GMOs in Africa: food and agriculture

Status report 2007

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The African Centre for Biosafety (ACB) is a non profit organisation, based in Johannesburg, South Africa. It provides authoritative, credible, relevant and current information, research and policy analysis on issues pertaining to genetic engineering, biosafety and biopiracy in Africa.

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Contents

This booklet provides current information on Genetic Engineering in food and agriculture in Africa. It serves as a historical record, tracking significant developments and identifying key trends and role players involved in the debate. Due to the rapidly evolving nature of events, the ACB will periodically update this work.

It is entirely possible that in the course of our work, we may have inadvertently missed some developments that may not be recorded or easily accessible to us in English. For this, we offer our profound apologies.

In this booklet, we use the terms genetic engineering and genetic modification interchangeably. It should also be noted that the reference numbers in the booklet do not always follow a chronological order due to the cross-referencing made and in order to avoid repetition of references.

Synopsis

More than 10 years have passed since GMOs were first commercialised in the world, yet out of more than 50 African countries, only South Africa has explicitly taken biosafety decisions to authorise the commercial cultivation and importation of GMOs for the purposes of food, feed and processing.

In 2006, 44 countries in Africa received food aid, with the World Food Programme (WFP) and the United States Agency for International Development (USAID) providing a staggering amount of almost 5 million metric tons, with USAID supplying at least 75% of this.[1] US food-in-kind donations are contaminated with GMOs as these are freely grown in the US and there are no segregation, traceability and labelling systems to enable the provision of non-GM food aid. Several African countries such as Sudan, Angola and Zambia have fiercely resisted receiving GM food aid, precipitating reforms in food aid policies internationally. The European Union (EU) now insists that its monetary contributions buy only GM-free aid, and in 2003, the WFP adopted a policy that allows recipient countries to specify whether they are prepared to receive food aid containing GMOs. However, only a few African countries are in a position to specify this, or to test food aid for GM contamination; none can do this on an on-going basis.

Some African countries including Zambia and Sudan have acquired testing equipment to determine whether food imports and food aid contain GMOs. But other countries are not in a position to effectively test food aid they receive due to resource and other capacity constraints. In August 2007, CARE International announced that it would no longer accept the US system whereby US grain is exported, using US carrier ships, as food aid, instead of donations in cash as many other countries do. CARE labelled the system as expensive and hugely inefficient.[2]

The GM push in Africa has recorded several significant setbacks and failures, with Florence Wambugu's GM sweet potato in Kenya and the Gates Foundation's GM sorghum in South Africa being the most prominent. The rejection by South Africa's GMO regulatory authority of the GM sorghum project is extremely significant, as this sets the boundaries that even pro-GM South Africa cannot cross: namely, that genetic engineering of a crop

where Africa is the centre of origin will not be tolerated. Importantly, this rejection represents a huge set back for crucial components of the 'New Green Revolution in Africa' push, which is heavily funded by the Gates Foundation.

Indeed, 2007, has not been a good year for GE in South Africa. The first ever GM cassava field trials also faced the thumbs down from the South African regulatory authorities; a major retailer in South Africa, concerned about the possibility of GM potatoes still in field trials in South Africa having entered the food chain, publicly announced their decision not to stock GM potatoes until its safety had been proven. The South African sugar industry also strongly indicated their extreme reluctance to throw their weight behind GM sugarcane. The South African regulatory authorities also rejected out of hand, Syngenta's application for commodity import of its GM maize for ethanol on food safety grounds.

While the GE lobby has waged a heavily resourced battle for acceptance of GMOs, public reaction has in many instances been hostile. The media has been extremely critical of GMOs in countries such as Kenya, Zambia and South Africa and several well-organised coalitions of civil society groups are in the forefront of resistance to GMOs in several African countries. The fiercest opposition can be found in South Africa, Kenya and several countries in West Africa. An example of strong opposition in West Africa is COPAGEN, a coalition of farmers' organizations, consumers' organizations, trade unions, women's organizations, youth groups, national and international NGOs, cultural groups, academics, artists' organizations, and individuals opposed to GMOs in various West African countries. The coalition of Kenyan civil society groups very recently successfully mounted a campaign to stop the Kenyan Parliament from passing a pro-GM Biosafety Bill. South African civil society is extremely active in resisting GMOs, with the charge being led by several groups including the African Centre for Biosafety, Biowatch SA and the South African Freeze Alliance on Genetic Engineering (SAFeAGE).

As at 23 October 2007, 40 African countries are Parties to the international environmental agreement regulating the cross border movement of GMOs, namely the Cartagena Protocol on Biosafety. These include Algeria, Benin, Botswana, Burkina Faso, Cameroon, Cape Verde, Chad, Congo, Democratic Republic of the Congo, Djibouti, Egypt, Eritrea, Ethiopia, Gambia, Gabon,

Ghana, Kenya, Lesotho, Liberia, Libyan Arab Jamahiriya, Madagascar, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Sudan, Swaziland, Togo, Tunisia, Uganda, United Republic of Tanzania, Zambia and Zimbabwe.[3]

This huge number of Parties to the Protocol from Africa signifies a strong commitment to the international biosafety regulation of GMOs.

Very few countries have fully functional biosafety systems in place to adequately regulate GMOs. Indeed, several countries, including Mali and Kenya have delayed promulgation of controversial biosafety legislation, in the face of widespread opposition from civil society groups in their countries.

Several countries in Africa have imposed biosafety restrictions on GMOs including Algeria, Angola, Benin, Sudan, Uganda, Mozambique, Zambia and Zimbabwe.

Only nine countries in Africa have to date reported field trials of GMOs, namely, Burkina Faso; Egypt; Kenya; Morocco; Senegal; South Africa; Tanzania; Zambia and Zimbabwe.

Twenty-four countries have some capacity and institutions to conduct GM research and development, with South Africa and Egypt being involved in numerous projects. These include Algeria; Benin; Botswana; Burkina Faso; Cameroon; Egypt; Ethiopia; Ghana; Kenya; Madagascar; Malawi; Mali; Mauritius; Morocco; Namibia; Niger; Nigeria; Senegal; South Africa; Tanzania; Tunisia; Uganda; Zambia and Zimbabwe.

Analysis: key issues and trends

As a result of its well established, large scale industrial farming and agribusiness sector, GMOs easily found a place in South Africa's agriculture several years ago. Yet, 2007 has been marked with several significant set backs for the pro-GE lobby in South Africa.

Kenya, with its high concentration of pro-biotech support, has pushed ahead with its lax and permissive 2007 Biosafety Bill, despite widespread opposition, public protest and court action in that country. However, the dissolution of the Kenyan Parliament before it could pass the Bill on the 22nd October 2007 opens up new opportunities for revision of the Biosafety Bill in that country. The South African and Kenyan activities are spearheaded by a range of players that include multinational companies, research institutions, government institutions and agribusiness players.

Burkina Faso is Africa's biggest cotton producer and is the focus of efforts to bring GM cotton into commercial production in that country. Indeed, Burkina Faso is the bridgehead for a concerted move to proliferate GE cotton in West Africa's cotton belt.

In March 2007, at a Ministers' meeting of ECOWAS (the Economic Community of West African States), a regional group of fifteen countries including Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guniea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, produced a 2006-2010 "Action plan for the development of biotechnology and biosafety in the ECOWAS sub-region", backed by the World Bank, and executed by WECARD (West and Central African Council for Agricultural Research and Development), INSAH (Sahel Institute) and CILSS (Permanent Inter-state Committee for Drought Control in the Sahel), with a total budget over five years of US$ 23,6 million. The plan includes as key actions "promotion of biotechnology products specific agribusiness", "strengthening of the seed systems and national phytosanitary legislations to facilitate dissemination of the products" and "reinforcement of the intellectual property systems to enable all the parties involved to take advantage of the development of the biotechnology sector in the region"[4]. Part of the action plan is "harmonisation" of biosafety legislation in the region. COPAGEN described this as "using the Burkina Faso's pro-GM stance as a template to be imposed on other countries in the region"[5]. COPAGEN notes that its participation in consultations on this plan had been manipulated and their position seriously misrepresented on the GEF website where it is claimed "COPAGEN-BF — previously hostile to the Program — were this time noticeably more supportive of its aims".[5]

A second grouping of African countries — of which both Zimbabwe and Ghana[6] are examples — appear to be hastily introducing biosafety legislation in the absence of the requisite biosafety capacity and resources for monitoring, control and enforcement being in place. These countries have drafted weak biosafety legislation, substantially weaker than the minimum standards established by the Biosafety Protocol, and aimed primarily at making GE research and development, importation of GE foods and eventually commercialisation possible.

Harmonisation of biosafety legislation

'Harmonisation of biosafety regulation' is designed to create a one-stop GMO approval system at the sub-regional level, so as to side step a country-by-country, case-by-case risk assessment and decision-making process. In this way, fast-track GM approval systems can be created for the expeditious introduction of GMOs into Africa.

The harmonisation approach is supported by the World Bank, USAID and national and regional affiliates of the Consultative Group on International Agricultural Research (CGIAR) and various African academic and research institutions. Several African governments are also in favour of harmonisation. In West Africa, ECOWAS strongly encouraged by the World Bank, are the drivers behind a harmonisation push in West Africa.[7] Kenya is the focal point for the harmonisation push for the East African countries of Uganda and Tanzania, under the auspices of the Programme for Biosafety Systems (PBS), funded by USAID.[6] The African Union and the New Partnership for Africa's Development Africa (NEPAD) have also urged all African states to adopt "a consistent Africa-wide position on food and environmental standards".[8]

New Green Revolution in Africa

On 12 September 2006, the Rockefeller and the Bill & Melinda Gates Foundations launched a new partnership which they named Alliance for a Green Revolution in Africa (AGRA). AGRA has committed an initial $150 million to enable the transfer of a technology package featuring improved hybrid seeds, inorganic fertilizers, water management and extension services to Africa. AGRA's goal is to develop 100 new varieties in 5 years focusing on at least 10 different staple crops, including maize, cassava, sorghum, and millet.

AGRA is supported by the Yara Foundation (linked to the Norwegian fertilizer company, the largest fertilizer company in Africa), the United Nations Millennium Villages Project, UN's Food and Agriculture Organisation (FAO), the International Fund for Agricultural Development (IFAD), WFP, NEPAD, the UK Department for International Development (DFID) and a range of pro-GM proponents including USAID, Syngenta, Monsanto, Dupont, African Agricultural Technology Foundation (AATF), Syngenta Foundation for Sustainable Agriculture, International Service for the Acquisition of Agribiotech Applications (ISAAA), and Africa Harvest Biotech Foundation International (AHBFI).[213]

Former UN Secretary General, Kofi Annan has been appointed as the Chair of the Board of Directors of AGRA. Upon his appointment, he said of AGRA and GM: "We in the alliance will not incorporate GMOs in our programmes. We shall work with farmers using traditional seeds known to them." Going further, Annan said "poor pricing of commodities and not type of seeds, keeps African growers away from their farmlands despite spiralling food insecurity and poverty on the continent" and that "insufficient infrastructure such as roads, poor storage facilities and weak market structures were to blame for Africa's continued dependence on food aid".[9] GE proponents such as AfricaBio, the Africa Biotechnology Stakeholders Forum (ABSF), AHBFI, Biotechnology-Ecology Research and Outreach Consortium (BioEROC) and ISAAA — were swift in their response by trying to roll back Annan's statement into the official NEPAD position that "regional economic integration in Africa should embody the building and accumulation of capacities to harness and govern modern biotechnology".[10]

Nevertheless, the New Green Revolution push has already been discredited by several African groups, including the Nyéléni Declaration on Food Sovereignty[11] as being a Trojan Horse for the wholesale introduction of GE into Africa. A statement signed by 70 organisations from 12 African countries at the World Social Forum in Nairobi, 2007[12], strongly condemned AGRA as "putting over $150 million towards shifting African agriculture to a system dependent on expensive, harmful chemicals, monocultures of hybrid seeds, and ultimately genetically modified organisms (GMOs)."

Agrofuels

Agrofuels NOT biofuels

"We believe that the prefix 'bio', which comes from the Greek word for 'life', is entirely inappropriate for such an anti-life devastation. So, following the lead of non-governmental organisations and social movements in Latin America, we do not talk about biofuels and green energy. Agrofuels is a much better term, we believe, to express what is really happening: Agribusiness producing fuel from plants as another commodity in a wasteful, destructive and unjust global economy".

GRAIN, 27 July 2007. **Stop the Agrofuels craze!** [13]

The drive for agrofuels as a "renewable energy" substitute is creating new opportunities for GE. This has been met with alarm in civil society circles because of the dangers of gene pool contamination as well as the large scale take-over of current food growing resources, especially land and water. A variety of crops – maize, soybeans, groundnuts, cassava, sugarcane, pumpkin seeds and non-food crops such as *Jatropha* – are all earmarked for agrofuel production in Africa.

"There are a colossal number of players involved in the promotion of agrofuels in Africa. From these, the Brazilian government, the oil industry and carbon traders stand out as being the most strategic – and the most rapacious.

Brazil has swooped on the African continent as an important pawn towards its global ambitions to create a global market for ethanol. Brazil is successfully garnering support through bilateral and trilateral cooperation agreements with a number of African countries such as Senegal and Benin. Brazil has targeted the African Union, flanked by several UN agencies, to ensure regional buy in for the roll out of harmonised legal and economic instruments to sustain a viable biofuels market. Through the International Biofuels Forum, Brazil with its partners, China, India, South Africa, the US and the European Commission will aggressively promote an international market for biofuels and will force down the throats of the rest of the world, international standards to ensure that ethanol is turned into an internationally tradable commodity.

Several oil companies such as BP, D1 Oils and Petrobras are involved in biofuels projects in Africa, aimed indiscriminately at oil producing and

non-oil producing countries alike – from tiny Swaziland to oil rich Nigeria. These predatory oil companies will support any venture – at any social and environmental cost – as long as it contributes to its global strategy to delay the oil peak. Interest is also being shown in countries like Ghana, to link large-scale plantations of *Jatropha* with the carbon-trading regime of the Kyoto Protocol.

The political stage is thus being set in Africa, for the roll out eventually, of grand schemes of large agrofuel production. Mozambique is set to take the lead in Southern Africa. Through its Mozambique Petroleum Company, it hopes to invest $550 million in a sugarcane and *Jatropha* agrofuels project for the purposes of supplying the regional and international markets with ethanol and biodiesel." [14]

Position paper of the global south on food sovereignty. The Geopolitics of Agrofuels: energy sovereignty and the transition towards a post-oil society. Quito 2007

During 2007, South Africa published a draft Biofuels Strategy, which proposed to replace 4,5% of South Africa's liquid road-transport fuels with agrofuels through mandatory blending with conventional petroleum and diesel — 8% for ethanol and 2% for biodiesel. These agrofuels would be blended and sold through the existing infrastructure of the oil industry in South Africa.

South African civil society organisations have condemned the draft strategy. Specifically, concerns have been expressed that the draft SA Biofuels Strategy will provide the impetus for more varieties of GM maize and soybean to be pushed through South Africa's lax regulatory regime and in so doing, present unacceptable risks to human health and the environment. [15] Concerns have also been expressed that it would be only a matter of time before Monsanto's patented varieties of canola are pushed through the regulatory system to be grown on 500 000 ha of prime, non-irrigated arable land in the former Transkei in the Eastern Cape.

Significantly, South Africa's regulatory authority turned down an application by Syngenta for the commodity import of its GM maize event 3272, genetically modified for the conversion of maize to ethanol.

It is estimated that the replacement of all humankind's fossil fuels consumption with agrofuels would require at a minimum, 22% of the net primary productivity (NPP) of the Earth's current biota. All of the prime productive land has already been given

up to agriculture. How much more would be required or have to be appropriated to serve the needs of producing crops for energy? It would be more energy efficient to lay a field of photovoltaic panels and get 200 times the amount of energy than it would be to plant maize on a hectare of land.[16]

GM food aid

Southern African food security crisis and WFP policy on food aid

Food aid consisting of maize and soya or food products derived from maize, soya and cotton emanating from the US and distributed in Africa are highly likely to contain GMOs, unless it has been certified otherwise. During the 2001 food security crisis in southern Africa, GMOs in food aid from USAID and WFP were rejected outright by Zambia and conditionally by Zimbabwe, Malawi, Mozambique and Zimbabwe when these countries requested that all US imported GE maize be milled prior to distribution so that it could not be planted. Lesotho and Swaziland authorised the distribution of non-milled GE food aid but warned against using seeds for planting. In response, and under extreme international pressure, the WFP adopted a policy on GMOs in food aid during 2003. The policy requests recipient country offices of the WFP to comply with national regulations regarding GM food imports. The WFP will only provide food as aid that is approved as safe in both donor and recipient nations. Countries that clearly state that they do not wish to receive GM food aid will have their wishes respected. The WFP still accepts GM food aid from donors but will also respect the wishes of donors who give cash in lieu of 'in-kind' aid and where they request that the money not be spent on GM food. However, the WFP policy promises far more than it delivers since no country in Africa besides South Africa has taken biosafety decisions on any GMO grown in the US and which may be contained in food aid shipments. A WFP representative in Johannesburg, Richard Lee, said that WFP respects the wishes of food aid recipients about GM-free food, and requires certification that products are GM-free from GM producing donor countries where such certification is required.[17]

THE WFP POLICY PROMISES FAR MORE THAN IT DELIVERS SINCE NO COUNTRY IN AFRICA BESIDES SOUTH AFRICA HAS TAKEN BIOSAFETY DECISIONS ON ANY GMO GROWN IN THE US AND WHICH MAY BE CONTAINED IN FOOD AID SHIPMENTS.

Africa continues to reject GM food aid, but the US retaliates

In 2002 Angola discovered that un-milled GM maize had been entering the country as food aid.[18] In April 2004, Angola introduced a ban on imports of un-milled GM food aid. The country decided to mill food aid before use or import it from non-GM sources. Zambia offered in principle to provide the 19,000 tons of GM-free grain from its 120,000-ton surplus produced in 2003.[19]

In May 2003, Sudan banned the import of GM food, but issued a series of temporary waivers enabling food aid shipments to the country to continue while alternatives were found. In March 2004, Sudan introduced restrictions on GM food aid, and requested that food aid be certified "GM free." The US response was swift and brutal: suspension of food aid shipments to Sudan and enormous political pressure on the government to rescind the ban. The Sudanese government, with its back to the wall, had no option but to relent by extending the waiver for six more months, allowing the distribution of GM food to continue until January 2005.[20]

By early 2007, the Sudanese government had lifted the waiver (so again blocking the import of GM-containing food aid), and acquired instruments for testing GM contents in food. [21] In April 2007 Sudan first held up and then released 100,000 tonnes of cereals from the UN WFP, after testing it for containing GMOs. The WFP strongly denies this charge.[22]

The US's policy of providing food aid in kind — effectively providing an extra, subsidized market for its own grain farmers under Public Law 480 — is extremely controversial. PL 480 clearly asserts that the purpose of US food aid programmes is to 'develop and expand export markets for US agricultural commodities'. This not only includes markets for domestic agricultural surpluses but also, crucially, facilitates the penetration of GM food. USAID has made it quite clear that it seeks to "integrate biotech into local food systems" and "spread agricultural technology through regions of Africa."

European Markets

European rejection of GE food plays an important role in making African exporters to Europe (and that is the majority of African states) cautious in adopting GMOs.[23] An added consideration for African producers is the lack of labelling systems in Africa — and the difficulty of introducing and administering such systems in the light of existing unlabelled GE imports coming into their countries and possibly contaminating

non-GM food sources. This presents a growing threat for African access to European markets. In December 2006, it was reported that UK and German buyers of South African wines had cancelled orders for SA wine after learning about the proposed GM grape vine field trials and that the Stellenbosch researchers had received "stacks of letters from wine lovers insisting they don't want to buy or drink engineered wines".[24]

Namibia requires certification from SA in respect of exports of animal feed to that country because it exports beef to Europe where organic meat — meat from animals fed non-GM derived animal feed is sought after.

Brakes on contamination of Africa's genetic diversity

The potential for gene pool contamination of endemic or staple food crops was a significant factor in rejections by the SA authorities of research applications proposing to genetically engineer cassava and sorghum. This line of thinking has been strong in Africa for a long time, not only for defending its wealth of biodiversity, but also being ever aware of the vulnerability of many African households who are dependent on natural resources and small-scale, low-input and risk-averse farming systems. Decisions by the pro-GM South African regulatory authorities imply that an obstacle has arisen for pro-GM proponents who are targeting food crops for biofuels production as well as targeting African staple crops in an effort to prove their sincere intentions. However, both refusals are on appeal.[25, 26]

Regional snap-shot of the GM push

West Africa

Regional Biotech Investment and Organisations

The US Department of Agriculture sponsored Norman E. Borlaug's International Science and Technology Fellows Program to train African scientists in biotechnology in the US.[27] The USAID-funded Program for Biosafety Systems (PBS) assists countries in East and West Africa to enhance biosafety policy, research, and capacity. The International Service for National Agricultural Research (ISNAR) is its lead institution. PBS members include the International Food Policy Research Institute (IFPRI), Donald Danforth Plant Science Center, AGBIOS, Michigan State University and Western Michigan University. In West Africa, the International Institute for Tropical Agriculture (IITA) based in Nigeria and Le Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles (CORAF) are regional partners.[28]

The West African Biotechnology Network (WABNET) was launched in May 2004, jointly executed by the federal government of Nigeria, USAID and the International Institute of Tropical Agriculture (IITA).[29]

USAID's Collaborative Agricultural Biotechnology Initiative (CABIO) provides support for the extension of agricultural biotechnology, including genetic modification, and is being extended into West Africa. Support includes assisting in priority-setting programs in East/Central and West Africa that should lead to a regional research agenda for African sub-regional agricultural research organizations.[30]

The World Bank is playing a large role in enabling each of these countries to produce Biosafety legislation. Whilst the World Bank cannot compel any of these countries to adopt any particular form of Biosafety legislation, it does in fact suggest and influence biosafety policy.[63] The World Bank is focussing its efforts on the West African Economic and Monetary Union (WAEMU also known as UEMOA),[31] a smaller grouping of 8 West African states that has the power to impose the 'fast-track adoption' of compulsory 'enabling' legislation on its members.[63] This initiative by the World Bank is carried out with complete disregard for the parties concerned. For example, the project proposal itself was available only in English, yet all the countries of the WAEMU are French-speaking and public consultations have been organised on an invitation-only basis.[63]

ECOWAS (Economic Community of West African States) is a regional group of fifteen countries including Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.[7] A series of meetings of ECOWAS Ministers, supported by USAID, have taken place annually between 2003-2005 in order to ease the way for GE industries in West Africa. The 2005 meeting held in Mali called for greater allocations from ECOWAS country agricultural budgets for GM research and development. The March 2007 meeting was bent on discussing a regional plan to facilitate public acceptance of GMOs into West Africa. Civil society groups, including Environmental Rights Action/ Friends of the Earth Nigeria, Friends of the Earth Ghana, Friends of the Earth Sierra Leone, Centre for Environment and Development/Friends of the Earth Cameroon, Consumer Association of Ghana, Green Earth organization (Ghana), Ghana National Association of Farmers and Fishermen (Accra, Ghana), Akuse Rice Farmers Association (Ghana), Yonifa Farms (Greater Accra Region, Ghana), Department of Crop Science (University of Ghana), Afife Irrigation Project (Ghana) and the National Development Planning Committee (Ghana) called on the ECOWAS ministers to follow an inclusive process of consultation devoid of industry influence, to initiate plans to promote local production and preservation of seeds and to monitor the illegal introduction of GMOs into West Africa.[32]

In July 2007, WAEMU's Commissioner in charge of rural development, natural resources and environment, Ismail Binguitcha-Fare, warned that West Africa is likely to face increased risks of massive introduction of GMOs in the next few years.[33] At a meeting to officially inaugurate a regional bio-security orientation and monitoring program, he said that tests on GMO seeds are currently underway and once the new seeds are fully developed, they will be sold through formal and informal channels. [33]

GM cotton push

The GM machinery, ably assisted by the South African government has peddled the experience of poor black farmers who have been growing GM cotton in the Makhathini Flats in South Africa since the late 1990s as being worthy of imitation on the continent. However, beneath the hype lies a tragic tale of oppression and vulnerability, which the introduction of *Bt* cotton has further exacerbated.[34, 35] Attempts at replicating the Makhathini Flats experience in the rest of Africa, which itself has been caught up in an endless cycle of debt, will undoubtedly yield similar results.

Nevertheless, in June 2006, the international NGO GRAIN reported on a World Bank plan (funded by the Global Environmental Facility) to "undermine public debate and aggressively drive GM crops into the heart of peasant agriculture", under the guise of the West African Regional Biosafety Project.[36] The World Bank's strategy is to harmonise biosafety regulations for GM crops across regions in order to override national processes that are more susceptible to local opposition. As discussed earlier, the idea is to establish favourable regulations in a few countries whose governments are open to GM crops and then to use these regulations as a model that can be imposed on neighbouring countries by way of regional policy bodies. In this way, harmonisation by-passes democratic debate and provides industry with a large, one-stop regional market for their GM seeds. As a result of the WUEMA group of countries being the most open to imposing uniform biosafety legislation on its members, they are being targeted first.

The West Africa Regional Biosafety Project — with participating countries: Benin, Burkina Faso, Mali, Senegal, Togo — is a direct descendent of USAID activities in the region and the UNEP-GEF Biosafety Capacity building project. As national debate over GM crops has erupted in the region, leading to a wide variation in national biosafety process, USAID has been aggressively supporting regional biosafety harmonisation and the introduction of Bt cotton, the main cash crop for West African peasants. The US government's agenda for pushing Bt cotton in West Africa has three objectives: bringing African support to the small club of GM nations on the international stage; distracting attention from unfair US domestic cotton subsidies; and securing US corporate control over West Africa's lucrative cotton production.

These regional projects shift decision-making power even further to international and regional bodies that are removed from local influence and they give undue power to agencies like the World Bank, that are well-known for championing the interests of GM corporations. Such projects make a mockery of the vibrant national and local debates on GM raging around the world.

The trajectory of the GM cotton push is further discussed under the country profile for Burkina Faso below.

East and Central Africa

Regional Biotech Investment and Organisations:

The USAID funded Program for Biosafety Systems (PBS) assists countries in East and West Africa to enhance biosafety policy, research, and capacity. The International Service for National Agricultural Research (ISNAR) is its lead institution. PBS members include the International Food Policy Research Institute (IFPRI), Donald Danforth Plant Science Center, AGBIOS, Michigan State University and Western Michigan University. East African partners are the African Biotechnology Stakeholders Forum (ABSF; Kenya), Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) and the East African Regional Programme and Research Network for Biotechnology, Biosafety, and Biotechnology Policy Development (BIO-EARN).[37] BIO-EARN is a programme to build policy and research capacity in agricultural biotechnology in Kenya, Uganda, Ethiopia and Tanzania, funded by the Swedish Development Agency (SIDA) with policy development funded by IBS/ISNAR. BIO-EARN's 3-5 year plan is to produce genetically modified cassava, sorghum and sesame with altered starch and oil composition.[38]

The African Agricultural Technology Foundation (AATF) is a public-private partnership based in Kenya, with the purpose of developing GM technology in Africa. AATF received start-up funds from USAID, the Rockefeller Foundation and DFID, as well as Monsanto, Dupont, Dow and Syngenta.[39] In 2004, the AATF signed a memorandum of understanding with the USDA to share and disseminate agricultural technologies.[40] Focal areas include development of insect resistant maize, pro-vitamin A enhanced maize and rice, and cowpea production.[41]

A Biosciences Facility for Eastern and Central Africa is being established as part of NEPAD's continent-wide network of centres of excellence. The establishment of the new facility has been made possible by an initial investment of more than Canadian $30 million by the Canada Fund for Africa through the Canadian International Development Agency.[42]

The USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) facilitates collaborative research between those countries in Africa linked to the ASARECA, US public and private sectors and international agricultural research centres. The principal aim is to foster regional acceptance of GM through weak biosafety regulations.[43] ASARECA is a partner of USAID's Agricultural Biotechnology Support Project (ABSP) whose goal it is to support research, product development and policy development for the commercialisation of GM crops.

Private partners of ABSP include Monsanto, Syngenta, Pioneer Hi-Bred and DNA Plant Technology.[126] The Horn Biotechnology Forum (HBF), founded in 2002, held a workshop on biotechnology in the Horn of Africa countries (Djibouti, Eritrea, Ethiopia, Somalia, and Sudan) on June 29, 2006 in Addis Ababa, Ethiopia. The "Workshop on Present Status, Challenges and Future Opportunities" aims to raise biotechnology awareness and promote better understanding of the current status, challenges, and future opportunities of biotechnology applications for the region.[44]

A former lecturer at Kenya's Jomo Kenyatta University of Agriculture and Technology, is leading a Sh800 million ($11.2 million) project aimed at improving agricultural productivity in East Africa. The Swedish funded project focuses on biotechnology and dependence on non-renewable energy resources. The BIO-EARN project also offers training in biotechnology. The Inter-University Council for East Africa will monitor the implementation of the project between 2006-2009.[45]

North Africa

Regional Biotech Investment and Organisations

The International Centre for Agricultural Research in the Dry Areas (ICARDA) aims to use Egypt as a base to test chickpeas with GM *Ascochyta* resistance, as well as herbicide resistance and to test Bt lentils. Together with AGERI from Egypt and FAO, ICARDA is working closely with Algeria, Morocco and Tunisia to establish suitable biosafety regulations to allow the introduction of GM plants in these countries in the future.[46]

Southern Africa

Regional Biotech Investment and Organisations

The Southern Africa Regional Biosafety programme (SARB) is a partnership with seven Southern African Development Community (SADC) countries — Malawi, Mauritius, Mozambique, Namibia, South Africa, Zambia and Zimbabwe — to provide technical training in biosafety regulatory implementation.[43] SARB is a sub-unit of the USAID-funded Agricultural Biotechnology Support Project (ABSP) whose goal is to support research, product development and policy development for the commercialisation of GM crops. Private partners of ABSP include Monsanto, Syngenta, Pioneer Hi-Bred and DNA Plant Technology. According to USAID, the objective of SARB is to provide

the "regulatory foundation to support field testing of genetically engineered products".[47]

On 30 June 2005 the African Union and NEPAD announced the establishment of 'The African Panel on Biotechnology', which includes senior scientists and policymakers from across the continent.[48]

On 5 August 2005, NEPAD and South Africa's Council for Scientific and Industrial Research (CSIR) formally launched SANBio, a network aimed at bringing together researchers and institutions from 12 countries across the region and encouraging the pooling of knowledge and resources. This is part of NEPAD's 'African Biosciences Initiative' aimed at building regional networks of 'centres of research excellence'. The hub for southern Africa is in South Africa. Other hubs being developed are Egypt (for North Africa), Kenya (East and Central Africa) and Senegal (West Africa).[49]

At a meeting in Mozambique of Ministers of science and technology of the Southern African Development Community (SADC) region in December 2005, the 14 countries that make up SADC (Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe), agreed to co-ordinate their science policies and work together to develop the region's science and technology infrastructure.[50] The main resolutions were to harmonise some of the rules governing how scientific research is carried out, especially customs regulations on the movement of researchers and scientific equipment and to co-ordinate tertiary education at a regional level by creating regional training centres.

A Regional National Biosafety Framework (NBF) Development Workshop was held in Mozambique for African Lusophone Countries in March 2005.[51]

Regional Laws and Regulations

The Southern African Development Community (SADC) Advisory Committee on Biotechnology and Biosafety has recommended that donors of GM food aid should comply with Prior Informed Consent principles and the notification requirements of the Biosafety Protocol.[43] SADC has issued guidelines on handling GMOs, and has asked its member states to develop national biotechnology policies and establish biosafety regulatory systems. These have also contributed to the shift in the WFP policy on GM food aid, discussed above.

Country by country status reports

ALGERIA

Laws and Regulations

In December 2000, Algeria introduced a ban on the "import, distribution, commercialisation and utilisation of GM plant material".[20] National legislation on GMOs is in preparation.[52] Algeria is working with ICARDA (see North Africa regional information) to develop a biosafety framework to permit the introduction of GM crops in future. Algeria is party to the Convention on Biological Diversity and has ratified the Cartagena Protocol.[53]

GMO R&D

There is some research capacity in agricultural biotechnology, but no known research, field trials or commercial release of GMOs to date.[52]

GMOs in Food Aid and Imports

On 5 January 2001, Algeria which imports large quantities of durum wheat from the United States, announced that it would not import any genetically modified wheat.[54] There is a ban on the import of GMOs until national laws come into force, with the exception of GMOs imported for research.[52] In 2006, Algeria received 18,033 metric tons of (unspecified) food aid from the World Food Programme, which according to the WFP office in Johannesburg,[17] was non-GM. Algeria received no food aid from the US in 2006.

ANGOLA

Laws and Regulations

Angola does not have any biosafety legislation in place yet. It is party to the Convention on Biological Diversity but has to date not ratified the Cartagena Protocol on Biosafety,[55] although Agbios has reported that the Biosafety Protocol has already been brought into force in Angola, after the National Assembly (parliament) passed the relevant international resolution in March this year.[56]

GMO R&D: field trials or commercial release

As at 2004, no GM research has been conducted by the Agricultural Research Institute,[57] however, it is entirely possible that research has commenced since 2004 and is not accessible in the public domain.

GMOs in food aid and imports

In 2002 it was discovered that un-milled GM maize had been entering the country as food aid.[58] In April 2004, Angola introduced a ban on imports of un-milled GM food aid.[20] The country will mill food aid before use or import it from non-GM sources. Zambia offered in principle to provide the 19,000 tons of GM-free grain from its 120,000-ton surplus produced in 2003.[19] In 2006, Angola received 1,467 tons of food aid (most of it cornmeal and vegetable oil) in US food aid,[59] which can be assumed to be GM.

BENIN

Laws and Regulations

Benin is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety. In March 2002, Benin declared a moratorium on GM crops.[60]

GMO R&D: field trials or commercial release

Research institutes that may have some capacity to conduct research on agricultural biotechnology include the Institut National de Recherche Agricole du Benin (INRAB); the Institut International d' Agriculture Tropical au Bénin (IITA); the Universite National du Benin (UNB); and the Centre Béninois de la Recherche Scientifique et Technique. The Direction de la Recherche Agronomique du Benin (DRA) is collaborating on a ten year IITA funded research and development project on GM drought tolerance, insect and virus resistance in cowpeas. Other participating African countries include Burkina Faso, Cameroon, Ghana, Niger, Nigeria and Senegal.[61]

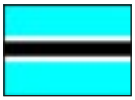
There are no known trials or commercial release of GMOs to date.

GMOs in food aid and imports

Benin has taken measures to prevent imports of GM food,[20] with a moratorium prohibiting the import of GMOs until national legislation comes into force.[62] However,

Benin still accepts food aid from the US with the high possibility that the grain itself is GM.[63] In 2006, Benin received 1,004.5 tons of US food aid, more than half of it vegetable oil and "wheat-soy blend", both likely to be GM. WFP food aid to Benin in 2006 amounted to 5,792 tons. Its GM status was not clear.

BOTSWANA



Laws and Regulations

Botswana is a Party to the Convention on Biological Diversity, and the Cartagena Protocol on Biosafety.

Botswana is in the process of drafting a biotechnology governing framework and guidelines.[64] The framework was initiated by UNEP-GEF in 2002, with the National Coordinating Strategy Agency the focal point for Biosafety.[65] There is criticism that the drafting process has failed to encompass all stakeholders, especially members of the public who lack knowledge on GMOs.[64]

GM R&D: field trials or commercial release

Botswana may have agricultural biotechnology research capacity at the Department of Agricultural Research; the Botswana College of Agriculture; and the National Food Technology Research Centre.

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

There are no records of Botswana being the recipient of food aid.

BURKINA FASO

Laws and Regulations

Burkina Faso is a Party to the Convention on Biological Diversity, and the Cartagena Protocol on Biosafety.

GMO R&D: field trials and commercial release

The Institut de l'environnement et de recherches agricoles (INERA) is collaborating on a ten year IITA funded research and development project on GM drought tolerance, insect and virus resistance in cowpeas. Other participating African countries include Benin, Cameroon, Ghana, Niger, Nigeria and Senegal.[61] In 2003, field trials of two Bt cotton varieties (Monsanto and Syngenta) were underway at research stations of the Institut Nationale de l'Environnement et de la Recherche Agronomique in Farakoba and Kouaré.[66] In July 2003, Burkina Faso Fibre and Textile Company (SOFITEX), announced plans to embark on the production of GM cotton.[67] There are no known commercial releases to date. Along with other major West African cotton producing countries, Burkina Faso is under a lot of pressure from the US government and multilateral organisations to introduce GM cotton as quickly as possible.

In 2004 the Burkina Faso government accepted proposals from Monsanto to allow the planting of genetically modified cotton, the first country in the region to do so.[68] Monsanto and Syngenta announced plans to expand testing of genetically modified (GM) cotton during the 2006/07 farming season.[69] The monitoring agency, The Union nationale des producteurs de coton du Burkina, reported that 663 farmers have participated in establishing cotton test fields on 316 acres in several parts of the country. The Francophone Union économique et monétaire ouest-africaine have provided the equivalent of $24 million to Burkina Faso in support of these efforts.[69]

In November 2006, Burkina Faso's SOFITEX, announced that it would introduce transgenic cotton to the market by June 2007, because "there is no longer any obstacle to introducing transgenic cotton in Burkina. It was scheduled to be introduced in 2008 but the authorities want it to be in 2007," said SOFITEX's Celestin Tiendrebeogo. The move was opposed by the Coalition for the protection of African Genetic Heritage, (COPAGEN), a grouping of sub-Saharan farming and consumer organisations.[70]

However, in May 2007 SOFITEX, declared that it has postponed until 2009 the start of genetically modified cotton production. SOFITEX said during 2007 and 2008 it will focus on increasing the quantity and quality of available transgenic cottonseed. Burkina Faso is Africa's largest cotton producer, with around 700,000 tonnes in 2006.[71]

GMOs in food aid and imports

Burkina Faso receives food aid through the United Nations World Food Programme.[72] It is unclear if this is GM food aid. In 2006, Burkina Faso received 8,754.1 tons of US food aid, including soy flour, vegetable oil and cornmeal[59] (very likely to be GM).

BURUNDI 

Laws and Regulations

Burundi is a Party to the Convention on Biological Diversity and is not yet a Party to the Cartagena Protocol on Biosafety.

GMO R&D: field trials and commercial release

Burundi is a participant in the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) (see East and Central Africa regional information). There are no known trials or commercial release of GMOs to date.

GMOs in food aid and imports

In September 2000, the Association of Burundi Consumers (ABUCO) and other organisations wrote to President Clinton protesting about the dumping of unlabelled maize in Burundi, asking why food exported to Europe was labelled but food aid to Africa was not.[73] In 2006, Burundi received 73,804 metric tons of WFP food aid (not specified), and 8,691.9 tons of US food aid,[59] the majority of it likely GM-containing corn, corn-soy blend and vegetable oil.

CAMEROON 

Laws and Regulations

Cameroon is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

The Cameroon Biosafety Law No 2003/006 titled "Law No 2003/006 of 21 April 2003 To Lay Down Safety Regulations Governing Biotechnology in Cameroon" ("Biosafety Law") was signed by the President of Cameroon on the 21 April 2003, and passed by the Cameroon Parliament during November 2003.[74] The Biosafety Law has not implemented the Biosafety Protocol in its entirety.

GMO R&D: field trials or commercial release

The Institut de la Recherche Agronomique (IRA) is collaborating on a ten year IITA funded research and development project on GM drought tolerance, insect and virus resistance in cowpeas. Other participating African countries include Benin, Burkina Faso, Ghana, Niger, Nigeria and Senegal.[61] There are no known trials or commercial release of GMOs to date.

GMOs in food aid and imports

Cameroon has been a recipient of food aid through the World Food Programme, which could possibly have contained GM products (31,474 tons in 2006).[75] Also in 2006, Cameroon received 3,905.8 tons of US food aid,[59] of which 2,243.1 tons of vegetable oil was likely contaminated by GMOs.

CAPE VERDE

Laws and Regulations

Cape Verde is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

The Ministry of Environment, Agriculture and Fisheries is in the process of drafting Biosafety legislation.

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Cape Verde received 2,243.1 tons of corn and US food aid, likely to be GM.[59] It also received 1,865 tons of food aid from the WFP.

CENTRAL AFRICAN REPUBLIC

Laws and Regulations

The Central African Republic is a Party to the Convention on Biological Diversity but not a Party to the Cartagena Protocol on Biosafety. Biosafety regulations are in preparation.

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

The Central African Republic receives mainly rice as food aid, but in 2006 received quantities of cornmeal (97.5 tons) and vegetable oil (307.2 tons),[59] both likely to contain GMOs as they came from US food aid. The country does not currently have any legal protection against importation of unapproved GMOs.

CHAD

Laws and Regulations

Chad is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

A national biodiversity strategy is in place.

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date. The USAID Office of Economic and Science Policy (ESP) is set to provide biosafety regulatory assistance to Chad, by providing much more "targeted assistance" by focussing on Bt cotton field trials and GM food aid.[76]

GMOs in food aid and imports

In 2006, Chad received 8,214.3 tons of US food aid, which contained vegetable oil (1,881 tons), cornmeal (1,411.5 tons) and corn-soy blend (130 tons).[59] These are very likely to contain GMOs.

CONGO 

Laws and Regulations

Congo is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

In 2006, the food aid Congo received from the US contained 5,604.4 tons of vegetable oil,[59] which are likely to contain GMOs. WFP food aid amounted to 4,570 tons.

COTE D'IVOIRE 

Laws and Regulations

Cote d'Ivoire is a Party to the Convention on Biological Diversity but is not a Party to the Cartagena Protocol on Biosafety.

Cote d'Ivoire was assisted by the UNEP/GEF global project on the development of a National Biosafety Framework. In addition to assisting countries in developing biosafety frameworks, UNEP/GEF also approved assistance to 8 African countries to implement these countries' biosafety frameworks. Cote d'Ivoire is one of these countries and by 2002 had developed biosafety guidelines and was in the process of completing legislation.[77]

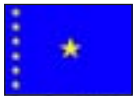
GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Cote d'Ivoire is the recipient of food aid provided through the World Food Programme (25,839 tons in 2006). In 2006, it received 1,322.5 tons of food aid from the US,[59] most of it in GM-containing cornmeal and vegetable oil.

DEMOCRATIC REPUBLIC OF CONGO



Laws and Regulations

DRC is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

GMO R&D: field trials or commercial release

The Democratic Republic of Congo is a participant in the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) (see East and Central Africa regional information). There is no known R&D, field trials or commercial release of GMOs to date.

GMOs in food aid and imports

In 2006, US food aid to the DRC amounted to 15,377.9 tons, the majority of which was corn, corn-meal, corn-soy blend, soy protein products and vegetable oil,[59] all likely to contain GMOs. It received 43,331 tons of food aid from the WFP.

DJIBOUTI

Laws and Regulations

Djibouti is a Party to the Convention on Biological Diversity, and the Cartagena Protocol on Biosafety.

Djibouti has been participating in the UNEP-GEF Biosafety Project and has produced a completed final draft of a National Biosafety Framework.[78]

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Djibouti has been the recipient of US food aid (117 tons of vegetable oil in 2006)[59] and could possibly have received GM products. WFP gave 5,091 tons of unspecified food aid.[75]

EGYPT 

Laws and Regulations

Egypt is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Biosafety Regulations and Guidelines were published in draft form in 1994. Egypt's national biosafety system was formally instituted by the Ministry of Agriculture and Land Reclamation (MALR) in 1995. The system involves several ministries, organizations, and/or government agencies involved with the importation, exportation, and local production of natural products.[79] Egypt's National Biosafety Committee (NBC) is the official body responsible for ensuring that biotechnology products are used safely. Applications for GM field trials are submitted to the Chair of the NBC. Imported GM material requires an import permit that must be obtained in advance from the supreme committee on food safety, the Ministry of Health. Procedures for commercializing GM crops were established in 1998 by Ministerial decree no 1648.[79]

GMO R&D

The Agricultural Research Centre (ARC) has been actively researching and developing GM crops since it launched the Agricultural Genetic Engineering Research Institute (AGERI) in 1990. The Ministry of Agriculture in partnership with USAID established the Centre. Monsanto has partnered with AGERI to develop a commercial GM cotton strain.[80] Other key biotech research institutions include the National Research Centre Agriculture Division, and the Faculties of Agriculture at Cairo University, University of Alexandria and Ain Shams University.[81] Egypt is a partner of USAID's Agricultural Biotechnology Support Project (ABSP) whose goal is to support research, product development and policy development for the commercialisation of GM crops. Private partners of ABSP include Monsanto, Syngenta, Pioneer Hi-Bred and DNA Plant Technology.[126]

Egypt has started testing GM cotton and sugarcane.[82] AGERI in partnership with the International Centre for Agricultural Research in the Dry Areas (ICARDA) are researching GM heat resistance in bananas, and salt tolerance in barley.[81, 20] AGERI is also participating in an international research project funded by ICARDA and a number of northern institutions to research and develop GM lentils with the appropriate Bt toxin gene to control Sitona weevil and with herbicide resistance for *Orobanche* control, and to develop GM resistance in faba beans to *Ascochyta* blight, rust, chocolate

spot, *Orobanche* and stem nematodes.[83] AGERI is also researching GM resistance to banana bunchy top virus.[81] Menofeia Genetic Engineering Research Institute is conducting experiments on gene transfer in pineapples.[81] Other GM research in the experimental phase includes heat resistance and lepidoptera resistance in cotton; lepidoptera resistance in maize (Bt); Necrotic Yellow Virus resistance in faba beans; Zucchini Yellow Mosaic Virus (ZYMV) resistance in melons; and other unspecified GM research on faba beans and tomatoes.[81] Pioneer Hi-Bred International is working with AGERI on Bt maize to develop resistance to corn borer.[84]

GMO field trials

Monsanto field trials of Bollgard II cotton started in 2003.[85] Other field trials are underway for ZYMV virus resistance in cucumbers, squash, melons and musk melons; potato leaf roll virus and potato virus Y (PVY) resistance in potato; Tomato Yellow Leaf Curl Virus (TYLCV) resistance in tomatoes; ZYV resistance in cantaloupe; Sugar Cane Mosaic Virus (SCMV) resistance in sugar cane; lepidoptera resistance in maize and potato tuber moth (PTM) resistance in potato; and salt tolerance in wheat.[81]

GMO commercial release

In April 2005, Egyptian proponents of GM products called for commercial production of GM crops to get underway. Hesitation regarding commercialisation was related to Egypt's fear of losing lucrative European markets, which are not as receptive to GM products. Since Europe relaxed its import ban on GM products, opening the door to 18 products and reviewing 24 more, the options for commercialising have looked more appealing. Ultimately Egyptian scientists want to develop genes they can patent, reducing the reliance on foreign companies.[86]

GMOs in food aid and imports

The Ministry of Health's Supreme Committee for Food Safety issues food import permits including imports of GM foods.[87] Food aid from the WFP in 2006 came to 8,257 tons.[75]

US pressure

Egypt initially supported the US, Argentina and Canada WTO complaint against the EU's de facto moratorium (on 13 May 2003 the US, along with Canada, Argentina, Egypt fielded a complaint in the WTO against the EU's de facto moratorium on GMOs) and

was rewarded with the promise of a free trade agreement in 2004. This offer was retracted by the US with indecent haste when Egypt withdrew from the complaint. The reasons given by Egypt for the withdrawal was the need to preserve adequate and effective consumer protection.

EQUATORIAL GUINEA

Laws and Regulations

Equatorial Guinea is a Party to the Convention on Biological Diversity but is not a Party to the Cartagena Protocol on Biosafety.

In 2005, Equatorial Guinea was approved as eligible to join the global NBF Development project of the UNEP.

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Equatorial Guinea has been the recipient of food aid and could possibly have received GM products.

ERITREA

Laws and Regulations

Eritrea is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

GMO R&D: field trials or commercial release

Eritrea is a participant in the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) (see East and Central Africa regional information). There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Eritrea has been the recipient of food aid and could possibly have received GM products.

ETHIOPIA

Laws and Regulations

Ethiopia is a Party to the Convention on Biological Diversity, and the Cartagena Protocol on Biosafety.

The National Seed Industry Agency regulates seed imports. The Environmental Protection Authority is responsible for all types of authorization of GMOs. The Ethiopian Agricultural Research Organization coordinates research and development on agro-biotechnology nationally, monitors and evaluates such activities and finances research projects.[88]

GMO R&D: field trials or commercial release

Ethiopia reported in 2004 that a document on agricultural biotechnology had been drafted. The workshop out of which this document arose discussed, among others, biotechnology policies and strategy of Ethiopia, the biosafety regime for the development of biotechnologies, the role of higher learning institutions for capacity building in agricultural biotechnology, and how to share experiences on agricultural biotech research and development.[89] Ethiopia has a draft biosafety bill, namely 'Draft Biosafety Proclamation, Final Draft April 2007', which was debated at a two day stakeholder workshop 10-11 April 2007. The feedback is currently being factored into the production of the final biosafety law.

Ethiopia is a participant in the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) and BIO-EARN (see East and Central Africa regional information) The Ethiopian Agricultural Research Organisation (EARO) has a programme on food biotechnology. It is collaborating on an international project funded by the International Potato Centre on GM improvements and virus resistance in sweet potato. Other African countries involved are Kenya and Uganda.[90] There are no known trials or commercial release of GMOs to date.

GMOs in food aid and imports

Ethiopia has been the recipient of 551,757 tons of food aid via the World Food Programme in 2006, and could possibly have been the recipient of GM products. US food aid in 2006 amounted to 57,595.3 in 2006, including 7,740 tons of vegetable oil, and 11,736 tons of corn-soy blend, all highly likely to have contained GMOs.[59, 75]

Public opinion

In early 2006, 29 journalists, scientists, information officers and communication experts drawn from Burundi, Cote d'Voire, Ethiopia, Ghana, Kenya, Rwanda, Rwanda and Tanzania attended a three day workshop in Ethiopia to "enhance capacities of eastern and central African media capacity to cover biotechnology accurately, credibly and effectively" and "dissipate the fear of modern biotechnology so as to help factor it into Africa's development process". The workshop was jointly sponsored and organised by the United Nations Education, Scientific and Cultural Organization (UNESCO), the International Service for the Acquisition of Agribiotech Applications (ISAAA) AfriCenter, Agricultural Biotechnology Support Program (ABSPII) and SDD-UNECA, with additional support from the Association for Agricultural Research in Eastern and Central Africa (ASARECA and Program for Biosafety Systems (PBS).[91]

GABON

Laws and Regulations

Gabon is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

An Environmental Protection Law No 16/93 (1993) and a Forest Code Law 16/01 (2001) regulate biosafety, neither of which contains regulations on biotechnology or GMOs. Gabon is party to the Convention on Biological Diversity.

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GAMBIA 

Laws and Regulations

The Gambia is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Biosafety is regulated by the Environment Management Act (1994), which does not contain information on biotechnology or GMOs.[92] The Gambia has been participating in the UNEP-GEF Biosafety Project and has produced a Draft National Biosafety Framework for The Gambia.[93]

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

The Gambia has been the recipient of 551,757 tons of food aid via the World Food Programme and could possibly have been the recipient of GM products. US food aid in 2006 amounted to 57,595.3 in 2006, including 7,740 tons of vegetable oil, and 11,736 tons of corn-soy blend, all highly likely to have contained GMOs.[59, 75]

GHANA 

Laws and Regulations

Ghana is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

The Ministry of Environment, Science, and Technology (MEST) is the lead agency on biotechnology development in Ghana. A National Biodiversity Committee, comprised of representatives from local universities, research institutes, and other agencies, advises MEST on the development of guidelines related to biodiversity and biosafety.[94] On the 16th August 2005, Ghana issued draft biosafety legislation intended to protect the country's citizens and environment from the potentially damaging effects of GMOs.[95] This document is the result of collaboration with the UNEP/GEF Biosafety Unit through the Project "Development of a National Biosafety Framework for Ghana".[96]

GMO R&D: field trials or commercial release

There are several research programmes on agricultural biotechnology at the Council for Scientific and Industrial Research (CSIR) Plant Genetic Resources Centre (PGRC), Crops Research Institute (CRI), Oil Palm Research Institute (OPRI), and Animal Research Institute (ARI). Other institutions engaged in agricultural biotechnology research are the Faculty of Agriculture at the University of Ghana, and the Biotechnology and Nuclear Agriculture Research Institute (BNARI).[97] The Savannah Agricultural Research Institute (SARI) has participated in a project on GM resistance to downy mildew in pearl millet.

The European Commission Directorate General for Research under the INCO Programme funds the project, and there are a number of collaborating institutions including institutions in Namibia and South Africa.[98] SARI is collaborating on a ten year IITA funded research and development project on GM drought tolerance, insect and virus resistance in cowpeas. Other participating African countries include Benin, Burkina Faso, Cameroon, Niger, Nigeria and Senegal.[61] In 2007, Prof R.M. Al-Hassan (Department of Agricultural Economics & Agribusiness, University of Ghana) and working with the Program for Biosafety Systems (PBS), funded by USAID, with researchers from IFPRI and BNARI, argued the economic case for developing and commercialising a GM tomato resistant to the Yellow Leaf Curl Virus (TYLCV). A 2006 PBS report assessed the economic potential of GM eggplant, cabbage and cassava.[99]

There are no known GM field trials or commercial releases to date.

GMOs in food aid and imports

In July 2005, Mr Ernest Debrah, the Ghanaian Minister of Food and Agriculture said the country would reject, without hesitation, the importation of any GM foods, crops and materials into the country even though it might ease the famine problem.[100] A month later in August 2005, Mr Debrah said that Ghana had not taken any strong stand against the importation and cultivation of genetically modified crops, but was rather strongly in favour of it.[101]

In August 2006, the US Department of Agriculture (USDA) announced the presence of LLRICE601, an unapproved GM rice variety, owned by Bayer CropScience, in more than 15 European countries. The European Union is now testing all rice imports coming from the US. In September/October 2006 Friends of the Earth Ghana collected samples of US long grain rice in the country and sent them to a US laboratory for

independent testing. The results showed that there was LL601 contamination in Ghana.[102] In 2006, Ghana received 12,999 tons of food aid from the US, around 10% of which was vegetable oil and wheat-soy blend.[59]

Public opinion

In May 2007, The Statesman reported[103] that it had gathered information showing that "the international community has began workshops for stakeholders in a bid to educate and persuade them to accept genetically modified foods in Ghana".

GUINEA

Laws and Regulations

The Environmental Protection Code, which does not contain information on biotechnology or GMOs, regulates biosafety. Guinea is a Party to the Convention on Biological Diversity but is not a Party to the Cartagena Protocol on Biosafety.

GMO R&D: field trials or commercial release

The **Division of Biosafety and Biotechnology** (SBB), in collaboration with the Belgian focal point for the Convention on Biological Diversity (CBD) hosted a training programme for the national Biosafety Clearing-House (BCH) Focal Points of developing countries. A representative from Guinea attended in May 2006.[104] There is no known R&D, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Guinea has been the recipient of food aid, 2,094 tons from the US in 2006,[59, 75] including cornmeal, corn-soy blend and vegetable oil, all likely to contain GMOs. It received another 12,365 tons from the WFP.[59, 75]

GUINEA-BISSAU

Laws and Regulations

Guinea-Bissau is a Party to the Convention on Biological Diversity but is not a Party to the Cartagena Protocol on Biosafety.

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Guinea-Bissau has received food aid from the US (including 1,327 tons of vegetable oil) as well as 5,606 tons from the WFP.[59, 75]

KENYA

Laws and Regulations

Kenya is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

The 1996 Guidelines for Safety in Biotechnology regulated biosafety, setting the measures for risk assessment, management and monitoring of operations involving GMOs, rDNA technologies and derived products, until October 2006, when the government adopted a comprehensive national policy — the National Biotechnology Development Policy 2006 — to guide research, development and trade in biotechnology products.[105] The policy came into effect immediately. According to Kenyan laws, a Policy, unlike a Bill, does not have to go through Parliamentary debate. The National Biosafety Committee (NBC) continued to review research proposals and advises on risk assessment and risk management.[106] In March 2005 a Parliamentary motion to ban GMOs in Kenya, tabled in December 2004, was submitted for its second reading and was to be voted on.[107] Differences between legislators resulted in the debate on whether or not to ban GMOs in Kenya being suspended, until later deliberation.[108]

In 2005, Kenya drafted a lax Biosafety Bill, which dealt with applications for the contained use, field trials, import and export, and placement of GMOs on the market. In June 2007, a new version of the bill was published. In an analysis, ACB's Mariam Mayet,[109] found the Kenyan 2007 Biosafety Bill to be essentially a lenient permitting system as opposed to a biosafety regime designed to regulate GMOs within a context of caution. It creates an omnipotent National Biosafety Authority (NBA), which will be in charge of almost every aspect concerning GMOs in Kenya. The NBA has been given exceedingly wide powers including a wide discretion to dispense with the need for risk assessments for import of GMOs as food aid, food trade, field trials and commercial releases.

According to Kenyan environmental lawyer Maurice Makoloo, Kenyan small-scale farmers, faith-based organisations, NGOs and civil society groups, the Bill was drafted in secret.[110] These groups presented a memorandum to the Minister of Science and Technology, Dr Noah Wekesa, and Agricultural Minister Kipruto Arap Kirwa, demanding the withdrawal of the Bill and calling for a national exercise of collecting views and the incorporation of the views into the Bill. In August 2007, peasant farmers and GMO critics staged protests against the Bill and demanded Parliamentary debate on the Bill to be delayed until after the general elections scheduled for December 2007.[111]

The Kenyan media has reported that the new Bill was a long-running boardroom initiative by key biotechnology bodies and national research institutes, with support from USAID and giant biotechnology multinationals and their foundations. In August 2007, the Africa Science News Service in Kenya reported[112] that Kenyan parliamentarians are finally set to pass the Biosafety Bill that will offer the regulatory framework to deal with the very controversial GMOs.

In October 2007, street protests marked the debate on Kenya's controversial 2007 Biosafety Bill that had gone through its second reading in Parliament. The Kenya Biodiversity Coalition, an organisation composed of 43 NGOs, farmer associations, consumer and community groups, decried the deliberate weakening of the Bill so that the importation and commercialisation of GMOs can be "hassle-free". The coalition also takes issue with the Bill's failure to incorporate the views of farmers and ordinary Kenyans.[113, 114] The Kenyan Biodiversity Coalition was indeed able to prevent in the last minute an industry-friendly Biosafety Bill from being passed by the Kenyan Parliament, which was scheduled to finally approve the Bill on Tuesday, 16 October. Before the Bill could be discussed, the Kenyan President on the 22nd October 2007 dissolved the Parliament to prepare for the upcoming national elections. This is a temporary reprieve for the Biosafety Bill,[115] which opens up opportunities for revision of the Bill and more transparent processes with regard to biosafety rule-making.

GMO R&D

Institutions involved in agricultural biotechnology research include the Kenya Agricultural Research Institute (KARI); Jomo Kenyatta University of Agriculture and Technology; the Department of Biochemistry at the University of Nairobi; the National Potato Research Centre (NPRC); the Faculty of Agriculture at Moi University; and Kenyatta University (KU).[116, 117] The Sustainable Agricultural Centre for Research Extension and Development Africa is supported by the Rockefeller Foundation to carry out GM research.[118] The International Livestock Research Institute (ILRI), a CGIAR centre based in Nairobi, carries out biotechnological research on livestock diseases.[116]

Kenya is home to the African Agricultural Technology Foundation (AATF), the African Biotech Stakeholders Forum (ABSF) and the African Biotechnology Trust. The latter two are spin-offs of the International Service for the Acquisition of Agri-biotech Applications (ISAAA). The ISAAA has also established an AfriCentre with its base in Kenya. ISAAA is a US-centered, GM promotion and 'technology transfer' agency funded by AgrEvo, Bayer, Cargill, Dow, Monsanto, Novartis, Pioneer, Syngenta, in addition to foundations and Western governmental funding agencies.[119] African Harvest Biotechnology Foundation International (AHFBI), supported by CropLife International — an organisation led by companies such as BASF, Bayer, Dow, DuPont, Monsanto, and Syngenta119 — is also based in Kenya. These organisations make Kenya a country of concentrated lobbying in favour of GM. Kenya is the home of the East Africa Regional Network on Biotechnology, Biosafety and Biotechnology Policy (BIO-EARN) (see East and Central Africa regional information).

African Harvest, in particular, is fronted by Florence Wambugu, a proponent for GM food and touted as a leading African Biotechnology Expert. Wambugu has been quoted as saying that the biotechnology revolution could pull the African continent out of decades of economic and social despair. Wambugu's career has been built around a Monsanto-initiated project to create a genetically engineered virus-resistant sweet potato. Yields from these Kenyan sweet potato trials were described as astonishing. The FAO listed the sweet potato project as an example of successful technology development.[120] In contrast, Kenya's Daily Nation,[121] the New Scientist[122] and The Guardian[123] all exposed the sweet potato trials as a failure with transgenic crop yields much lower than non-transgenic tubers and with the plants susceptible to viral attack, the very thing it had been created to resist.

In May 2007, about 20 graduates from UC Berkeley's College of Natural Resources wore green sashes or armbands to protest Florence Wambugu's appearance as their graduation ceremony's keynote speaker. The students said they disagreed with Wambugu's views on the use of GM in combating hunger in Africa.[124]

An important study by a University of Edinburgh African Studies specialist has shown that Wambugu has invented a 'crisis narrative' to claim that banana yields in Kenya are declining due to pests and that only her 'biotech' bananas can save the situation, when the available evidence points to a completely different reality.[125]

Kenya is linked to USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) (see East and Central Africa regional information). Kenya is also a partner of USAID's Agricultural Biotechnology Support Project (ABSP) whose goal is to support research, product development and policy development

for the commercialisation of GM crops. Private partners of ABSP include Monsanto, Syngenta, Pioneer Hi-Bred and DNA Plant Technology.[126]

KARI is involved in a project to develop GM sweet potato, supported by USAID, Monsanto and the World Bank.[119] In June 2004 the Kenyan government launched a 'level II biosafety greenhouse' that allows for containment of genetically modified (GM) crops at the experimental stage. The Kenya Agricultural Research Institute (KARI) and the International Center for Maize and Wheat Research (CIMMYT), which also trained scientists to manage the facility at its centre in Mexico, jointly developed the greenhouse. It was built as part of the Syngenta Foundation's Insect Resistant Maize for Africa (IRMA) project that aims to develop a GM maize variety resistant to the stem borer. The greenhouse was funded by the Kenyan government and Switzerland-based Syngenta Foundation.[127] Approval to introduce Bt maize seeds and carrying out the specified research in the greenhouse has already been granted by the NBC. In May 2004 the project was waiting for Kenya Plant Health Inspection Services (KEPHIS) to issue a permit before Kenya's first GM maize could be grown.[128] KEPHIS placed more stringent regulatory measures on the project, setting the project back by 2 years. This means that the GM maize is not expected to be released for commercial growing until 2010.[129] In January 2006 GM Watch[130] revealed that Kenya's new Permanent Secretary for Agriculture, Dr Romano Kiome, was the former executive director of the Kenya Agricultural Research Institute (KARI), which has been involved in a series of controversial GM-crop collaborations with the likes of Monsanto, USAID and the Syngenta Foundation. Dr Kiome said he saw no conflict of interest in his being Permanent Secretary for the Ministry which regulates GM crops and grants permits for plant research activities to institutions such as KARI.

KARI and CIMMYT are also working on developing GM herbicide resistance in maize to combat the Striga weed.[84]

KARI is collaborating in an international project funded by the International Potato Centre on GM improvements and virus resistance in sweet potato. Other African countries involved are Ethiopia and Uganda.[90] Other GM research in the experimental phase includes gene transfer in the common bean (*Phaseolus*); Cassava Mosaic Virus resistance in cassava; lepidoptera resistance in cotton (Bt and European Corn Borer),[131] transformation in tobacco and tomato; and transformation of sweet potato with proteinase inhibitor gene.[116] The University of Nairobi is conducting research into capripox virus and rinderpest recombinant vaccine production for livestock.

Current biotech crop research in Kenya includes genetically engineered (Bt) maize that is resistant to maize stem borers, pest resistant Bt Cotton, Bt cassava that is

resistant to the Cassava Mosaic Virus, and Bt sweet potato against the Sweet Potato Virus.[132]

GMO field trials

Field trials on Sweet Potato Feathery Mottle Virus (SPFMV) resistance in sweet potatoes discussed above were reported to have failed in early 2004.[119] The failure of the trials resulted in new research on a second-generation product that includes a gene construct from the Muguga virus strain, a virulent Kenyan potato virus strain. Further research aims to produce a second-generation GM sweet potato variety that is equipped with double protection (Cp gene and its replicase gene).[133] ILRI has released a recombinant vaccine against East Coast fever (theileriosis) for field trials.[116]

In 2004, Monsanto imported Bt cotton into Kenya for field trials. At the Kenyan Agricultural Research Institute's research station in Mwea, Central Kenya, a variety of genetically enhanced cotton, resistant to the bollworm pest, is undergoing field tests.[134]

In August 2005, the Kenyan agriculture secretary ordered the destruction of all Bt maize crops undergoing field trials because their environmental impact had not been fully assessed.

In May 2005, KARI and IRMA proceeded with field trails, becoming the first African country other than South Africa to plant GM maize in open fields.[135] In these field trials of Bt maize designed to resist stem borer attacks, a technician applied a systemic pesticide Furadan to the plants, effectively invalidating the results and resulting in the trials being aborted.[136] New field trials of this event have since resumed. Researchers conducting these field trials are optimistic that the transgenic seed will be available by 2008.

In July 2007, the National Biosafety Committee (NBC) approved field trials for Bollgard II cotton, owned by Monsanto, a new version of Bollgard I that was tested between 2003 and 2005. Kenyan scientist Dr Charles Waturu said the main objective of the trials is to establish the efficacy of the Bollgard I and Bollgard II genes on lepidopteran worm pests of cotton, to look at the impact of the modified plants on non-harmful, beneficial species of plants and insects, and to examine the risk of the Bt-cotton inter-crossing with commercial cotton varieties.[137]

GMOs in food aid and imports

Kenya accepted US maize and soymilk food aid in 2001 without restrictions.[138] In 2006, US food aid to Kenya totalled 46,106 tons,[59] of which more than half likely contained GMOs.

In July 2007, The East African newspaper[139] researched and reported on "an ongoing campaign to persuade Kenyan farmers to grow GM maize, cotton and other crops (which) has the blessings of key public bodies, national research organisations and politicians and is bankrolled by giant biotechnology multinationals from the United States and elsewhere." This includes trips for parliamentarians who then afterwards publicly support GMOs.

LESOTHO

Laws and Regulations

Lesotho is Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

A Biosafety Committee was set up in Lesotho in 2001, but has limited capacity for risk assessment[65]. Lesotho has been participating in the UNEP-GEF Biosafety Project and has produced a Draft National Biosafety Framework for Lesotho (NBF) which to a great extent is descriptive of the Draft National Biosafety Policy for Lesotho: "Striving to achieve safe application of biotechnology" (Draft Policy) and Draft Biosafety Bill, 2004".[140]

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Lesotho has no monitoring capacity for GMOs. It is suspected that food products imported from South Africa may contain GM. Lesotho has permitted the distribution of non-milled GM food aid, with a warning to the public that the grain should be consumed and not used for cultivation.[141] In 2006, Lesotho received 21,905 tons of food aid from the WFP, who maintained that they sourced the aid from within Southern African and although South Africa produces GM-maize, the WFP food aid was certified GM-free.[17]

LIBERIA

Laws and Regulations

Liberia is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

In 2002, Liberia applied for participation in the UNEP-GEF project on development of National Biosafety Frameworks.[142] By the end of 2004, Liberia published a final draft of a UNEP-GEF sponsored national biosafety framework.[143]

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Liberia has been the recipient of food aid, including vegetable oil (2,812 tons) and corn-soy blend from the US in 2006, which are very likely to contain GMOs. Liberia also received 48,704 tons in food aid from the WFP, which may contain GMOs.

LIBYA

Laws and Regulations

Libya is a Party to the Convention on Biological Diversity and the Cartagena Protocol.

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

There are no records of Libya being the recipient of food aid.

MADAGASCAR

Laws and Regulations

Madagascar is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

GMO R&D: field trials or commercial release

There are research projects on agricultural biotechnology at the Centre National de la Recherche Apliquée au Développement Rural (FOFIFA), and the Centre de Développement Rural et de Recherche Appliquée in the Faculty of Agriculture at the University of Antananarivo,[144] but there is no known research, field trials or commercial release of GMOs to date. Madagascar is a member of the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) (see East and Central Africa regional information).

GMOs in food aid and imports

At the World Summit on Sustainable Development held in Johannesburg in 2002, Rasoanaivo Philippe of Institut Malgache de Recherches Appliquées signed a statement of solidarity with southern African nations over GM food and crops condemning the use of food aid as a tool of propaganda to force acceptance of GM food and crops by Southern nations.[145] In 2006, Madagascar received a total of 5,455 tons of corn-soy blend and vegetable oil in food aid from the US,[59] likely to contain GMOs.

MALAWI

Laws and Regulations

Malawi is a Party to the Convention on Biological Diversity but is not a Party to the Cartagena Protocol on Biosafety.

Malawi's Biosafety Bill was hastily enacted into law by its Parliament in October 2002, to allow GM food aid to enter the country. Despite the existence of this Act, no applications for testing, use and application of GMOs has been authorised in Malawi, as there is scant human and technical capacity to adequately assess these applications and monitor the trials.[147]

The National Research Council of Malawi (NRCM) organised a consultative workshop in 2004, bringing together various stakeholders to discuss the management and use of modern biotechnology in Malawi. Several inadequacies of the Act were highlighted including lack of specific focus, unclear clarification of definitions and terms, and some important issues missing.[147]

A draft Biotechnology Policy, geared towards promoting commercialisation of GMOs and international trade in GM products, is in existence.[147]

GMO R&D: field trials or commercial release

There are research projects on agricultural biotechnology in the Department of Agricultural Research and Technical Services; the Forestry Research Institute of Malawi (FRIM); the University of Malawi; and the Bunda College of Agriculture.[146]

GMOs in food aid and imports

Malawi accepted GM maize from the US as food aid during the famine that hit the country in the year 2001. In the absence of any position on GMOs, Malawi had to make a hasty decision regarding GM food aid and to ease the burden on its population, accepted the GM containing food.[147] Malawi has had a ban on importing un-milled GM crops since 2002.[20] The government is prepared to accept GM food aid, provided maize is milled prior to distribution.[148] In 2006, Malawi received vegetable oil, corn-soy and cornmeal from US food aid,[59] which are likely to contain GMOs. It received 117,912 tons of food aid from the WFP.

In December 2005, Monsanto donated 700 metric tons of hybrid corn seeds to Malawi, all part of an integrated plan to distribute the seeds through the Malawian government and local non-governmental organizations in Malawi. The hybrid corn seeds, available in 5-kilogram (11-pound) bags, could reach as many as 140,000 Malawi farm families.[149]

International NGO Action Aid has argued that Malawi should formulate national legislation to reject GM maize, until it undertakes a scientific assessment of the effects of GMOs on human health and biodiversity. According to Action Aid, milling is not seen as a viable option because it reduces the shelf life of maize and increases handling costs and the risk of infestation.[150]

MALI

Laws and Regulations

Mali is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

A citizen's jury was held in Mali in January 2006 where farmers from around the Sikasso district attended a series of debates and discussions on GM technology. The upshot of this citizen's jury was a very clear condemnation of the introduction of GMOs in Mali. Under pressure from consumer groups and civil society organisations, the government of Mali stopped plans to produce a law permitting trials on GM crops in February 2006.[151] In February 2007, Mali hosted a conference to step up the struggle for the adoption of food sovereignty.[63]

GMO R&D:

Biotechnological research projects are carried out at the Centre International de Cooperation en Recherche Agronomique pour le Development; the Institut d'Economie Rurale (IER); and the University of Mali.[152] In 2004 the IER embarked on a five-year project, with USAID, Monsanto, Syngenta and Dow Agrosciences, to develop and commercialise GM cotton.[153]

GMO field trials and commercial release

There are no known field trials or commercial release to date.

GMOs in food aid and imports

Mali has been the recipient of food aid through the WFP and Adventist Development and Relief Agency (ADRA). Whether this has contained GM products is not clear.[154] The WFP donated 23,474 tons of food aid to Mali in 2006. According to WFP policy, it can donate GM-containing food to countries that do not object to it.[155] Mali received food aid from the US in 2006,[59] including products with maize, vegetable oil and soy, highly likely to contain GMOs.

MAURITANIA

Laws and Regulations

Mauritania is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

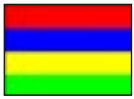
GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

Mauritania received food aid from the US in terms of Public Law 480 in 2006, including vegetable oils, wheat-soy blends and corn-soy blends, to a total amount of 2,332.5 tons.[59] These are likely to have contained GMOs. The country also received 33,041 tons of food aid from WFP,[75] the GM status of which was not clear.

MAURITIUS



Laws and Regulations

Mauritius is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

The Genetically Modified Organisms Bill (No. 44 of 2003) was passed into law in March 2004.[156] The law is viewed as perhaps having the most stringent precautionary regulations yet on the African continent, going as it does beyond the minimum requirements of the Cartagena Protocol,[158] however, not all sections of the Act have been proclaimed.[160] A National Biosafety Committee (NBC) is responsible for risk assessment and the de facto decision-making authority. However, the NBC is comprised mainly of civil servants without biosafety expertise and those involved in GM research and development, including the powerful sugar industry. The role of the committee is currently limited to investigating the implications of proclaiming the remaining sections of the GMO Act.[160]

GMO R&D: field trials or commercial release

The government is in the process of establishing the Mauritius Agricultural Biotechnology Institute (MABI) to provide impetus and complement GM research being undertaken by the Food and Agriculture Research Council (FARC), the Mauritius Sugar Industry Research Institute (MSIRI), and the University of Mauritius.[157] The MSIRI has already developed two GM sugar cane varieties, one resistant to Basta herbicide and the other to Roundup Ready, Monsanto's herbicide.[158] These were ready for field trial experiments some 5 years ago, and are now awaiting adoption of a biosafety framework[65] and have been evaluated under glasshouse conditions only.[160] Further economic assessment has shown that under present operational and market conditions, weed control based on Basta Resistant cane is not more cost-effective than alternative non-GM methods.[160]

A few projects are also devoted to potato.[159] The Mauritius Sugar Industry Research Institute (MSIRI) initiated work on the transgenic lines of the Shepody variety of GM potato seeds, with high tolerance to Potato Virus Y (PVY), and the non-transgenic lines. These were provided by Monsanto to assess their reaction to the local PVYN strain. Under glasshouse conditions, the transgenic lines were found to be highly resistant as they did not show any symptoms, nor could any infection be detected. Production of the PVY gene construct is a major production constraint and because Monsanto did not pursue the project, efforts will be made to produce a PVY-resistant potato locally.[160]

GMOs in food aid and imports

Mauritius is a net food importer and has established certificates and permits to regulate food imports. These do not, however, cover the import of GM foods and the GMO Act was introduced to fill this legal void. One of the main aims of the Act is to regulate all aspects concerning the importation of GMOs locally, and as at September 2006, the relevant section of the Act had not yet been proclaimed.[160] Therefore any GMOs imported into Mauritius, are without a GMO permit. There are no records of Mauritius being the recipient of food aid.

MOROCCO

Laws and Regulations

Morocco is a Party to the Convention on Biological Diversity but is not a Party to the Cartagena Protocol on Biosafety.

Morocco is working with ICARDA (see North Africa regional information) to develop a biosafety framework to permit the introduction of GM crops in future.[46]

GMO R&D field trials or commercial release

There are research projects on agricultural biotechnology at the Institut National de la Recherche Agronomique (INRA); École Nationale d'Agriculture de Meknès (ENA); and the Institut Agronomique et Vétérinaire Hassan II (IAV).[161] Morocco is a partner of USAID's Agricultural Biotechnology Support Project (ABSP) whose goal is to support research, product development and policy development for the commercialisation of GM crops. Private partners of ABSP include Monsanto, Syngenta, Pioneer Hi-Bred and DNA Plant Technology.[126] Unspecified research into GM wheat is in the experimental phase.[161] Field tests of GM tomatoes have been reported.[116]

GMOs in food aid and imports

Morocco received WFP food aid in 2006, but none from the US.

MOZAMBIQUE

Laws and Regulations

Mozambique is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Mozambique has a Draft National Biosafety Framework prepared by the Grupo Inter-Institucional Sobre Bio-Seguranca (GIIB) in 2005.

This proposed biosafety framework consists of a draft Decree of Council of Ministers, containing the biosafety regulation and 2 draft technical guidelines for risk evaluation as well as public awareness and participation in biosafety and biotechnology related issues. The draft biosafety law is typically a permitting system, based on a step-by-step, case-by-case risk assessment, evaluation and decision-making system that adopts a risk management approach to genetic engineering in food agriculture and medicine. Mozambique views genetic engineering as having a role to play in agriculture, food security and human health care, but that the risks have to be managed by the creation of an enabling legislative environment, to this end.[162]

GMO R&D: field trials or commercial release

There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

The government is prepared to accept GM food aid, provided maize was milled prior to distribution,[163] but has limited monitoring capacity.[65] In 2006, US food aid to Mozambique consisted of wheat only (12,905.5 tons), but the nature of its food aid (23,806 tons) from the WFP was not specified.[59, 75] Between 2002 and 2006, the WFP bought food aid for Southern African countries from within the region, more than half of it from GM-maize producing South Africa, but claimed that the South African produce was certified GM-free.[17]

NAMIBIA

Laws and Regulations

Namibia is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

In 1996, the Namibian Biotechnology Alliance (NABA), a non-profit, interdisciplinary interest group on biotechnology and biosafety issues, was formed. Its members comprise government, university, NGOs and private sector specialists in biological, agricultural, conservation and legal fields. The brief of NABA is to establish a framework for the sound use and control of biotechnology applications in Namibia.[164] Namibia published a National Policy document enabling the safe use of biotechnology in 1999.[165, 166] There is a National Biosafety Committee and draft legislation, but limited capacity for risk assessment.[65] In November 2006, a bill to regulate genetically modified organisms and products in Namibia was tabled by Education Minister Nangolo Mbumba in the National Assembly. This draft bill provides for a Biosafety Council with seven members to fall under the National Commission on Research, Science and Technology. The council will be tasked with deciding on applications for the import, export and transport of GMOs or products, their use and release into the environment as well as placing in the market. Further the bill makes provision for labelling.[167]

GMO R&D: field trials or commercial release

A GMO testing, training and research lab was opened at the University of Namibia in September 2004, sponsored by UN Environmental Programme — Global Environment Facility.[168] The Department of Research and Training has participated in a project on GM resistance to downy mildew in pearl millet. The European Commission Directorate

General for Research under the INCO Programme funds the project, and there are a number of collaborating institutions including ones in Ghana and South Africa.[169]

There are no known trials or commercial release of GMOs to date.

GMOs in food aid and imports

Namibia accepted milled GM maize in 2000. The government rejected GM maize in 2002, and received wheat for food aid instead, on the recommendation of the National Biosafety Committee.[65] Namibia received food aid from the WFP in 2006.

NIGER

Laws and Regulations

Niger is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Legislation is being formulated within the framework of the UNEP/GEF (United Nations Environment Programme/Global Environment Facility) project.

GMO R&D: field trials or commercial release

At a conference for the USDA and USAID in Burkina Faso, the Presidents of Mali, Niger, Ghana and Burkina Faso voiced support for biotechnology, saying it has the potential to increase agricultural production and improve the environment, thus improving the standard of living in their countries.[170] The Institut National des Agronomiques du Niger (INRAN) is collaborating on a ten year IITA funded research and development project on GM drought tolerance, insect and virus resistance in cowpeas. Other participating African countries include Benin, Burkina Faso, Cameroon, Ghana, Nigeria and Senegal.[61] Three research institutes: l'Institut National de Recherche Agronomique (INRAN), l'Université Abdou Moumouni de Niamey, and ICRISAT intend to apply biotechnology techniques in seed genetic manipulation research in their future programmes.[171] There are no known trials or commercial release of GMOs to date.

GMOs in food aid and imports

Niger has been the recipient of food aid via the World Food Programme (49,742 tons in 2006)[75] and could possibly have been the recipient of GM products. Of the 7,218 tons of food aid received from the US under Public Law 480 in 2006,[59] more

than 70% consisted of products likely to contain GMOs: corn-meal, corn-soy blend and vegetable oil.

NIGERIA

Laws and Regulations

Nigeria is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

The National Biotechnology Agency was established in November 2001 to drive biotech policy.[172] The Nigeria Biosafety Guidelines (2001) and the Environmental Impact Assessment Decree (1992) regulate biosafety.[173] A National Biosafety Committee (NBC) is responsible for the formulation of policies and procedures pertaining to agricultural biotechnology, and to provide technical advice to the Federal Ministry of Agriculture. It consists of government, the scientific community and the private sector.[174]

In 2006 Nigeria adopted a Biosafety Act (2006). In an analysis[175], Mariam Mayet of the African Centre for Biosafety described the Bill as "an unimaginative piece of legislation that mimics the standard fare: biosafety laws that adopt a permit system for the regulation of genetically modified organisms (GMOs). The "Rights Based Approach" that was extensively discussed and supported at a Friends of the Earth, Africa workshop in November 2006, which sought to begin a new discourse in biosafety regulation based on the protection of fundamental rights, including the right to say no, the right to food, etc. had been utterly abandoned. The Biosafety Bill is primarily concerned with establishing a seemingly elaborate and potentially costly institutional system to regulate GMO related activities. The expenditure of public funds to make these institutions work will no doubt, deflect scarce resources away from public spending for socially urgent needs.

GMO R&D:

There are GM research projects at the National Cereals Research Institute (NCRI); the National Institute for Oil Palm Research (NIFOR); the Institute of Agricultural Research & Training (IAR&T); the National Centre for Genetic Research and Biotechnology (NCGRB); and the University of Nigeria.[173]

In 2003, the Nigerian-based International Institute for Tropical Agriculture (IITA) and its parent body the Consultative Group for International Agricultural Research (CGIAR)

announced the "HarvestPlus Plan" to embark on resources for second-generation GE crops (maize, cassava, and sweet potatoes).[43]

The IITA and USAID-sponsored Nigeria Agriculture Biotechnology Project (NABP) launched in November 2003 to support the expansion of GM food in Africa.[173] Among NABP's objectives are to build national capacity to conduct research and development for bioengineering of priority crops; develop the capacity of the national biosafety committee to review and approve applications for field testing and commercialization of bioengineered crops; and develop public awareness and acceptance of the benefits of biotechnology.[176] In May 2004, USAID committed $2.1 million to "assist leading Nigerian universities and institutes, including IITA in the research and development of bio-engineered cowpea and cassava varieties, which resist insect and disease pests".[20] In July 2004 Nigeria's Federal Government signed a Memorandum of Understanding with the United States on promotion of Biotechnology and GM products in Nigeria.[177] This has come under criticism from the All-Nigerian Consumer Movements Union. Further the union has rejected GM foods and called on the federal government to change its position on "these dangerous products".[178]

Research has been conducted on GM virus and insect resistance in cowpeas, and "transformation and regeneration" of cowpea, yam, cassava and banana.[116] The IAR&T is collaborating on a ten year IITA funded research and development project on GM drought tolerance, insect and virus resistance in cowpeas. Other participating African countries include Benin, Burkina Faso, Cameroon, Ghana, Niger and Senegal.[61]

The Bill and Melinda Gates Foundation are partly funding a project to breed more nutritious generations of cassava, maize and yams. Researchers from the Nigeria-based IITA said that the 10-year HarvestPlus plan would harness selective breeding and biotechnology to improve these crops.[179]

GMO field trials or commercial release

There are no known field trials or commercial release of GMOs to date.

GMOs in food aid and imports

There are no records of Nigeria being the recipient of GM food aid. However, in August 2006, the Environmental Rights Action/Friends of the Earth, Nigeria, urged the Federal Government in August 2006 to immediately ban the importation of rice from the United States, following the suspension by Japan of US long-grain rice imports due to GM contamination.[180]

RWANDA 

Laws and Regulations

Rwanda is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

In April 2003, Rwanda published a National Strategy and Action Plan for the Conservation of Biodiversity in Rwanda. One of the ongoing projections identified was the development of national procedures and measures for assessment and management of risks caused by genetically modified living organisms (GMLOs). This included establishment of the necessary identification procedures and the control of introduction, use and transfer of GMOs by competent authorities.[181]

GMO R&D: field trials or commercial release

A draft policy on science, the National Science, Technology, Scientific Research and Innovation Policy outlines plans to apply science to Rwanda's problems in health, agriculture and the environment. Practically, this means developing biotechnology to increase crop yields and improve animal husbandry.[182] Rwanda is a participant in the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) (see East and Central Africa regional information). There is no known GMO R&D, field trials or commercial release to date.

GMOs in food aid and imports

Rwanda is the recipient of food aid as part of the World Food Programme (23,910 tons in 2006) and under the US Public Law 480 programme.[59, 75] More than 70% of the 9,500.1 tons from the US is likely to have contained GMOs.

SAO TOME E PRINCIPE 

Laws and Regulations

Sao Tome E Principle is a Party to the Convention on Biological Diversity but not a Party to the Cartagena Protocol on Biosafety.

GMOs in food aid and imports

Sao Tome e Principe received 921 tons of food aid from the WFP in 2006,[75] possibly containing GMOs.

SENEGAL

Laws and Regulations

Senegal is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Legislation is being formulated within the framework of the UNEP/GEF (United Nations Environment Programme/Global Environment Facility) project. A Biosafety Bill has been drawn up by the National Committee on Biosafety. The Bill covers the use in a contained environment, deliberate release into the environment, import, export, transit and marketing of living modified organisms for pharmaceutical and veterinary use. All these activities are subject to prior authorization granted by a competent authority.[184]

GMO R&D

There are research projects on agricultural biotechnology at the Institut Sénégalais de Recherches Agricoles (ISRA); the Institut de Technologie Alimentaire (ITA); Ecole Nationale Supérieure d'Agriculture (ENSA); Université Cheick Anta Diop; Faculté des Sciences Economiques et Gestion — Centre de Recherches Economiques Appliquées; the Centre d'Etude Régional pour l'Amélioration de l'Adaptation à la Sécheresse (CERAAS); and the Université Gaston Berger de Saint Louis (UGB).[183] The ISRA is collaborating on a ten year IITA funded research and development project on GM drought tolerance, insect and virus resistance in cowpeas. Other participating African countries include Benin, Burkina Faso, Cameroon, Ghana, Niger and Nigeria.[61]

GMO field trials or commercial release

An unofficial field trial of Monsanto's Bt cotton was carried out by the national cotton company, but abandoned after the cotton failed to perform.[20] There are reports of field trials being carried out without any regulatory oversight or public knowledge.

GMOs in food aid and imports

With Senegal importing over 50% of its national cereal consumption requirements, much of which comes from Argentina, one of the largest GMO-producing countries, Senegal is at real risk of being invaded by GMOs.[184] In 2006, Senegal received food aid (4,124.4 tons)[59] from the US, more than half of it likely to contain GMOs. It received 15,307 tons of food aid from the WFP,[75] the GM status of which was not clear.

SEYCHELLES

Laws and Regulations

Seychelles is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Seychelles is currently implementing the UNEP-GEF development of national biosafety frameworks project, and developed a biosafety policy and framework under this project between January 2003 and May 2005. Supporting structures in the implementation of the project include: a National Executive Agency; a National Project Coordinator; a National Coordinating Committee, a National Biosafety Framework Drafting Committee, and a Public Awareness & Public Participation Committee.[185] In the absence of this legislation and its confirmation by parliament, the utilization of GM products is subject to the joint approval of the Veterinary and Public Health Authorities with a precautionary approach being maintained.

GMO R&D: field trials or commercial release

No GM research, trials or commercial plantings of GMOs are being carried out in the Seychelles.

GMOs in food aid and imports

Seychelles is a transit point for shipping, and imports substantially for her population's food needs.

SIERRA LEONE

Laws and Regulations

Sierra Leone is a Party to the Convention on Biological Diversity but is not a Party to the Cartagena Protocol on Biosafety.

Sierra Leone's existing National Constitution (1991) and Environment Protection Act (2000) make provision for harnessing all natural resources in a manner that will promote development in all aspects of agriculture and food self-sufficiency whilst simultaneously taking measures appropriate to ensure the protection and safe-guarding of the environment and human health. Against this legislative backdrop, several interactive meetings, national review meetings, legal and technical experts meetings and regional stakeholder workshops were held between July 2003 and August 2006. This has culminated in the formulation of a National Biosafety Framework (NBF) for Sierra Leone.[186] This NBF will be forwarded to Parliament once the Sierra Leone government ratifies the Cartagena Protocol on Biosafety. These guidelines have been devised to guide all production, applications and practices in the use of modern biotechnology.[186]

GMO R&D: field trials or commercial release

There is no known research, field trials or commercial release of GMOs to date.

GMOs in food aid and imports

During the latter part of 2006, Friends of the Earth in Sierra Leone collected samples of US long grain rice and sent them for testing to an independent laboratory in the US with a validated testing method for LLRICE601. The results confirmed LLRICE601 contamination in Sierra Leone. GM rice has also reportedly been found in rice imported from Vietnam. There is concern that the contamination could also stem from US food aid.[187] LLRICE601 is an unapproved genetically modified rice variant owned by Bayer CropScience. Sierra Leone received US food aid amounting to 5,806.2 tons, including vegetable oil likely to contain GMOs, and a further 15,903 tons from the WFP, the GM status of which was not clear.[59, 75]

SOMALIA

Somalia is neither a Party to the Convention on Biological Diversity nor the Cartagena Protocol on Biosafety. In 2006, Somalia received 18,265.9 tons of food aid from the US and 78.089 tons from the WFP, some of which is likely to have contained GMOs.[59, 75]

SOUTH AFRICA

Laws and Regulations

The Genetically Modified Organisms Act was passed in 1997, but is little more than a permitting system designed to expedite GM imports into the country and releases into the environment.[43] The recent amendments to the GMO Act (GMO Amendment Bill passed during 2006), does nothing to change this situation.[188] Under the Act, an Executive Council (EC) is tasked with the responsibility of approving/refusing and monitoring activities involving GMOs. The Council has representatives from 10 government departments. The Department of Health has established two legislative advisory groups on GM food labelling in co-operation with the Department of Agriculture. One group, to be run by the Bureau of Standards, will develop an identity preservation system to track food ingredients and check label claims. The other group, under the Centre for Scientific and Industrial Research (CSIR), will review sampling and detection methods and make recommendations to government.[189] There is a National Biotechnology Strategy in place. South Africa is party to the Convention on Biological Diversity and has acceded to the Cartagena Protocol on Biosafety. The government has established the National Biotechnology Advisory Council (NBAC) to provide strategic advice to the Minister of Science and Technology particularly on matters of ethics. The Biotechnology Advisory Council is chaired by Professor Jennifer Thompson and is a subcommittee of the National Advisory Council on Innovation.[190]

While government does not support labelling of GMOs, a different view is emerging in the market place. Some milk is labelled rBST free, meaning that recombinant bovine somatotropin growth hormone was not given to the cows producing the milk. The clothes and food chain Woolworths introduced a GM food labelling policy, the supermarket chain, Pick and Pay announced that they would not sell GM potatoes (currently in field trials) until their biosafety could be conclusively proven. The anti-GM alliance SAFeAGE is running a consumer driven campaign in favour of labelling GM foods.

GMO R&D

South Africa has a number of public and private labs adequately equipped to do GM work. There are over 110 plant biotech groups, over 160 plant biotech projects and over 150 trials.[65] Research institutions include the CSIR Biotechnology Programme which focuses on transgenic cereal crops, particularly maize, sorghum, millet and barley[191] the African Centre for Gene Technologies (ACGT), an alliance between CSIR and the University of Pretoria as a platform for the development of GM technology,[192] the Forestry and Agricultural Biotechnology Institute (FABI) at the University of Pretoria, the Agricultural Plant Sciences Department at the University of KwaZulu-Natal; the University of Stellenbosch Institute of Plant Biotechnology; the University of the Free State Faculty of Natural and Agricultural Science; Rhodes University and the University of Pretoria's Faculties of Agricultural Science and Veterinary Science. The Agricultural Research Council (ARC) conducts biotechnology research in a number of its units, including the Biotechnology Division of the Vegetable and Ornamental Plant Institute (ARC-VOPI); the Grain Crops Institute (ARC-GCI); the Institute for Tropical and Subtropical Crops; the Animal Improvement Institute (ARC-AII) Infruitec-Nietvoorbij (ARC Infruitec-Nietvoorbij); and the Small Grain Institute (ARC-SGI). [193]

South Africa is a partner of USAID's Agricultural Biotechnology Support Project (ABSP) whose goal is to support research, product development and policy development for the commercialisation of GM crops. Private partners of ABSP include Monsanto, Syngenta, Pioneer Hi-Bred and DNA Plant Technology.[126] In 1995 UNESCO's Biotechnology Action Council established a Biotechnology Education and Training Centre for Africa at ARC-Roodeplaat.[194] A number of lobbying and advocacy organisations also exist to advance the interests of GM companies, including AfricaBio. The very rapid uptake of GM crops in South Africa is principally due to the South African Committee on Genetic Experimentation (SAGENE). Established as a regulatory body under South Africa's apartheid regime, SAGENE continued to be the driving force behind GMO releases long after the defeat of apartheid.[39]

The University of Cape Town's Institute for Infectious Diseases and Molecular Medicine dedicated to advanced research and training in molecular biology and biotechnology, became host to a laboratory of the International Centre for Genetic Engineering and Biotechnology (ICGEB) in 2007.[195, 196] According to Science and Technology Minister, Mosibudi Mangena, the prestigious laboratory would focus on better disease control and management of crops, at a cost of R40 million over the next four years (2007-2010).

GMO research in the experimental phase includes drought tolerance in groundnut (ARC-Grain Crops Institute); cob rot and Maize Streak Virus (MSV) resistance in maize; Potato Virus X and Y (PVX and PVY) resistance in potato (ARC-Roodeplaat); and unspecified research into sugar cane.[197] In July 2007, scientists from the University of Cape Town working with PANNAR announced that they had genetically engineered maize resistant to MSV,[198] but personal communication between the ACB and Dionne Shepard, co-ordinator of the project in August 2007, revealed that the project is at a very early stage in its infancy. ARC-VOPI, CSIR and University of Pretoria have been part of two projects together with Zambian institutions, sponsored by Plant Research International from the Netherlands, the Department of Knowledge and Science Dissemination in the Netherlands and the European Commission, to develop GM resistance to *Fusarium moniliforme* in maize.[199, 200] CSIR is conducting research into genetic modifications for nutritional quality in grain sorghum and resistance to downy mildew in pearl millet.[84] The European Commission Directorate General for Research under the INCO Programme funds the pearl millet project, and there are a number of collaborating institutions including ones in Ghana and Namibia.[201]

Other unspecified GM research includes research on wheat; barley; lupins; sunflowers; cucurbits; ornamental bulbs; cassava; sweet potato; apricot; peach; apple; table grapes; banana and indigenous vegetables.[116] Onderstepoort Veterinary Institute has projects on recombinant vaccines for African horsesickness and bluetongue virus in sheep.[84] The plant biotechnology research group at the CSIR secured a multimillion-rand research grant from the Department of Science and Technology (DST) to extend research into transgenic plants as a platform for the production of pharmaceuticals.[202]

GMO field trials

In 2003, South Africa had approved 172 GM field trials.[203] These are not all listed, but include field trials of glyphosate (herbicide) tolerance, genetically inserted bromoxynil (pesticide), multiple resistance (2 Bt, bromoxynil + insect) and imidazolinone (herbicide) tolerance in cotton; glyphosate tolerant eucalyptus; glufosinate and phosphinothricin tolerance in canola; phosphinothricin (pesticide) and glyphosate (herbicide) tolerance in maize; multiple resistance (glyphosate and insect) in maize; Potato Leaf Roll Virus (PLRV) resistance in potato (ARC-Roodeplaat); glyphosate tolerance in soybean; stilbene resveratol Vst1, Vst2 (fungi) resistance and glufosinate tolerance in strawberries; glufosinate tolerance in sugar cane; and genetically modified protein content in *Xanthamonas campestris* pv *campestris*.[197]

In February 2007, the African Centre for Biosafety published a web-based Biohazard Map: Field Trials of GMO's in South Africa [204] depicting the field trials in 32 different field trial sites in 8 of South Africa's nine provinces for 2006.[205]

The traits that are being expressed in these trials are predominately "stacked" meaning that more than one trait has been engineered into the crop, e.g. insect resistance and herbicide tolerance. Others include insect resistance (in maize, cotton, potato, sugarcane field trials), herbicide tolerance (maize, cotton field trials), drought resistance (soybean field trials) and an anti-microbial trait (sugarcane field trials).

Many of the field trial applications are run by the giant GM multinationals, namely Monsanto, Delta and Pinelands (D&PL), Syngenta and Dow Agro Sciences. Two South African research institutes are also involved, the Agricultural Research Council (ARC) and the South African Sugarcane Research Institute (SASRI). [205] Field trials conducted especially by the GM giants such as Monsanto, invariably serve as pipeline indicators for the next wave of GM crops that will come onto the South African market in the ensuing years.

Scientists at the University of Stellenbosch have applied to the Department of Agriculture for permission to grow GM grapes that are fungal resistant in field trials to see how the transgenic plants will fare. In a separate application, a former South African now living in Canada has applied to sell GM yeast here for use in wine-making. From GM grapes to wine could take as long as five years. The GM yeast for wine fermentation on the other hand can be ready to be sold immediately if and when the government approval is granted.[206] In December 2006 it was reported that UK and German buyers of SA wines had cancelled orders for SA wine after hearing of the controversy, and that the Stellenbosch researchers had received "stacks of letters from wine lovers insisting they don't want to buy or drink engineered wines".[207] At a meeting of the Executive Council of the Department of Agriculture on the 17 July 2007, no decisions were taken on the GM yeast and GM grapevines.

The regulatory authorities received an application in 2006 for a confined experimental trial release of genetically modified cassava plants containing a gene isolated from cassava and inserted to result in the production of amylase-free starch. In early 2007, the EC rejected an application for open field trials of GM cassava intended for biofuel production. Such trials would have posed a risk of genetic contamination of an essential African food crop. ARC is in the process of appealing against the decision.

On 30 January 2007, the EC turned down an application by the Council for Scientific and Industrial Research's (CSIR) to conduct experiments with GM sorghum in a level III containment facility. The reason for the refusal were that that the benefits for SA science were not significant since the GM sorghum line had been developed elsewhere; that "any accidental release of the GMO in question into the environment would have severe negative impact on the environment, given that this is an indigenous species with wild relatives in South Africa", and that any subsequent authorisation of environmental release of any kind is unlikely.[208] In March 2007, the CSIR appealed against the decision, and in September 2007, the organisation representing commercial grain farmers in the country, was drumming up support for the appeal.

In March 2007, the South African GMO authorities gave Monsanto permission to conduct experiments involving GM drought tolerant maize in open field trials in South Africa. Transgenic drought tolerance is at least 8 to ten years away from approaching commercialisation, and involves a large set of genes in the expression of a complex trait like drought tolerance. Nevertheless GM drought tolerant crops are being used as powerful PR tools by the biotech machinery and strategic philanthropy such as the Rockefeller Foundation to promote acceptance of GM crops, expand existing markets and develop new markets.[209]

GMO commercial releases

South Africa is the only African country to date where GM crops are commercially planted. In 2004, 500,000 ha of GM crops were planted. This includes 400,000 ha of GM maize (15% of total hectares of maize planted in South Africa), of which 155,000 ha was Bt white maize for human consumption. In addition, 70,000 ha of soybean (50% of total soybean hectares) and 30,000 ha of cotton (85% of total cotton hectares) were commercially planted in South Africa.[210] Nearly all of the GM crops grown in South Africa are sown on large commercial farms.[20]

In January 2007, the farm union Agri SA reported that the country's GM crop area had soared by 180% to 1.4 million hectares in the 2006/07 season with one million hectares of this under maize and the remainder soybean and cotton. The GM maize constituted 44% of this year's maize planting, up from last year's 29,3%.[211] This made South Africa the second highest GM producer after India and the eighth largest GM producer in the world.

Monsanto launched a Seeds of Hope Campaign in the Eastern Cape Province of South Africa with support and subsidies from the SA government, to target the "bottom of the pyramid" small farmers who, despite their low income, have considerable

purchasing power as a group. This forms part of a programme in 13 countries, through which Monsanto was reaching 320,000 farmers worldwide.[212] Figures for South Africa, including figures of how many farmers bought GM (Roundup Ready) seeds, are not available. By 2007, Monsanto seems to have lost interest. The campaign does however appear to serve as a pilot for the "New Green Revolution in Africa".[213]

In April 2007, the SA sugar industry decided to delay the introduction of genetically modified (GM) sugar cane for commercial use because of fears that the move could threaten the sector's local and export markets.[214]

GMO imports

There is a very active import market of GMOs in South Africa, for the purposes of food, feed and processing. Over the past few years, the EC has authorised the importation of hundreds of thousands of tons of GM maize into South Africa mainly from Argentina. Import permits are granted mainly to the large grain trading and shipping companies, such as Cargill, Louis Dreyfus and more recently to players in the animal feed industry such as Meadow Feeds and Epol.

However, during 2005, the Executive Council imposed a moratorium on the approval of new GM varieties for the purposes of being imported into South Africa as food, feed or processing.[215] This does not mean an end to the importation of GMOs approved prior to the moratorium. Indeed, during the period January-April 2007, "a staggering 519,269 MT of GM maize was imported from Argentina, with each shipment containing up to 7 different GM events."[216]

South Africa does not allow any imports of GM maize from the United States because the US has approved many more GM maize varieties for commercial growing than has South Africa. Since the US has failed to put in place a mandatory traceability system, it is not possible for the South African authorities to enforce a zero tolerance for unapproved GMOs because of the risk of contamination.

In June 2007, Bayer CropScience submitted an application to the Executive Council established under the Genetically Modified Organisms Act in South Africa, for commodity clearance of its Liberty Link 25 (LL25) genetically modified (GM) cotton. This is the first ever application for commodity clearance to enable the importation of GM cotton into South Africa. South Africa's cotton production is small, averaging around 20,000 ha for 2006/7 and steadily declining. 90% of South Africa's own cotton production consists of GM varieties. If the application is approved, it will open the doors for the importation into South Africa of GM cotton from the US, where cotton

production is heavily subsidized. It is well documented that these subsidies are destroying livelihoods in Africa and other developing regions.

Food safety concerns raised by government and industry

The EC is currently reviewing the safety of a variety of Monsanto's GM maize, NK603, in South Africa after a flare-up over its effect on laboratory rats during a 90-day trial. Greenpeace commissioned an independent biosafety study which found that there were "statistically significant" effects on the blood and organs of laboratory rats in the form of liver and kidney toxicity and differences in weight gain between the sexes. NK603 is licensed in South Africa and is eaten in maize products such as mealie pap (maize porridge), a staple food for majority of the countries people.[217] Dr Julian Jaftha, chairman of South Africa's GMO Executive Council said in July 2007 that the government could reverse its decision to license the products if toxicity claims proved to be true.[218]

The major South African retail chain Pick and Pay in April 2007 declared that it would not stock a government-backed GM potato, which the Agricultural Research Council (ARC) hopes to commercialise, until the EC could provide conclusive scientific evidence on the biosafety of the product. Instead the retailer recently co-founded a massive job creation initiative known as the Organic Freedom Project in a bid to boost the local availability of organic produce as well as organic crops for agrofuels.[218]

The EC has also turned down an application by Syngenta for commodity import of its GM maize event 3272, genetically modified for the production of maize to ethanol. This application was expressly refused. Reasons[219] for the refusal include that:

- food and feed safety for kernels, milled products and other by-products was not demonstrated;
- methodologies for evaluation of allergenicity had not been followed; and
- there is a risk of co-mingling with non-GM maize which poses an economic risk for maize exports.

Public opinion

In April 2007, the NGO Biowatch South Africa appealed against a high court order that it should pay the legal costs of GE giant Monsanto in a court case where Biowatch successfully sued for access to information about GMO decision-making. Biowatch

argued that awarding costs could cripple the organisation and exert a chilling effect on other watchdog organisations.[220] At the time of going to press, judgement was made against Biowatch and the organisation is considering further legal options.

The South African Advertising Standards Authority (ASA) ordered Monsanto to withdraw an advertisement in which Monsanto stated "no negative reactions (to GM foods) have ever been reported" because the advertisement was indeed misleading and unsubstantiated.[221]

SUDAN

Laws and Regulations

Sudan is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

During November 2005, Sudan published a National Biosafety Framework assisted and funded by the Global Environment Facility (GEF) and the United Nations Environment Programme (UNEP).[222]

GMO R&D: field trials or commercial release

The Agricultural Research Corporation (ARC) has programmes on agricultural biotechnology. Sudan is a participant in the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) (see East and Central Africa regional information). Sudan hosted a regional workshop in February 2007 on "Principles of Biosafety Research for the Release of Genetically Engineered Crops". There is no known research, trials or commercial release of GMOs to date.

GMOs in food aid and imports

In May 2003, Sudan banned the import of GM food, but issued a series of temporary waivers enabling the continued entry of food aid shipments into the country while alternatives were being sought. In March 2004, Sudan again attempted to introduce restrictions on GM food aid, with Sudan requesting that food aid be certified "GM free." The US response was to suspend food aid shipments to Sudan and exert enormous pressure on the government to rescind the ban. The government of Sudan relented, and extended the waiver for six more months, allowing the distribution of GM food to continue until January 2005.[20] By early 2007, the Sudanese government

had lifted the waiver (so again blocking the import of GM-containing food aid), and acquired equipment for testing GM contents in food aid shipments.[21] Sudan — largely because of the humanitarian crisis in Darfur — received a massive 586,859 tons of food aid from the WFP, and 75,545 tons from the US during 2006.[59, 75] In April 2007 Sudan first held up and then released 100,000 tonnes of cereals from the UN WFP, after testing it for containing GMOs. The WFP strongly denied the charge.[223]

SWAZILAND

Laws and Regulations

Swaziland is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

A Biosafety Committee was set up in 2001, but Swaziland has limited capacity for risk assessment.[65] Swaziland has produced a Draft Policy entitled "Creating an Enabling Environment for the Safe Use of Biotechnology and its Products in Swaziland" and a Biosafety Bill. The general approach of the Draft Policy appears to create an enabling regulatory environment for the introduction of GMOs into Swaziland.[224] There are serious discrepancies between the Draft Policy and the Biosafety Bill and the Bill seemingly ignores the safeguards set out in the Draft Policy with respect to GM food aid. The Biosafety Bill does not establish any mechanisms for public participation in decision-making with respect to applications for authorisations, as envisaged in the Draft Policy. No provision is made for labelling.[224]

GMO R&D: field trials or commercial release

There is no known R&D, field trials or commercial release of GMOs to date.

GMOs in food aid and imports

Swaziland is a net importer of food as around 70% of farmers are engaged in subsistence farming. Swaziland has permitted the distribution of non-milled GM food aid, with a warning to the public that the grain should be consumed and not used for cultivation.[225]

TOGO 

Laws and Regulations

Togo is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

In December 2004, Togo passed a National Biosafety Framework, paving the way for the establishment of legal and institutional frameworks. Friends of the Earth have been very active in monitoring policy and regulatory biosafety developments in Francophone and Anglophone Africa. FoE Togo, for example, has been the lead actor in the adoption of its law on GMOs in the country and acting as civil society legal adviser for other groups in Francophone Africa. [226]

GMO field trials or commercial release

There are no known field trials or commercial release of GMOs to date.

GMOs in food aid and imports

Togo receives food aid through the United Nations World Food Programme (288 tons in 2006).[75, 72] It is unclear if this included GM food aid.

TUNISIA 

Laws and Regulations

Tunisia is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Tunisia is working with ICARDA (see North Africa regional information) to develop a biosafety framework to permit the introduction of GM crops in future.

GMO R&D: field trials or commercial release

There are research projects on agricultural biotechnology at the Institut de la Recherche Agronomique de Tunisie; the Institut National de Recherches en Genie Rural, Eaux et Forets; the Centre de Biotechnologie de Sfax (CBS); the Institut National de Recherche Scientifique et Technique (INRST); Jendouba University; and Tunis El Manar University.[227] GM research on virus resistance in potato is in the experimental phase.[227]

In the latter part of 2006, Tunisia announced several initiatives aimed at boosting scientific development. These included the establishment of a national 'observatory' to coordinate studies of science, technology and innovation and promote scientific training programmes and the establishment of 12 technology parks to encourage the commercialisation of academic research. This was welcomed by the Centre of Biotechnology of Sfax.[228]

GMOs in food aid and imports

There are no records of Tunisia being the recipient of GM food aid.

UGANDA

Laws and Regulations

Uganda is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

The 1995 National Environment Statute regulates environmental safety, but does not contain regulations on biotechnology.[229] A draft law regulating research into GM crops and the release of GM organisms has been submitted to Cabinet, prior to being voted on in Parliament.[230]

GMO R&D: field trials or commercial release

In August 2003, the National Agricultural Research Organisation (NARO) announced a new laboratory for biotechnology research, the Kawanda Agricultural Research Institute, starting with the banana as a subject. The laboratory is partly funded by USAID and the Rockefeller Foundation.[231] Other institutes that carry out agricultural biotechnology research include NARO's Food Science Research Institute; Serere Agricultural and Animal Research Institute (SAARI); and the University of Makerere.[229]

In August 2004, research on disease resistance in bananas and a planned project on Bt cotton were shelved while biosafety laws were put in place.[232]

USAID-Uganda have implemented several biotechnology programs in Uganda, namely, the Agricultural Productivity Enhancement Program (APEP); the Program for Biosafety Systems (PBS); and the Agricultural Biotechnology Support Program II (ABSPII).[233] Biotechnology is one of the key areas of APEP activities in Uganda and will include amongst its activities, building policy.

Uganda's National Agricultural Research Organisation and the International Institute of Tropical Agriculture are working together to develop a transgenic banana that can resist banana bacterial wilt[234] and are preparing a confined field trial of bananas genetically modified to resist black sigatoka disease, a serious fungal condition.[235] There are no plans to release the transgenic bananas to farmers until a Biosafety framework is in place. NARO is collaborating on an international project funded by the International Potato Centre on GM improvements and virus resistance in sweet potato. Other African countries involved are Ethiopia and Kenya.[90]

Uganda is a participant in the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) and BIO-EARN (see East and Central Africa regional information).

In December 2006 Uganda, with funding from the UN Environment Programme Global Environment Facility obtained equipment worth US$50,000 that would allow for the identification of GMOs in food.[236] It is planned that the new tools will be used for regional capacity building with the injection of additional funding from ASARECA or the East African Community for the development of a regional centre of excellence.[236]

In May 2007, it was reported that Uganda has imported GM sweet banana plants from Belgium for field trials. The GM sweet banana would be tested at the Kawanda Agricultural Research Institute for resistance to the bacterial wilt and Black Sigatoka fungal disease. Field results are expected within 5-10 years. GM Watch has pointed out that Geoffrey Arinatwe, the Ugandan scientist who developed this GM banana is one of a group of scientists based in Belgium responsible for a series of attempts to hype GM bananas. [237] Arinatwe is quoted in a San Francisco Chronicle article, for example, as saying, "Without a genetic fix, the banana may be history". GM Watch noted that such typical spurious claims have been expertly debunked each time in turn.[237]

Also in May 2007, USAID announced that it would inject $160,000 into pest resistant cotton trials in Uganda, ostensibly to help improve the competitiveness of Uganda's cotton farmers. GM Watch commented on the irony of this endeavour, pointing out that: "the US is now claiming to be helping the same cotton farmers it has impoverished through the massive trade distorting subsidies it gives to its own cotton sector which undermine cotton prices and African exports.[238]

In July 2007, the Donald Danforth Plant Science Center announced a grant of more than $3 million to fund research to enhance resistance to viral infection and increase the nutritional content of the sweet potato for Africa through co-operation between the International Potato Center (CIP) in Lima, Peru and the National Agricultural Research Organisation — Uganda (NARO). The technology was donated by Monsanto and the Danforth Center, and the money comes from the Howard G. Buffett Foundation — the main donor to the Gates Foundations' contributions to AGRA's 'new Green Revolution in Africa' push. This is an attempt to give new impetus to Monsanto's failed GM sweet potato project which, after years of hype, was revealed as a failure before the results of three years of field trials in Kenya were finally made public. These showed that the GM sweet potatoes despite supposedly being virus resistant were no less vulnerable than ordinary varieties, and their yield was no better or in some cases worse. In Uganda, conventional breeding produced a high-yielding variety much more quickly and cheaply.[239]

GMOs in food aid and imports

In 2001, the Ugandan government confiscated imports of American soya flour due to concerns that the shipment might contain GM soya. The impounded commodity was eventually released on the understanding that all future shipments would conform to Ugandan labelling standards and regulations.[240] However, from April 2003, Uganda began accepting donations of GM food.[241] In August 2003, President Museveni allowed the importation of 'non-contestable' forms of GMOs into Uganda.[242] In May 2004, the Ugandan government announced that GM foods could be imported into the country, but specified that they were to be used "strictly for consumption" and not for cultivation.[243] However, in July 2007, Uganda refused seed donations from abroad for fear that they could be GM, according to the state minister for disaster preparedness and refugees, Musa Ecweru. The country will accept only processed food.[244] It received 20,073 tons of food aid from the US and 212,114 tons from the UN WFP in 2006. According to the WFP's 2003 policy on GMOs, it would have to respect Uganda's wishes.

UNITED REPUBLIC OF TANZANIA

Laws and Regulations

Tanzania is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Tanzania has in place, a set of voluntary, non-legally binding biosafety guidelines which place a great deal of emphasis on field trials, yet neglect to provide for adequate regulation of commercial releases and imports of GMO food, including food aid, feed and processing. The precautionary principle in decision-making is not explicitly set out in these guidelines.[245] A National Biosafety Framework (NBF) was introduced in December 2006.[246]

GMO R&D: field trials or commercial release

Tanzania is a participant in the USAID-funded Association to Strengthen Agricultural Research in East and Central Africa (ASARECA) and BIO-EARN (see East and Central Africa regional information). There is limited research on GM virus-resistance in bananas, and there have been trials on GM tobacco.[65] Field trials of Bt cotton were started in 2005.[247]

Biotechnology Capacity

The International Centre for Genetic Engineering and Biotechnology (ICGEB) has approved the establishment by Tanzania of an Agricultural Biotechnology Centre (ABC), which it will fund in conjunction with the Tanzanian government. This centre will be established at the Sokoine University of Agriculture (SUA).[248]

GMOs in food aid and imports

Tanzania has been a port of entry for GM maize provided as food aid for other countries in the region.[65] It received 4,364 tons of food aid from the US under Public Law 480 (the majority of it likely to contain GMOs), and 93,497 tons from the WFP, whose GM status was not specified.[59, 75]

ZAMBIA

Laws and Regulations

Zambia is a Party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Zambia has draft legislation and a National Biosafety Committee, but little capacity for risk assessment.[65] The Environmental Protection Act (1995) regulates environmental safety, but does not contain regulations on biotechnology.[249] Zambia has established a National Biosafety Clearing House Website, managed by the National Institute for Scientific and Industrial Research (NISIR). NISIR is the National Biosafety Focal Point for the implementation of the Cartagena Protocol on Biosafety in Zambia.[250]

In April 2007, the Zambian Parliament adopted a biosafety bill aimed at preventing the entry of GMOs into the country. Minister of Science and Technology, Brian Chituwo said the Bill was needed because GMOs were bound to find their way into Zambia. The ACB has not been able to obtain a copy of the Bill, which is still awaiting final sign-off from the President.

GMO R&D: field trials or commercial release

Zambia is home to the pro-GM Biotechnology Outreach Society of Zambia. GM cassava improvement research is being carried out, and confined trials of Bt cotton were carried out in 1999/2000.[65] The University of Zambia has been part of two projects together with South African institutions, sponsored by Plant Research International from the Netherlands, the Department of Knowledge and Science Dissemination in the Netherlands and the European Commission, to develop GM resistance to *Fusarium moniliforme* in maize.[199] A case of unapproved GM maize field trials was reported in 2001.[65]

GMOs in food aid and imports

In 2002, government refused to accept GM grain donated as food aid.[251] In 2005, in the grip of its third severe drought since 2002, Zambia was again under pressure to accept GM food aid. The Zambian government remained firm in its stance to uphold the ban on GM foods until legislation was in place to ensure that GM foods pose no threat to human and animal health or the environment.[252]

In December 2005, Zambia's agriculture Minister, Mundia Sikatana announced that the Zambian government had decided to waive a requirement that scientists check whether duty-free maize imported from South Africa has been genetically modified. The 2005 drought had resulted in a failed maize crop, a national disaster was declared and the Zambians appealed for international relief. Both the Millers Association of Zambia (MAZ) and the Zambia National Farmers Union (ZNFU) had complained that the requirement for testing was slowing down imports.[253] In 2006, Zambia received only sorghum and wheat (not GM) from US food aid. It received 103,099 tons of food aid from the UN WFP, most of it sourced in South Africa. According to WFP's office in Johannesburg, South African maize was only used when accompanied by GM-free certificates.[17]

Public opinion

The pro-GM machinery waged a public campaign claiming that Zambians were starving to death as a result of the country's rejection of GM food aid. Yet, the Zambian Red Cross is on record as saying, "We didn't record a single death arising out of hunger," Until 2006, news articles still bore headlines such as "As millions starve, alarmists block famine solutions". CS Prakash's AgBioView featured articles that claimed environmentalists were collectively hell-bent on "man's extinction" and that Zambia's foolish leaders were hoodwinked by Greenpeace into committing crimes against humanity.[254, 255, 256]

In July 2007, the Zambian government rejected a call by a group of scientific, agricultural and non-governmental organisations (AfricaBio, the Africa Biotechnology Stakeholders Forum, Africa Harvest Biotech Foundation International, Biotechnology-Ecology Research and Outreach Consortium (BioEROC) and the International Service for the Acquisition of Agri-biotech Application (ISAAA)) to use GM crops "to reduce poverty and hunger". Zambian minister of agriculture and cooperatives, Ben Kapita, told SciDev.Net, "We have always said that Zambia will not be used as a dumping place for GMO products."[257]

ZIMBABWE

Laws and Regulations

Zimbabwe is both party to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety.

Zimbabwe has a legally binding biosafety system and limited capacity to detect the presence of GMOs.[65] Zimbabwe has established the Biosafety Board (ZBB) of Zimbabwe, a parastatal under the Department of Science and Technology Development established through an Act of Parliament. The mandate of the board is to manage the use of modern biotechnology.[258]

In October 2006, a National Biotechnology Authority Bill was passed. The Bill establishes a National Biotechnology Authority to regulate the development and use of all biotechnology applications and products, and will become Zimbabwe's primary "biosafety" instrument to implement Zimbabwe's obligations under the Biosafety Protocol. In her comments on the Bill, ACB's Mariam Mayet noted that it does not fully implement Zimbabwe's obligations under the Biosafety Protocol, for example transboundary movements (import and export), for which there are only enabling provisions. This is particularly strange since Zimbabwe receives bulk shipments of cereals and oil seeds as food aid/trade from GMO producing countries. The main preoccupation of the NBA seems to open Zimbabwe up to wholesale GE experimentation. The NBA does not address important biosafety issues, such as socio-economic and food security impacts; application of the Precautionary Principle in decision-making; principles, parameters, methodology and content of risk assessments; fair administrative justice and public participation; access to information; liability and redress; requirements for the establishment of an identity preservation system and documentation requirements in line with Article 18 of the Biosafety Protocol and labeling and consumer right issues.[259]

GMO R&D

Zimbabwe's Biotechnology Research Institute (BRI) was established in 1992. The emphasis on biotechnology started in 1992, with the Special Program Biotechnology, supported by the Netherlands.[260] There are research projects on agricultural biotechnology in some of the following research institutions: Department of Research and Specialist Services (DRSS); Veterinary Research Laboratory (VRL); Scientific and Industrial Research and Development Centre (SIRDC); the Biotechnology Research Institute (BRI) of the Scientific and Industrial Research and Development Centre (SIDRC); the Tobacco Research Institute; and the Faculties of Veterinary Science and Agriculture at the University of Zimbabwe.[261]

GM crop improvement research has been carried out on cowpea, tobacco, maize, sweet potato, tomatoes and sorghum. Confined trials of Bt maize and cotton have been conducted.[65] The Veterinary Service of Zimbabwe, working with the University of

Florida, has developed a recombinant vaccine against heartwater disease (cowdriosis) and will be conducting field trails.[84]

GMOs field trials

There have been reports of field trials being carried out without any regulatory oversight or public knowledge. The government destroyed some unsupervised field trials of Bt cotton conducted by Monsanto some years ago.[262] Field trials of Bt cotton and Bt maize were approved in 2001,[65] and there have been approved field trials of lepidoptera resistance (Bt) in cotton.[263]

There is no commercial release of GMOs to date.

GMOs in food aid and imports

The Zimbabwean government is prepared to accept GM food aid, provided maize is milled prior to distribution.[264] The ZBB screens all food aid before it comes in to safeguard the health of the people as well as protect the environment. In 2006, Zimbabwe received 182,884 tons from the UN WFP.[75] Most of it was sourced in South Africa. According to WFP's office in Johannesburg, South African maize was only used when accompanied by GM-free certificates.[17]

Acronyms

AATF	African Agricultural Technology Foundation
ABC	Agricultural Biotechnology Centre (Tanzania)
ABSF	African Biotechnology Stakeholders Forum
ABSP	Agricultural Biotechnology Support Project
ABSPII	Agricultural Biotechnology Support Program II
ABUCO	Association of Burundi Consumers
ACB	African Centre for Biosafety
ACGT	African Centre for Gene Technologies
ADRA	Adventist Development and Relief Agency
AGC	African Groundnut Council
AGERI	Agricultural Genetic Engineering Research Institute (Egypt)
AGRA	Alliance for a Green Revolution in Africa
AHBFI	African Harvest Biotech Foundation International
APEP	Agricultural Productivity Enhancement Program
ARC	Agricultural Research Council (same acronym for separate institutions in Egypt, Ghana, South Africa and Sudan)
ARI	Animal Research Institute (Ghana)
ASA	Advertising Standards Authority (South Africa)
ASARECA	Association for Strengthening Agricultural Research in East and Central Africa
BIO-EARN	East African Regional Programme and Research Network for Biotechnology, Biosafety, and Biotechnology Policy Development
BNARI	Biotechnology and Nuclear Agriculture Research Institute (Ghana)
BRI	Biotechnology Research Institute (Zimbabwe)
Bt cotton	A variety of GM cotton containing genes isolated from *Bacillus thuringiensis*, ostensibly to confer insect resistance to the host crop plant
CABIO	Collaborative Agricultural Biotechnology Initiative
CAR	Central African Republic
CBS	Centre de Biotechnologie de Sfax (Tunisia)
CERAAS	Centre d'Etude Régional pour l'Amélioration de l'Adaptation à la Sécheresse (Senegal)

CGIAR	Consultative Group on International Agricultural Research
CILSS	Permanent Inter-state Committee for Drought Control in the Sahel
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo (International Maize and Wheat Improvement Center)
COPAGEN	Coalition for the Protection of African Genetic Heritage
CRI	Crops Research Institute (Ghana)
CSIR	Council for Scientific and Industrial Research (same acronym for separate institutions in Ghana and South Africa)
DDPSC	Donald Danforth Plant Science Center
DFID	Department for International Development (United Kingdom)
DRA	Direction de la Recherche Agronomique du Benin (Benin)
DRSS	Department of Research and Specialist Services (Zimbabwe)
EARO	Ethiopian Agricultural Research Organisation
ECOWAS	Economic Community of West African States
EED	Evangelischer Entwicklungsdienst (Church Development Service)
ENA	École Nationale d'Agriculture de Meknès (Morocco)
ENSA	École Nationale Supérieure d'Agriculture (Senegal)
EU	European Union
FABI	Forestry and Agricultural Biotechnology Institute (South Africa)
FAO	Food and Agriculture Organisation
FARC	Food and Agriculture Research Council (Mauritius)
FOFIFA	Centre National de la Recherche Apliquée au Développement Rural (Madagascar)
FRIM	Forestry Research Institute of Malawi
GE	Genetic Engineering or Genetically Engineered
GEF	Global Environmental Fund
GM	Genetically modified
GMO	Genetically modified organism
HBF	Horn Biotechnology Forum
IAR&T	Institute of Agricultural Research & Training (Nigeria)
IAV	Institut Agronomique et Vétérinaire Hassan II (Morocco)
ICARDA	International Centre for Agricultural Research in the Dry Areas

ICGEB	International Centre for Genetic Engineering and Biotechnology
IER	Institut d'Economie Rurale (Mali)
IFPRI	International Food Policy Research Institute
IIAM	Mozambique's National Institute for Agricultural Research
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
INERA	Institut de l'environnement et de recherches agricoles
INRA	Institut National de la Recherche Agronomique (Morocco)
INRAB	Institut National de Recherche Agricole du Benin
INRAN	Institut National des Agronomiques du Niger
INRST	Institut National de Recherche Scientifique et Technique (Tunisia)
INSAH	Sahel Institute
IRMA	Insect Resistant Maize for Africa
ISAAA	International Service for the Acquisition of Agribiotech Applications
ISNAR	International Service for National Agricultural Research
ISRA	Institut Sénégalais de Recherches Agricoles
ITA	Institut de Technologie Alimentaire (Senegal)
KARI	Kenya Agricultural Research Institute
KEPHIS	Kenya Plant Health Inspection Services
KU	Kenyatta University
MAZ	Millers Association of Zambia
MABI	Mauritius Agricultural Biotechnology Institute
MEST	Ministry of Environment, Science, and Technology
MSIRI	Mauritius Sugar Industry Research Institute
MSU	Michigan State University
NABA	Namibian Biotechnology Alliance
NABP	Nigeria Agriculture Biotechnology Project
NARO	National Agricultural Research Organisation (Uganda)
NBA	National Biosafety Authority (Kenya)
NBAC	National Biotechnology Advisory Council (South Africa)
NBC	National Biosafety Committee (Kenya, Mauritius and Nigeria have separate institutions of the same name)

NBF	National Biosafety Framework (Sierra Leone)
NCGRB	National Centre for Genetic Research and Biotechnology (Nigeria)
NCRI	National Cereals Research Institute (Nigeria)
NEPAD	New Partnership for Africa's Development
NIFOR	National Institute for Oil Palm Research (Nigeria)
NISIR	National Institute for Scientific and Industrial Research
NPRC	National Potato Research Centre (Kenya)
NRCM	National Research Council of Malawi
OPRI	Oil Palm Research Institute (Ghana)
PBS	Programme for Biosafety Systems (funded by USAID)
PGRC	Plant Genetic Resources Centre (Ghana)
R&D	Research and development
SAARI	Serere Agricultural and Animal Research Institute (Uganda)
SACRED	Sustainable Agricultural Centre for Research Extension and Development Africa
SADC	Southern African Development Community
SAGENE	South African Committee on Genetic Experimentation
SARI	Savannah Agricultural Research Institute
SIDA	Swedish Development Agency
SIRDC	Scientific and Industrial Research and Development Centre (Zimbabwe)
SOFITEX	Burkina Faso Fibre and Textile Company
SUA	Sokoine University of Agriculture
UGB	Université Gaston Berger de Saint Louis (Senegal).
UN	United Nations
UN WFP	United Nations World Food Programme
UNB	Universite National du Benin
UNESCO	United Nations Education, Scientific and Cultural Organization
USAID	United States Agency for International Development
USAID ESP	USAID Office of Economic and Science Policy
USDA	US Department of Agriculture
VRL	Veterinary Research Laboratory (Zimbabwe)

WABNET	West African Biotechnology Network
WAEMU	West African Economic and Monetary Union
WECARD	West & Central African Council for Agricultural Research & Development
WFP	World Food Programme
ZBB	Zimbabwe Biosafety Board
ZNFU	Zambia National Farmers Union

References

1 World Food Programme Food Distribution Annual Report 2006, Tables 5 and 9. The exact amount provided by the WFP and USAID is 4, 864. 600 MT. (accessed 15.09.2007).

2 Gelfand, Lauren. http://www.worldpoliticsreview.com/article.aspx?id=1074 (accessed 15.09.2007).

3 Cartagena Protocol on Biosafety. Montreal, 29 January 2000. Convention on Biological Diversity. Status of **r**atification and **e**ntry into **f**orce. http://www.biodiv.org/biosafety/signinglist.aspx?sts=rtf&ord=dt (accessed 28.10.2007).

4 ECOWAS 2007: Action plan for the development of biotechnology and bio-safety in the ECOWAS sub-region, 4. (accessed 15.09.2007).

5 http://www.grain.org/m/?id=142 (accessed 15.09.2007).

6 International Food Policy Research Institute. **Assessing the potential economic impact of genetically modified crops in Ghana**. http://www.ifpri.org/pbs/pdf/pbsbriefghana02.pdf (accessed 28.10.2007).

7 ECOWAS. http://www.sec.ecowas.int/index.html (accessed 28.10.2007).

8 Juma, C. and Serageldin, I. August 2007. **Freedom to Innovate. Biotechnology in Africa's development.** Report of the High-Level African Panel on Modern Biotechnology. African Union/NEPAD. http://www.sarpn.org.za/documents/d0002770/Freedom_innovate_AU-NEPAD_Aug2007.pdf (accessed 28.10.2007).

9 Odhiambo, A. 17 July 2007. **Annan rules out use of GMOs in the war on hunger in Africa.** Business Daily (Kenya). http://www.gmwatch.org/archive2.asp?arcid=8110 (accessed 28.10.2007).

10 http://www.absfafrica.org/Africa%20welcomes%20AGRA%20clarification.pdf (accessed 15.09.2007).

11 Declaration of the Forum for Food Sovereignty, Nyéléni. 27 February 2007. http://www.nyeleni2007.org/spip.php?article290 (accessed 28.10.2007).

12 FoodFirst. **Africa's wealth of seed diversity and farmer knowledge — under threat from the Gates/ Rockefeller "Green Revolution" initiative.** Statement from African civil society organisations at the World Social Forum 2007, Nairobi, Kenya. 25 Jan 2007. http://www.foodfirst.org/node/1610 (accessed 28.10.2007).

13 GRAIN, 27 July 2007. **Stop the Agrofuels craze!** http://www.grain.org/seedling/?id=477 (accessed 28.10.2007).

14 Position paper of the global south on food sovereignty. **The geopolitics of agrofuels: energy sovereignty and the transition towards a post-oil society.** Quito 2007.

15 Mayet, M. February 2007. **Opening Pandora's box: GMOs, fuelish paradigms and South Africa's biofuels strategy.** http://www.biosafetyafrica.net/portal/DOCS/biofuels_and_GMOs.pdf (accessed 28.10.2007).

16 African Centre for Biosafety. 10 November 2006. **Turning food into fuel: GM drought tolerant soybean and its use in the production of biodiesel.** http://biosafetyafrica.net/portal/images/ACB/turningfoodintofuel.pdf (accessed 28.10.2007).

17 Lee, R. World Food Programme. Personal Communication, July 2007.

18 Science in Africa. April 2004. **Angola bans genetically modified seed.** http://www.scienceinafrica.co.za/2004/april/angolagm.htm (accessed 28.10.2007).

19 Open Democracy. Mulvaney, P. 29 April 2004. www.opendemocracy.net/debates/article-4-64-1876.jsp (accessed 15.09.2007).

20 Makanya, Z. 4 July 2004. **12 reasons for Africa to reject GM crops.** Seedling Magazine. http://www.grain.org/seedling_files/seed-04-07-04.pdf (accessed 28.10.2007).

21 Abdelbagi, M. Ali. September 2007. Personal communication.

22 Reuters AlertNet. 26 April 2007. **Sudan to release Darfur-bound aid -WFP.** http://www.alertnet.org/thenews/newsdesk/L26291529.htm (accessed 28.10.2007).

23 Clapp, J. 2005. **The political economy of food aid in an era of agricultural biotechnology.** Global Governance 11: 467-485.

24 Chicago Tribune, http://www.chicagotribune.com/news/nationworld/chi-0612080189dec08,1,3690649.story?coll=chi-newsnationworld-hed (accessed 15.09.2007).

25 African Centre for Biosafety. 5 September 2007. Update. **ARC's appeal against GM cassava ruling.** http://www.biosafetyafrica.net/portal/images/ACB/arcappealagainstgmcassavaruling.pdf (accessed 28.10.2007).

26 African Centre for Biosafety. Media Advisory. 4 September 2007. **Desperate appeal against rejection of Gates Foundations' GM sorghum experiments.** http://www.biosafetyafrica.net/portal/images/ACB/appealagainstrejectionofgmsorghumexp.pdf (accessed 28.10.2007).

27 Veneman, A. US Secretary for Agriculture. 16 September 2004. Keynote Address. 7th Annual AfriCANDO Trade and Investment Symposium. http://japan.usembassy.gov/e/p/tp-20040921-03.html (accessed 15.09.2007).

28 International Service for National Agricultural Research news release. 9 June 2003. http://www.futureharvest.org/pdf/Biosafety_FINAL1.pdf (accessed 15.09.2007).

29 Checkbiotech. 11 May 2004. http://www.checkbiotech.org/root/index.cfm?fuseaction=news&doc_id=7749&start=1&control=210&page_start=1&page_nr=101&pg=1 (accessed 15.09.2007).

30 USAID FactSheet. 12 June 2002. Collaborative Agriculture Biotechnology Initiative. **Mobilizing new science and technology to reduce poverty and hunger.** http://www.usaid.gov/press/releases/2002/fs020612.html (accessed 28.10.2007).

31 WAEMU. West African Economic and Monetary Union (WAEMU) / Union Economique et Monetaire de l'ouest Africaine (UEMOA). **History and present status.** http://www.dfa.gov.za/foreign/Multilateral/africa/waemu.htm (accessed 28.10.2007).

32 FoE Africa Briefing Paper. March 2007. **West Africa & the biotech push.** http://www.eraction.org/publications/FoEAfrica_briefing02.pdf (accessed 28.10.2007).

33 People's Daily Online, China. http://english.people.com.cn/90001/90781/6212368.html (accessed 15.09.2007).

34 Elfrieda Pschorn-Strauss. 2005. **Bt cotton in South Africa: the case of the Makhathini farmers.** Seedling.

35 Harald Witt, Rajeev Patel and Matthew Schnurr. 2006. **Can the poor help GM crops? Technology, representation and cotton in the Makhathini Flats, South Africa.** ROAPE 109: 497-513.

36 GRAIN. 2006. **Latest World Bank biosafety proposal for West Africa heavily criticised.** http://www.grain.org/m/?id=142 (accessed 30.10.2007).

37 GM Watch. 7 June 2004. **Africa compelled to adopt GM.** http://www.gmwatch.org/archive2.asp?arcid=3709 (accessed 28.10.2007).

38 BIO-EARN. http://www.bio-earn.org/biotech/biotech.htm (accessed 15.09.2007).

39 GM Watch. 26 June 2004. **Focus on Africa.** http://www.gmwatch.org/p1temp.asp?pid=37&page=1. (accessed 28.10.2007).

40 Harrison, A. and Hays, S. M. 21 June 2004. USDA Press Release No. 0247.04. **USDA and African Agricultural Technology Foundation sign agreement to share technologies.** http://www.usda.gov/Newsroom/0247.04.html (accessed 28.10.2007).

41 East African Standard. 17 June 2004. http://allafrica.com/stories/200406160970.html (accessed 15.09.2007).

42 Kiome, R. Doyle Foundation. **New Biosciences facility for Eastern and Central Africa.** http://www.doylefoundation.org/BiosciencesBrochure.pdf (accessed 28.10.2007).

43 Mayet, M. 1 July 2004. **Africa — the new frontier for the GE industry.** GM Watch. http://www.gmwatch.org/archive2.asp?arcid=4023 (accessed 28.10.2007).

44 Crop Biotech Update. Workshop to address Biotech in Horn of Africa. May 2006. http://www.isaaa.org/kc/CBTNews/2006_Issues/May/CBT_May_12.htm#14 (accessed 28.10.2007).

45 Research Day Worldwide. 27 April 2006. **East Africa wins Sh800 million for agricultural research.** http://www.researchresearch.com/news.cfm?pagename=newsStory&type=default&elementID=61524 (accessed 15.09.2007).

46 ICARDA. **High-tech tools for food security: biotechnology at ICARDA.** http://www.icarda.org/Biotechnology.htm (accessed 28.10.2007).

47 USAID. 2003. Fact Sheet. **SARB: Southern African regional biosafety program.** http://www.usaid.gov/press/facsheets/2003/fs030623_html (accessed 15.09.2007).

48 Chege, K. 21 July 2005. **African Union sets up biotechnology advisory panel.** http://www.scidev.net/News/index.cfm?fuseaction=readnews&itemid=2238&language=1 (accessed 28.10.2007).

49 Ngandwe, T. 22 August 2005. **Southern African network for biosciences launched.** http://www.scidev.net/content/news/eng/southern-african-network-for-biosciences-launched.cfm (accessed 28.10.2007).

50 Malakata, M. 2005. **Southern Africa adopts a regional approach to science.** 12 December 2005. http://www.scidev.net/content/news/eng/southern-africa-adopts-a-regional-approach-to-science.cfm (accessed 28.10.2007).

51 UNEP-GEF Biosafety Projects. June 2005. http://www.unep.ch/biosafety/newsletter/newsletter_7.pdf (accessed 28.10.2007).

52 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=DZA (accessed 28.10.2007).

53 The Convention on Biological Diversity. http://www.biodiv.org/doc/world/dz/dz-nr-cpbi-en.pdf (accessed 28.10.2007).

54 Schubert, R. 2001. **Farmers, foreign markets send negative signals about Roundup Ready wheat.** Cropchoice.com. http://www.cropchoice.com/leadstry923b.html?recid=228 (accessed 28.10.2007).

55 The Convention on Biological Diversity around the World. http://www.biodiv.org/world/map.aspx?ctr=ao (accessed 28.10.2007).

56 Agbios. **Angola: Biosafety protocol in force in country.** Angola Press Agency (Luanda). 11 April 2007. http://www.agbios.com/main.php?action=ShowNewsItem&id=8390 (accessed 31 October 2007).

57 Matos, E. M. 2005. **Report on plant breeding and biotechnology capacity survey: Angola.** Draft version. FAO. http://apps3.fao.org/wiews/docs/Angola%20Full%20Report.pdf (accessed 15.09.2007).

58 Science in Africa. April 2004. **Angola bans genetically modified seed.** http://www.scienceinafrica.co.za/2004/april/angolagm.htm (accessed 28.10.2007).

59 http://www.fas.usda.gov/excredits/FoodAid/Reports/Food%20Aid%20Table%20I%202006%20final.pdf (accessed 15.09.2007).

60 The East African (Kenya). 5 Apr 2004. http://allafrica.com/stories/200404070238.html (accessed 15.09.2007).

61 WISARD Agricultural R&D Server. http://www.wisard.org/wisard/shared/asp/projectsummary.asp?Kennummer=4210 (accessed 28.10.2007).

62 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=BEN (accessed 28.10.2007).

63 GRAIN. **Foundations for GM crops in West Africa are being built — a battle looms ahead.** http://www.grain.org/seedling/?id=444#_2 (accessed 15.09.2007).

64 http://www.checkbiotech.org/blocks/dsp_document.cfm?doc_id=12625 (accessed 15.09.2007).

65 Mnyulwa, D. & Mugwagwa, J. 2003. **Agricultural biotechnology in Africa: a regional synthesis.** Working paper no. 1 for FANRPAN/IFPRI Regional Dialogue on Biotechnology, Agriculture and Food Security in Southern Africa.

66 Genetic Resources Action International (GRAIN) press release. 2 Feb 2004. http://www.grain.org/publications/btcotton-newsrelease-feb-2004-en.cfm (accessed 15.09.2007).

67 Agbios. 29 July 2003. **SOFITEX to embark on GMO cotton production.** http://www.agbios.com/main.php?action=ShowNewsItem&id=4668 (accessed 28.10.2007).

68 BBC News. **Push to spread GM crops in Africa.** 21 June 2004. http://news.bbc.co.uk/2/hi/europe/3826261.stm (accessed 28.10.2007).

69 SeedQuest. **Monsanto and Syngenta to expand testing of GM cotton in Burkina Faso.** http://www.seedquest.com/News/releases/2006/september/16990.htm (accessed 28.10.2007).

70 Yahoo News http://news.yahoo.com/s/afp/20061124/bs_afp/burkinafarmbiotechgmo_0611 (accessed 15.09.2007).

71 Agence France Press. (http://ca.news.yahoo.com/s/afp/070524/world/burkina_farm_cotton (accessed 15.09.2007).

72 UN WFP. **World Hunger — Burkina Faso.** http://www.wfp.org/country_brief/indexcountry.asp?country=854 (accessed 28.10.2007).

73 Vint, R. **Force-feeding the world.** http://www.saynotogmos.org/global_south2.htm (accessed 28.10.2007).

74 African Centre for Biosafety. http://www.biosafetyafrica.net/cameroon.htm (accessed 15.09.2007).

75 WFP. 2006 annual report. http://www.wfp.org/policies/Introduction/index.asp?section=6&sub_section=1 (accessed 15.09.2007).

76 Mayet, M. February 2006. **Colonising Africa's agriculture.** D+C. Magazine for Development and Cooperation. http://www.inwent.org/E+Z/content/archive-eng/02-2006/foc_art2.html (accessed 28.10.2007).

77 **Enhancing biosafety scientific expertise in sub-Saharan Africa.** April 2002. http://www.merid.org/Meeting%20Summary%20Sci%20Exp%20020421%20FINAL.pdf (accessed 28.10.2007).

78 UNEP. http://www.google.co.za/search?hl=en&safe=off&rls=GGLG%2CGGLG%3A2005-24%2CGGLG%3Aen&q=%2Bdjibouti+%2Bbiosafety&meta=lr%3Dlang_en (accessed 15.09.2007).

79 El Haleem, Z. A. & Hamza, A. 2002. FAO/WHO Global forum of food safety regulators. **Country report proposed by Egypt.** FAO. http://www.fao.org/DOCREP/MEETING/004/AB424E.HTM (accessed 15.09.2007).

80 Business Today Egypt. August 2004. (accessed 15.09.2007).

81 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=EGY (accessed 28.10.2007).

82 Balile, D. 18 June 2004. **Egypt will help Tanzania with 'inevitable' GM crops.** SciDev.Net http://www.scidev.net/news/index.cfm?fuseaction=readnews&itemid=1437&language=1 (accessed 28.10.2007).

83 WISARD Agricultural R&D Server. http://www.wisard.org/wisard/shared/asp/projectsummary.asp?Kennummer=4235 (accessed 28.10.2007).

84 USAID Africa Bureau. 2001. **An inventory of agricultural biotechnology for the Eastern and Central Africa Region.** www.iia.msu.edu/absp/invent_draft2.pdf (accessed 28.10.2007).

85 Bharat Textile. 19 July 2003. http://www.monsantoafrica.com/news/afrenshowlib.phtml?uid=7330 (accessed 15.09.2007).

86 SciDevNet. 15 April 2005. **Wearing down resistance to GM crops in Egypt.** http://www.scidev.net/Features/index.cfm?fuseaction=readFeatures&itemid=393&language=1 (accessed 28.10.2007).

87 Biosafety Information Network & Advisory Service. http://binas.unido.org/binas/country.php?id=6 (accessed 15.09.2007).

88 Biosafety Information Network & Advisory Service. http://binas.unido.org/binas/country.php?id=31 (accessed 15.09.2007).

89 Checkbiotech. 16 July 2004. **Ethiopia drafts agri-biotech documents.** http://www.checkbiotech.org/root/index.cfm?fuseaction=newsletter&topic_id=2&subtopic_id=9&doc_id=8189 (accessed 15.09.2007).

90 WISARD Agricultural R&D Server. http://www.wisard.org/wisard/shared/asp/projectsummary.asp?Kennummer=4399 (accessed 28.10.2007).

91 African Biotechnology Stakeholders Forum, Kenya. http://www.absfafrica.org/new/index.php?option=com_content&task=view&id=6&Itemid=2 (accessed 28.10.2007).

92 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=GMB (accessed 28.10.2007).

93 UNEP. February 2005. **Development of National Biosafety Framework for The Gambia.** http://www.unep.ch/biosafety/development/countryreports/GMNBFrep.pdf (accessed 28.10.2007).

94 Biosafety Information Network & Advisory Service. http://binas.unido.org/binas/country.php?id=34 (accessed 15.09.2007).

95 Sawahel. W. 17 August 2005. **Ghana drafts GM safety legislation.** SciDev.net. http://www.scidev.net/content/news/eng/ghana-drafts-gm-safety-legislation.cfm (accessed 28.10.2007).

96 UNEP. National Biosafety Framework for Ghana. http://www.unep.ch/biosafety/development/countryreports/GHNBFrep.pdf (accessed 15.09.2007).

97 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=GHA (accessed 28.10.2007).

98 Wisard Project Informer. **Genetic enhancement of pearl millet for drought mildew resistance.** Server.http://www.wisard.org/wisard/shared/asp/projectsummary.asp?Kennummer=3795 (accessed 15.09.2007).

99 IFPRI. **Assessing the potential economic impact of genetically modified crops in Ghana. Virus resistant tomato.** http://www.ifpri.org/pbs/pdf/pbsbriefghana02.pdf (accessed 28.10.2007).

100 Coomson, J. 28 July 2005. **Ghana has taken a strong stance against the importation and cultivation of genetically modified (GM) foods in Ghana.** http://www.checkbiotech.org/root/index.cfm?fuseaction=news&doc_id=10881&start=1&control=230&page_start=1&page_nr=101&pg=1 (accessed 15.09.2007).

101 **Ghana strongly favors GM Crops.** 19 August 2005. http://www.checkbiotech.org/root/index.cfm?fuseaction=news&doc_id=11042&start=21&control=220&page_start=1&page_nr=101&pg=1 (accessed 15.09.2007).

102 FoE. 24 November 2006. **West African food aid contaminated with GM rice.** http://www.foe.co.uk/resource/press_releases/west_african_food_aid_cont_24112006.html (accessed 15.09.2007).

103 Koranteng**, A. 9 May 2007. Ghana to accept GM products soon?** http://www.thestatesmanonline.com/pages/news_detail.php?newsid=3382&section=2 (accessed 28.10.2007).

104 Belgian Biosafety Clearing House. http://www.biosafetyprotocol.be/partnership.html (accessed 15.09.2007).

105 http://www.agbioworld.org/newsletter_wm/index.php?caseid=archive&newsid=2611 (accessed 28.10.2007).

106 Biosafety Information Network & Advisory Service. http://binas.unido.org/binas/country.php?id=36 (accessed 15.09.2007).

107 GM Watch. 12 Jan 2005. http://www.gmwatch.org (accessed 15.09.2007).

108 Mboyah, D. 11 July 2006. **A bill seeking to ban GMOs in Kenya hits a snag as legislators differ.** Africa Science News Service. http://www.africasciencenews.org/A%20bill%20to%20ban%20Gmos%20in%20kenya%20hits%20a%20snag%20as%20legislators%20differs.htm (accessed 15.09.2007).

109 Mayet, M. 22 June 2007. **Comments on the republic of Kenya's biosafety bill.** http://www.biosafetyafrica.net/portal/images/ACB/kenyabiosafetybill.pdf (accessed 28.10.2007).

110 Mbaria, J. http://www.nationmedia.com/eastafrican/current/News/News09070718.htm (accessed 15.09.2007).

111 Africa Science News Service, Kenya. 21 August 2007. **Kenya's biosafety bill faces opposition.** http://africasciencenews.org/asns/index.php?option=com_content&task=view&id=32&Itemid=1 (accessed 28.10.2007).

112 Sonkoyo, L. 21 August 2007. **Kenya parliamentarians could pass Biosafety Bill.** Africa Science News Service, Kenya http://africasciencenews.org/asns/index.php?option=com_content&task=view&id=33&Itemid=1 (accessed 31.10.2007).

113 Amungo, R. 19 October 2007. **Protests over Biosafety Bill in Kenya.** GM Watch. http://www.gmwatch.org/archive2.asp?arcid=8386 (accessed 28.10.2007).

114 Mbaria, J. 14 October 2007. **Scientists and lobby groups continue to differ on "designer foods".** GM Watch. http://www.gmwatch.org/archive2.asp?arcid=8370 (accessed 28.10.2007).

115 Udongo Comu:Locating. 23 October 2007. **Biosafety: a first for Kenyan NGO activism.** http://udongo.org:80/2007/10/23/biosafety-a-first-for-kenyan-ngos-activism/ (accessed 28.10.2007).

116 Mugabe, J. **Biotechnology in sub-Saharan Africa: an introduction.** www.atpsnet.org/docs/Mugabe.pdf (accessed 15.09.2007).

117 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=KEN (accessed 28.10.2007).

118 The Nation (Kenya). 15 May 2004. http://allafrica.com/stories/200405170116.html (accessed 15.09.2007).

119 GM Watch. Profiles. **Florence Wambugu.** http://www.gmwatch.org/profile1.asp?PrId=131&page=W (accessed 28.10.2007).

120 FAO. The state of food and agriculture: 2003 – 2004. **Agricultural biotechnology meeting the needs of the poor.** http://www.fao.org/docrep/006/Y5160E/Y5160E00.HTM (accessed 28.10.2007).

121 Gathura, G. 29 January 2004. **GM technology fails local potatoes.** The Daily Nation, Kenya. http://www.gmwatch.org/archive2.asp?arcid=2481 (accessed 28.10.2007).

122 New Scientist. February 2004. **Monsanto's showcase project in Africa fails.** Vol. 181(7).

123 The Guardian. http://www.monbiot.com/dsp_article.cfm?article_id=640 (accessed 15.09.2007).

124 GM Watch. 22 May 2007. **About 20 Cal graduates protest keynote speaker.** http://www.gmwatch.org/archive2.asp?arcid=7916 (accessed 28.10.2007).

125 GM Watch. 18 May 2007. **Lies, damn lies and Florence Wambugu.** http://www.gmwatch.org/archive2.asp?arcid=7890 (accessed 28.10.2007).

126 USAID 2002 ABSP Biotechnology Development in Africa, 1991-2002.www.afr-sd.org/Agriculture/Biotechnology/ABSP%20BioTech%20Dev%20in%20Africa.PDF (accessed 15.09.2007).

127 Chege, K. 25 June 2004. **$12 million greenhouse signals Kenyan GM commitment.** Science & Development Network. www.scidev.net/news/index.cfm?fuseaction=readnews&itemid=1452&language=1 (accessed 28.10.2007).

128 Kimutai, C. May 2004. **Kenya prepares to grow genetically modified maize**.

129 Chege, K. 14 December 2004. **Revision of plans delays Kenya's GM maize.** Science and Development Network http://www.scidev.net/gateways/index.cfm?fuseaction=readitem&rgwid=4&item=News&itemid=1803&language=1 (accessed 28.10.2007).

130 GM Watch. 1 January 2006. **Kenya's ag secretary sees no conflict between his role and directorship of GM food body.** http://www.gmwatch.org/archive2.asp?arcid=6089 (accessed 28.10.2007).

131 FAO. http://www.fao.org/biotech/inventory_admin/dep/stat_result.asp?country=KEN (accessed 28.10.2007).

132 Crop Biotech Net. 26 May 2006. Monsanto. **Kenya MPs to table biotech fact finding report to parliament.** http://www.monsanto.co.uk/news/ukshowlib.phtml?uid=10288 (accessed 28.10.2007).

133 Africa Harvest Biotech Foundation International (AHBFI). 8 Mar 2004. **A Harvest press release** www.ahbfi.org/sweetpress1.htm (accessed 15.09.2007).

134 GRAIN. February 2007. **Field trials and commercial releases of Bt cotton around the world.** http://www.grain.org/research/btcotton.cfm?id=306 (accessed 28.10.2007).

135 Ogodo, O. 31 May 2005. **Kenya begins first open field trials of GM maize.** SciDevNet. http://www.scidev.net/content/news/eng/kenya-begins-first-open-field-trials-of-gm-maize.cfm (accessed 28.10.2007).

136 Checkbiotech. 9 September 2005. **Kenya to repeat field trial for Bt maize.** http://www.checkbiotech.org/root/index.cfm?fuseaction=news&doc_id=11192&start=31&control=220&page_start=1&page_nr=101&pg=1 (accessed 28.10.2007).

137 Kenya: **NBC approves field trails on genetically engineered cotton variety.** http://www.bharattextile.com/newsitems/2004506 (accessed 15.09.2007).

138 The East African (Kenya). 1 June 2003. http://www.nationaudio.com/News/EastAfrica (accessed 15.09.2007).

139 Mbaria, J. http://www.nationmedia.com/eastafrican/current/News/News09070715.htm (accessed 15.09.2007).

140 Mayet, M. 2005. **Comments on Lesotho's Biosafety Bill.** African Centre for Biosafety. http://www.biosafetyafrica.net/_DOCS/ACB_Comments_Lesotho.pdf (accessed 28.10.2007).

141 Greenpeace. January 2003. **Genetically engineered food aid in southern Africa.** www.greenpeace.org.au/truefood/downloads/ge_foodaidbriefjan03.pdf (accessed 28.10.2007).

142 UNEP-GEF. UNEP-GEF Project on Development of National Biosafety Frameworks. Liberia: national progress report submitted to the third series of subregional Workshops (2003/2004). http://www.unep.ch/biosafety/development/countryreports/LRprogressrep.pdf (accessed 28.10.2007).

143 The National Biosafety Framework for Liberia. Final Draft. November 2004. http://www.unep.ch/biosafety/development/Countryreports/LRNBFrep.pdf (accessed 28.10.2007)

144 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=MDG (accessed 28.10.2007).

145 World Summit on Sustainable Development. Practical Action. **Statement of solidarity with southern African nations over GM food and crops.** http://practicalaction.org/?id=wssd_gm_statement (accessed 28.10.2007).

146 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=MWI (accessed 28.10.2007).

147 Mataya, C. & Gouse, M. October 2006. **Regional approach to biosafety for southern African countries.** Malawi Newsletter. http://www.fanrpan.org/documents/d00157/Malawi_Biotech_Newsletter_Oct2006.pdf (accessed 28.10.2007).

148 The East African (Kenya). 1 June 2003. http://www.nationaudio.com/News/EastAfrica (accessed 15.09.2007).

149 Monsanto. **Monsanto assists 140,000 farmers in Malawi with hybrid seed.** 20 December 2005. http://www.monsanto.co.uk/news/ukshowlib.phtml?uid=9710 (accessed 15.09.2007).

150 http://www.oneworldafrica.org/sasf/newsdetails.php?news_id=00000064 (accessed 15.09.2007).

151 Choike.org. A portal on southern civil societies. **Divisions in West Africa over GM crops.** http://www.choike.org/nuevo_eng/informes/4108.html (accessed 28.10.2007).

152 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=MLI (accessed 28.10.2007).

153 Genetic Resources Action International (GRAIN) press release, 2 February 2004. http://www.grain.org/publications/btcotton-newsrelease-feb-2004-en.cfm (accessed 15.09.2007).

154 Adventist News Network. 4 October 2005. **Malnourished Malians receive food aid from ADRA.** http://news.adventist.org/data/2005/09/1128455414/index.html.en (accessed 28.10.2007).

155 Clapp, J. 2005. **The political economy of food aid in an era of agricultural biotechnology.** Global Governance 11: 467-485.

156 IUCN. **Angola bans GM cereal imports, Mauritius moves on legislation.** http://www.ictsd.org/biores/04-04-02/inbrief.htm (accessed 28.10.2007).

157 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=MUS (accessed 28.10.2007).

158 Appasawmy, S. 2 April 2004. **GMO legislation — the Mauritian paradox.** http://www.genet-info.org (accessed 15.09.2007).

159 http://www.web-merchand.com/msiri/php/main.php?rub=147&langue=ang (accessed 15.09.2007).

160 FANRPAN Policy Brief. September 2006. **Addressing the impact of biosafety systems and regional policies on food security and agriculture in Mauritius.** http://www.fanrpan.org/documents/d00160/Mauritius_Policy_Brief_Sept2006.pdf (accessed 28.10.2007).

161 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=MAR (accessed 28.10.2007).

162 African Centre for Biosafety. **Draft national biosafety framework of Mozambique.** http://www.biosafetyafrica.net/mozambique.htm (accessed 15.09.2007).

163 The East African (Kenya). 1 June 2003. http://www.nationaudio.com/News/EastAfrica (accessed 15.09.2007).

164 CTA. Knowledge for development. Observatory on science and technology for ACP agriculture and rural development. http://knowledge.cta.int/en/content/view/full/269 (accessed 28.10.2007).

165 National Policy Document, Republic of Namibia. October 1999. **Enabling the safe use of biotechnology.** http://www.unam.na/research/NABA/national%20policy.PDF (accessed 28.10.2007).

166 Mokgoabone, K. 24 August 2004. **Botswana: draft framework for GMOs currently in progress.** Business Week. http://www.agbios.com/main.php?action=ShowNewsItem&id=5787 (accessed 28.10.2007).

167 Biotechnology Information Centre (BIC). 15 November 2006. **Namibia: biosafety bill tabled.** The Namibian. http://www.bic.searca.org/news/2006/nov/afr/15.html (accessed 28.10.2007).

168 The Namibian. 15 Sept 2004. http://allafrica.com/stories/200409150043.html (accessed 28.10.2007).

169 WISARD Agricultural R&D Server. http://www.wisard.org/wisard/shared/asp/projectsummary.asp?Kennummer=3795 (accessed 15.09.2007).

170 AllAfrica. **Four African presidents support biotech**, U.S. Official Says. http://allafrica.com/stories/200406220755.html (accessed 15.09.2007).

171 UNEP-GEF Project on Development of National Biosafety Frameworks. **Niger: initial project report as at project starting date.** http://www.unep.ch/biosafety/development/countryreports/NEprojectrep0.pdf (accessed 28.10.2007).

172 This Day (Lagos). 25 August 2004. **How Bio-Tech can drive national economy.** http://www.ipsnews.net/africa/interna.asp?idnews=25199 (accessed 15.09.2007).

173 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=NGA (accessed 28.10.2007).

174 Biosafety Information Network & Advisory Service. http://binas.unido.org/binas/country.php?id=13 (accessed 15.09.2007).

175 Mayet, M. February 2007. **Comments on Nigerian Biosafety Act 2006.** http://www.biosafetyafrica.net/portal/DOCS/Nigerian_Safety_Act_2006_Comments.pdf (accessed 28.10.2007).

176 CropBiotech Net. 24 September 2004. **IITA trains Nigerian policy makers on biotech.**

177 Sunday Times (Nigeria). 4 July 2004. Posted at http://www.gmwatch.org, 6 July 2004. (accessed 15.09.2007).

178 Angola Press. 16 March 2005. **Nigerian consumer body rejects GMOs.** http://www.angolapress-angop.ao/noticia-e.asp?ID=326883 (accessed 28.10.2007).

179 HarvestPlus. **$100m plan to enhance Third World crops.** http://pewagbiotech.org/buzz/display.php3?StoryID=114 (accessed 28.10.2007).

180 The Environmental Rights Action/Friends of the Earth Nigeria (ERA/FoE N) Press Release. 21 August 2006. http://www.foe.co.uk/resource/press_releases/west_african_food_aid_cont_24112006.html (accessed 31.10.2007).

181 **National strategy and action plan for the conservation of biodiversity in Rwanda.** April 2003. http://www.biodiv.org/doc/world/rw/rw-nbsap-01-en.pdf (accessed 28.10.2007).

182 Ngandwe, T. 8 June 2005. **Rwanda says R&D is critical to national development.** SCiDevNet. http://www.scidev.net/News/index.cfm?fuseaction=readnews&itemid=2142&language=1 (accessed 28.10.2007).

183 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=SEN. (accessed 28.10.2007).

184 GRAIN. July 2006. Sprouting up. **Towards the adoption of a national framework for biosafety in Senegal.** http://www.grain.org/seedling_files/seed-06-07-10.pdf (accessed 28.10.2007).

185 UNEP. **The Republic of Seychelles. Final draft national biosafety framework.** http://www.unep.ch/biosafety/development/Countryreports/SCNBFrep.pdf (accessed 28.10.2007).

186 Department of the Environment in the National Commission on Environment and Forestry. 2006. **National biosafety framework for Sierra Leone.** http://216.239.59.104/search?q=cache:XPxiJxLrO_4J:www.unep.ch/biosafety/development/Countryreports/SLNBFrep.pdf+%2B%22sierra+leone%22+%2Bgmo&hl=en&gl=za&ct=clnk&cd=9&lr=lang_en (accessed 15.09.2007).

187 Heong, C. Y. and Ching, L. L. 2006. **American GM rice found in Africa, actions taken across world.** Third World Network. http://www.twnside.org.sg/title2/health.info/twninfohealth057.htm (accessed 28.10.2007).

188 Mayet, M. 2007. **Regulation of GMOs in South Africa: details and shortcomings**. African Centre for Biosafety.

189 Biosafety Information Network & Advisory Service. http://binas.unido.org/binas/country.php?id=18 (accessed 15.09.2007).

190 Biowatch Bulletin. February 2007. www.biowatch.org.za (accessed 28.10.2007).

191 CSIR biotechnology programme. http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE057_RESEARCH?DIVISION_NO=1010012&PROGRAM_NO=3410085 (accessed 15.09.2007).

192 CSIR. http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE038_ARTICLE?ARTICLE_NO=7046886 (accessed 15.09.2007).

193 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=ZAF (accessed 28.10.2007).

194 Agricultural Research Centre. http://www.ejb.org/content/vol1/issue3/abstract/6/index.html (accessed 15.09.2007).

195 South African Government Information. 10 September 2007. **Major international biotechnology research laboratory opens its doors in South Africa.** http://www.info.gov.za/speeches/2007/07091016451001.htm (accessed 28.10.2007).

196 Govender, S. 5 December 2006. **SA to host international genetics lab.** http://www.iol.co.za/index.php?set_id=1&click_id=31&art_id=vn20061205074002145C273409 (accessed 28.10.2007).

197 FAO. http://www.fao.org/biotech/inventory_admin/dep/stat_result.asp?country=ZAF (accessed 28.10.2007).

198 EurekAlert, USA. 8 July 2007. **First all-African produced genetically engineered maize is resistant to maize streak virus.** http://www.eurekalert.org/pub_releases/2007-07/asop-fap070607.php (accessed 28.10.2007).

199 WISARD Agricultural R&D server. http://www.wisard.org/wisard/shared/asp/projectsummary.asp?Kennummer=5183 (accessed 28.10.2007).

200 WISARD Agricultural R&D server. http://www.wisard.org/wisard/shared/asp/projectsummary.asp?Kennummer=13090 (accessed 28.10.2007).

201 WISARD Agricultural R&D Server. http://www.wisard.org/wisard/shared/asp/projectsummary.asp?Kennummer=3795 (accessed 15.09.2007).

202 Pringle, C. 25 May 2007. **DST grant grows plant biotechnology research.** Engineering News, http://www.engineeringnews.co.za/article.php?a_id=108568 (accessed 28.10.2007).

203 International Food Policy Research Institute (IFPRI). March 2004. **To reach the poor — results from the ISNAR-IFPRI "Next Harvest" study on genetically modified crops, public research and policy implications.** Environment and Production Technology division (EPTD) Discussion Paper No 116 (IFPRI, Washington DC): 36. www.ifpri.org/divs/eptd/dp/papers/eptdp116.pdf (accessed 28.10.2007).

204 African Centre for Biosafety. http://www.biosafetyafrica.net (accessed 15.09.2007).

205 Williams, R. January 2007. **Field trials of GMOs: who is doing what in South Africa?** African Centre for Biosafety http://www.biosafetyafrica.net (accessed 15.09.2007).

206 Gosling, M. 18 October 2006. **SA scientists seek go-ahead for field trials of GM grapes.** Cape Times. http://www.capetimes.co.za/index.php?fArticleId=3491870 (accessed 28.10.2007).

207 Chicago Tribune, http://www.chicagotribune.com/news/nationworld/chi-0612080189dec08,1,3690649.story?coll=chi-newsnationworld-hed (accessed 15.09.2007).

208 Letter from M.Vosges, Registrar of the GMO Act to M. Mayet, African Centre for Biosafety, 29 May 2007, quoted in Rose Williams: Interrogating GMO decision-making: critique of GMO permit applications in South Africa 2004-2007.

209 African Centre for Biosafety. **Monsanto's GM Drought Tolerant Maize in South Africa.** http://www.biosafetyafrica.net/portal/images/ACB/acbdroughtstressgmmaize2.pdf (accessed 28.10.2007).

210 ISAAA Global Status of Commercialised Biotech/GM Crops: 2004. http://www.isaaa.org/kc/CBTNews/press_release/briefs32/ESummary/Executive%20Summary%20(English).pdf (accessed 28.10.2007).

211 Yeld, J. 26 January 2007. **South Africa: concern raised over SA's GM crop stats.** Cape Argus. http://allafrica.com/stories/200701260464.html (accessed 15.09.2007).

212 African Centre for Biosafety. January 2007. Briefing document. **Monsanto's "Seeds of Hope Campaign" in South Africa.** www.biosafetyafrica.net

213 Dano, E.C. 2007. **Unmasking the new Green Revolution in Africa: motives, players and dynamics.** EED, TWN and African Centre for Biosafety.

214 Brown, Justin. 16 April 2007. Business Report. (http://www.busrep.co.za/index.php?fSectionId=561&fArticleId=3782554).

215 Mayet M. August 2006. **Is South Africa in the US WTO sights over GM import ban?** Opinion and analysis. African Centre for Biosafety.

216 Mayet, M. 2007. **Regulation of GMOs in South Africa: details and shortcomings**. ACB Biosafety, Biopiracy and Biopolitics Series 2:14.

217 Jordan, B. Sunday Times. **Sick lab rats prompt SA probe into GM maize.** http://lists.eco-farm.org/pipermail/ge_news/2007-August/000003.html (accessed 2 November 2007).

218 Salgado, I. 23 April 2007. **Retailers enter battle for high ground in GM foods.** Business Report. http://www.busrep.co.za/index.php?fSectionId=566&fArticleId=3794980 (accessed 28.10.2007).

219 Letter from M.Vosges, Registrar of the GMO Act to M. Mayet, ACB, 23 March 2007, quoted in Rose Williams: Interrogating GMO decision-making: critique of GMO permit applications in South Africa 2004-2007. (accessed 15.09.2007).

220 Press statement. 24 April 2007. www.biowatch.org.za (accessed 15.09.2007).

221 Advertising Standards Authority of South Africa, South Africa, Ruling 8739. 18 June 2007. http://www.asasa.org.za/ResultDetail.aspx?Ruling=3719 (accessed 28.10.2007).

222 Sudan National Biosafety Framework. http://www.unep.ch/biosafety/development/countryreports/SDNBFrep.pdf (accessed 28.10.2007).

223 Reuters. 26 April 2007. **Sudan to release Darfur-bound aid -WFP.** http://www.alertnet.org/thenews/newsdesk/L26291529.htm (accessed 28.10.2007).

224 African Centre for Biosafety. 2005. **Comments on the draft national policy document: creating an enabling environment for the safe use of biotechnology and its products in Swaziland & National Biosafety Bill.** http://www.biosafetyafrica.net/swaziland.htm (accessed 15.09.2007).

225 Greenpeace. January 2003. **Genetically engineered food aid in southern Africa.** www.greenpeace.org.au/truefood/downloads/ge_foodaidbriefjan03.pdf (accessed 28.10.2007).

226 FoE. **GMO Campaign — FoE Africa.** http://www.eraction.org/index.php?option=com_content&task=view&id=24&Itemid=23 (accessed 28.10.2007).

227 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=TUN (accessed 28.10.2007).

228 Sawahel, W. 5 October 2006. **Tunisia unveils plans to boost scientific development.** SciDevNet. http://www.scidev.net/content/news/eng/tunisia-unveils-plans-to-boost-scientific-development.cfm (accessed 28.10.2007).

229 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=UGA (accessed 28.10.2007).

230 Biosafety Information Network & Advisory Service. May 2004. **Uganda grants a guarded welcome to GM foods.** http://binas.unido.org/binas/lib.php (accessed 15.09.2007).

231 Nature News. 22 Aug 2003. http://www.nature.com/nsu/030818/030818-17.html (accessed 15.09.2007).

232 New Vision (Uganda). 3 Aug 2004. http://allafrica.com/stories/200408030312.html (accessed 15.09.2007).

233 APEP. Uganda Agricultural Productivity Enhancement Program. http://www.apepuganda.org/htm/rhs_biotechnology.htm (accessed 28.10.2007).

234 Wamboga-Mugirya, P. 11 October 2006. **Uganda 'needs biotech law' to save banana sector.** SciDevNet. http://www.scidev.net/News/index.cfm?fuseaction=readNews&itemid=3149&language=1 (accessed 28.10.2007).

235 Wamboga-Mugirya, P. 29 September 2006. **Mixed response to Uganda's biotech progress.** http://www.scidev.net/dossiers/index.cfm? (accessed 28.10.2007).

236 Wamboga-Mugirya, P. 14 December 2006. **Uganda gets GM testing tools.** SciDevNet. http://www.scidev.net/dossiers/index.cfm?fuseaction=dossierreaditem&dossier=6&type=1&itemid=3283&language=1 (accessed 28.10.2007).

237 GM Watch. 16 May 2007. **GM sweet banana on trial in Uganda this month.** http://www.gmwatch.org/archive2.asp?arcid=7879 (accessed 28.10.2007).

238 GM Watch. 21 May 2007. **Uganda: USAID to fund GM cotton trials.** http://www.gmwatch.org/archive2.asp?arcid=7907 (accessed 28.10.2007).

239 GM Watch. 6 June 2007. **Failed Monsanto sweet potato project rides again!** http://www.gmwatch.org/archive2.asp?arcid=7973 (accessed 28.10.2007).

240 The East African (Kenya). 1 June 2003. http://www.nationaudio.com/News/EastAfrica (accessed 15.09.2007).

241 Betterhumans.com. 28 Jan 2003. http://www.betterhumans.com/News/news.aspx?articleID=2003-01-28-5 (accessed 15.09.2007).

242 New Vision (Uganda). 25 Aug 2003. http://allafrica.com/stories/200308250669.html (accessed 15.09.2007).

243 Biosafety Information Network & Advisory Service. May 2004. **Uganda grants a guarded welcome to GM foods.** http://binas.unido.org/binas/lib.php (accessed 15.09.2007).

244 GM Watch. 12 July 2007. **Big concerns over GMOs in South Africa, West Africa and Uganda**. http://www.gmwatch.org/archive2.asp?arcid=8099 (accessed 28.10.2007).

245 Mayet, M. March 2005. **Comments on the national biosafety guidelines for Tanzania, third draft.** African Centre for Biosafety. March 2005. http://www.biosafetyafrica.net/_DOCS/ACB_comments_guidelines-Tanzania.pdf (accessed 15.09.2007).

246 Mgwabati, F. 23 December 2006. **Govt introduces policy on GMOs.** Daily News. http://www.dailynews-tsn.com/page.php?id=5002 (accessed 15.09.2007).

247 Balile, D. 28 February 2005. **GM crop tests get green light in Tanzania.** http://www.scidev.net/content/news/eng/gm-crop-tests-get-green-light-in-tanzania.cfm (accessed 28.10.2007).

248 Daily News. 9 December 2006. **Tanzania to establish biotech centre.** http://www.dailynews-tsn.com/page.php?id=4783 (accessed 28.10.2007).

249 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=ZMB (accessed 28.10.2007).

250 http://www.biosafety.org.zm/ (accessed 15.09.2007).

251 The East African (Kenya). 1 June 2003. http://www.nationaudio.com/News/EastAfrica (accessed 15.09.2007).

252 Zulu, B. 21 April 2005. **As drought takes hold, Zambia's door stays shut to GM.** SciDevNet. http://www.scidev.net/dossiers/index.cfm?fuseaction=dossierReadItem&type=2&itemid=395&language=1&dossier=6 (accessed 28.10.2007).

253 IRIN. ZAMBIA. 13 December 2005. **Govt acts to speed up maize importation.** http://www.irinnews.org/report.asp?ReportID=50651&SelectRegion=Southern_Africa&SelectCountry=ZAMBIA (accessed 15.09.2007).

254 GM Watch. 27 November 2006. **As millions starve, alarmists block famine solutions.** http://www.gmwatch.org/archive2.asp?arcid=7330 (accessed 28.10.2007).

255 Matthews, J. 20 June 2005. **Fake blood on the maize.** http://freezerbox.com/archive/article.asp?id=339 (accessed 28.10.2007).

256 GM Watch. 25 October 2006. **AgBioView — Can you f@#$!*g believe that?** http://www.gmwatch.org/archive2.asp?arcid=7174 (accessed 28.10.2007).

257 Malakata, M. 3 August 2007. **Zambia adamant: no GM**. SciDev.Net http://www.scidev.net/news/index.cfm?fuseaction=readnews&itemid=3793&language=1 (accessed 28.10.2007).

258 Biosafety Board of Zimbabwe. http://www.biosafetyzim.ac.zw/about.htm (accessed 15.09.2007).

259 Mayet, M. **Comments on the National Biotechnology Bill, 2005, of Zimbabwe.** http://www.biosafetyafrica.net/portal/DOCS/Zimbabwean_biotech_bill.pdf (accessed 15.09.2007).

260 Falconi, C. **Measuring agricultural biotechnology research capacity in four developing countries.** AgBioForum 2: 3-4. http://www.agbioforum.org/v2n34/v2n34a06-falconi.htm (accessed 28.10.2007).

261 FAO. http://www.fao.org/biotech/inventory_admin/dep/country_rep.asp?country=ZWE (accessed 28.10.2007).

262 Gala, R. 2005. **GM cotton fiascos around the world.** ISIS. http://www.i-sis.org.uk/GMCFATW.php (accessed 28.10.2007).

263 FAO. http://www.fao.org/biotech/inventory_admin/dep/stat_result.asp?country=ZWE (accessed 28.10.2007).

264 The East African (Kenya). 1 June 2003. http://www.nationaudio.com/News/EastAfrica (accessed 15.09.2007).