[3]. The co-existence of these differing production systems facilitates access to niche markets, ensures good returns on investment, provides safeguards to sociocultural norms and values, protects biodiversity and permits diversification in production as a coping mechanism under variable environmental conditions. Stakeholders such as governments, consumers, producers, traders and industry (including seed developers) have requested a system that is demand-driven and offers freedom of choice while protecting the interests of indigenous communities. The goal is to cater for different niche markets that support the economic interests of the various commercial groupings.

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[1] UNEP/CBD/BS/COP-MOP/5/INF/10
[2] Non-GM crops are defined as crops produced by conventional and organic methods.
[3] Graham Brookes (2004). Co-existence of GM and Non-GM crops: current experience and key principles.

Regulatory Requirements for Achieving Co-existence

The EU position on co-existence of GM and non-GM crops: (i) advocates for management measures that reflect best available scientific evidence on the probability and sources of mixing between GM and non-GM crops; (ii) permits cultivation of GM and non-GM crops while ensuring that non-GM crops remain below the legal thresholds for labelling and purity standards with respect to GM food, feed and seeds, as defined by the Community legislation (Commission Recommendation 2003/556/EC). Threshold levels are set by countries that regulate the labelling of GM content in foods and by the organic industry. They are set at percentages of total content and if GM content is higher than the designated threshold, the food must note that GM ingredients are present.

Although co-existence of GM and non-GM crops in agriculture is an issue of economics and market value, the debate has sometimes been triggered by environmental and food/feed safety concerns. However, it must be noted that safety assessments are completed by regulatory authorities before approval is given for the commercial cultivation of GM crops. Biosafety regulation ensures both an adequate level of safety and access to safe new products that will benefit local communities. Potential pitfalls that regulatory authorities must avoid include excessive and unworkable compliance requirements, a lack of appreciation of the agricultural landscape (farm size and location), and a poor understanding of existing indigenous co-existence strategies. Although it has been established that outcrossing[4] decreases with increasing farm sizes, many farmers in Africa have small land holdings and having a variety of crops growing in close proximity can complicate implementation of successful co-existence. If these are crops that cross-pollinate easily with the GM crop, then managing coexistence can be challenging. Any attempt at successful co-existence must factor in existing practices for co-existence of conventional and organic agriculture, potential sources of adventitious mixing, whether these impact on the harvested crop, the legal threshold limits, the type of co-existence measures essential to attain such thresholds, and practical and affordable measures to ensure co-existence.

The adventitious presence[5] of GM material in non-GM products can occur at various stages of the value chain. At the production stage, there is the possibility of modified genes finding their way into non-GM crops through pollination or seed mixing. Cross-pollination through pollen drift by wind, water or animals to nearby non-GM crops is influenced by the crop biology and geographical distribution. Importantly, outcrossing can only occur to sexually compatible plants. All other plants are unaffected by pollen from GM crops. Seeds left in a field after harvest can result in volunteer plants during the next season that pollinate the new crop. Measures to control volunteers are already implemented for conventional and organic farming and can be used for GM crops. Adventitious presence can happen when farm machinery is not thoroughly cleaned between use on different crops, when different planting material is not kept separate in storage facilities and during post-harvest handling of produce if care is not taken during transportation and delivery to prevent unwanted mixing. Thus, practical technical and management measures are required during planting, cultivation, harvest, storage, transport and handling of harvested material. The key issue in successful co-existence is not the absence of possibilities but rather having safeguards at each of these levels and ensuring compliance. The safeguards are crop specific and effective isolation distances can range from 1 metre to over 1000 metres.

[4] The movement of pollen to surrounding crops.

[5] Unintended or technically unavoidable presence of GM material in a non-GM crop.

Product segregation has been in existence for centuries with producers cooperating to ensure crop integrity for specialised products. For instance, in North America and Europe the technical and management measures adopted to ensure segregation include delayed or staggered planting times, use of varieties with different flowering times, crop rotations, isolation distances, designated zones for planting specialist crops, use of buffer rows around specialist crops (pollen barriers), record-keeping, training, and delivery to designated storage facilities or processors. These measures have been effective in ensuring crop integrity. In Portugal, farmers growing GM maize undergo mandatory training and are obligated to inform farmers in neighbouring fields and operators with whom they share agricultural equipment. Based on FAO's crop classification, they also comply with established isolation distances, or use buffer rows and different flowering times. The produce, when harvested, is segregated and tagged using a unique identifier.

In some African communities, informal arrangements or understanding exist among producers to achieve some level of segregation. These common arrangements include designated zones for planting specific crops, designated silos that accept conventional and GM harvests or only organic produce; implemented isolation distances, staggered planting times, or using varieties with different flowering times. Groups of farmers in South Africa have segregated non-GM soybeans and non-GM maize for processors. This is not always financially lucrative, but indicates that co-existence is possible in Africa.

Current thresholds of acceptable levels of adventitious presence of GM material in non-GM commodities vary. For instance, while the EU has a threshold of 0.9 per cent before GM labelling is triggered, Australia, Brazil and New Zealand have thresholds of one per cent, and Japan five per cent. Some African countries, e.g. Burkina Faso and Ghana, have regulations that allow a one per cent threshold for adventitious presence of GM in non-GM food or feed products, which is in compliance with market demands. Countries currently have different regulatory approaches to co-existence. Some have co-existence policy measures without legislation, others have legislation and guidelines in various laws, and some have no provisions at all. An absence of legislation is not an insurmountable barrier. Industry bodies, such as agricultural boards, in some instances implement and monitor measures for coexistence and segregation of crop harvests. Spanish farmers, in the absence of legislation, used Good Agricultural Practices for guidance on farm and post-production processes and these guidelines are attached to seed bags at the point of sale.

Implications of Co-existence for International Trade

Implementing co-existence measures must be guided by international agreements established by the World Trade Organization, Codex Alimentarius and the Cartagena Protocol on Biosafety. Concerns have been raised as to whether markets exist for GM crops and whether cultivation of GM crops will undermine international trade. Evidence suggests niche markets exist for both GM and non-GM crops and that there is growing demand for GM crops. Choosing measures to adopt for co-existence must take into consideration both cost and practicality. Co-existence measures are frequently linked to identity preservation which provides a paper trail that confirms that segregation has been kept. Identity preservation provides an important measure of traceability within the food and feed value chain and is feasible to implement. South Africa, for example, confirms segregation using identity preservation.

The impact of co-existence on cross-border trade is an important consideration. Should regional economic communities in Africa strive for co-ordinated coexistence, adventitious presence and identity preservation standards to facilitate regional trade? Stewardship measures are being implemented on the continent to help minimise the impact of GM crops on local food and feed markets and on international trade[6]. To achieve effective segregation of specialised produce, distribution systems that originally handled undifferentiated commodities need to be remodelled, for example, adopting compartmentalized freighting systems rather than the current use of sheets to maintain horizontal separation during shipping. . The costs of co-existence measures must be carefully considered when designing new models including a consideration of who should pay these costs. The EU guidelines specify that producers who introduce a new production method in a region should bear responsibility for farm management measures to limit outcrossing.

Way Forward

Co-existence systems for GM, conventional and organic crops afford farmers a choice of production systems that will help meet demands for niche markets by maintaining crop integrity within an agro-ecological system and preserving the economic value of the harvest. Co-existence is an economic rather than a safety consideration. However, co-existence requires clear guidance and is a complex process where no 'one-size-fits-all model' will be effective in all growing regions. The feasibility of co-existence measures must be evaluated on a case-by-case basis. The foundation for successful co-existence is policies and guidelines that are science-based, efficient, cost-effective and specific to particular crop and farming systems. The drive to develop co-existence measures will most likely come from the food and feed industry, but will benefit from supportive government coordination. Considering current efforts at regional levels to harmonize biosafety regulations (see policy brief 2 on harmonization), it would be useful to explore regionally appropriate co-existence strategies at the same time.

In developing workable co-existence strategies for GM and non-GM crops, the guiding principle should be to employ advances in science to improve the safety, efficiency and integrity of current food production, processing and distribution systems. The focus should be on adopting available, safe and useful technologies rather than a policy of exclusion that serves the narrow interests of some to the detriment of others.

It is important for stakeholders to be willing to develop co-existence strategies. This will require a willingness to reach compromises, mutual respect, shared responsibilities and government leadership in creating an enabling environment for these discussions. The planning of co-existence measures will need updated information on the biology of crops in Africa to identify appropriate strategies for production. Planning should include information on the experiences and best practices that have worked in other parts of the world. While ongoing stewardship training, farmer cooperation, education and the application of indigenous agricultural knowledge are critical for success, establishing clear guidelines for co-existence is an essential starting point.

This is the third of a series of policy briefs by the African Union/NEPAD - African Biosafety Network of Expertise (ABNE) that addresses socio-economic issues on regulating modern biotechnology. ***This policy brief is primarily for regulators, policy-developers and decision-makers.***

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6 SABIMA is an agricultural biotechnology stewardship program being implemented in Africa by FARA.