

Later this year some Kenyan farmers will be planting a new kind of maize seed – StrigAway – a maize seed that is resistant to the weed Striga. Are farmers simply swapping the stranglehold of the Striga weed for the treadmill of patented seeds and herbicides? GRAIN reports on the introduction of StrigAway in Kenya.

Swapping Striga for patents

Yet another quick fix for Africa's farmers?

GRAIN

A new patented technology, known as Clearfield, is being introduced into Kenya this year with guarantees of a better harvest. Clearfield crops are owned by the German transnational chemical and biotechnology corporation BASF and are resistant to BASF's Imazapyr herbicide. They are thus similar to Monsanto's notorious glyphosate (Roundup) resistant crops, except that Clearfield crops are not considered to be genetically modified (GM). The resistance to Imazapyr is conferred through mutagenesis rather than genetic engineering (see page 6). Just like Monsanto, BASF forces farmers growing its seeds to sign strict contracts that forbid them to save seeds, that detail the production methods that they have to follow, and that restrict them to spraying only BASF proprietary herbicides.

Now BASF has joined forces with two high-profile non-profit organisations, CIMMYT and AATF (see page 6), to bring its technology to maize farmers in East Africa. The promise is that Clearfield maize seeds will rescue African farmers from the parasitic tentacles of the Striga plant, a weed that destroys huge tracts of Africa's maize production. If things move according to plan, the seeds, which are called StrigAway or Ua Kayongo (Swahili for "Striga killer"), will be commercialised in Kenya before the end of 2006.¹

This consortium is careful to highlight that StrigAway seeds are not genetically engineered (GE) and that this private-public partnership is a win-win situation for everyone, especially African farmers. But StrigAway seeds raise many of the

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1 - Africancrops.net, "A Web-site on Improvement of African Crops and Seed Systems", Partnerships to control Striga, www.africancrops.net/striga, October 2006



Kenya, Maize, Striga, Striga

The problem of Striga in Africa

Ninety-five per cent of maize in Africa is grown by small-scale farmers on plots smaller than 10 hectares. Maize is a major staple food in Kenya, where annual per capita consumption is around 100 kilogrammes. Farmers are faced with numerous pests; Striga is one of the most serious, infesting an estimated 20–40 million hectares of farmland throughout sub-Saharan Africa. The witchweeds (*Striga hermonthica* and *S. asiatica*) are parasitic weeds that attack the plant before it emerges from the soil. Thousands of small seeds are hidden in the soil, and as soon as a maize or sorghum seed germinates, it activates the Striga seeds, which then attaches to the roots of the plant and extracts water and nutrients, destroying the harvest. It is notoriously difficult to control, and becomes more difficult when farmers stop rotating crops or practise monocropping. Methods to control Striga have been researched for many decades and focused on developing resistant plants, herbicide applications, and management practices. These include crop rotation, intercropping, weeding (preventing seeds from forming), and host plant resistance. CIMMYT has developed nine Striga-tolerant varieties of maize for Kenya, one of which is also tolerant to drought. More recently the “push-pull” system based on a habitat management system, which includes the intercropping of *Desmodium* species, was able to suppress Striga, increase maize yield and provide extra fodder for cattle.

Mutagenesis versus genetic engineering

The Clearfield Production System is similar to Roundup Ready crops or other herbicide-tolerant and resistant crops in that it matches herbicide-resistant varieties with custom designed herbicides. In Roundup Ready crops, the herbicide-resistant gene is spliced into the gene construct with recombinant DNA technology, creating a transgenic plant. Clearfield technology in maize was developed through a process of mutagenesis – exposing the plant to chemicals that mutate its genetic code.

Mutagenesis produces plants with all kinds of morphological changes and a multitude of genetic changes, but because this technology does not rely on gene splicing it escapes regulations and international conventions. A prominent plant pathologist at Washington State University is quoted as saying that he “chuckles under his breath to hear that mutagenesis is considered safe and genetic engineering is not”. He adds that one has to be careful with Clearfield, as the herbicide-resistant gene can easily mutate, with weed resistance following on.

The faces behind the Striga killer

BASF: a German transnational corporation with sales of over US\$50 billion in 2005, which sees itself as the world’s leading chemical company, has announced its intention to become one of the major players in plant biotechnology. The company plans to invest US\$675 million over the next 10 years in plant biotech research. BASF will launch several Clearfield systems, and expects them to yield annual sales of approximately US\$300 million.

CIMMYT: The International Wheat and Maize Improvement Centre is one of 16 international agricultural research centres supported by the Consultative Group on International Agricultural Research (CGIAR). Originally focused on developing freely distributed, open pollinated varieties, it has now moved towards GE and partnerships with the private sector.

AATF: The African Agricultural Technology Foundation was formed in Kenya to promote GE and negotiate access for biotechnology companies. Organisations like AATF and the International Service for the Acquisition of Agri-biotech Applications (ISAAA) play a critical role in brokering public-private deals all over Africa and, in the name of “technology transfer”, they create entry points for the global seed industry to new markets. The AATF is playing a critical role in introducing Clearfield technology in Africa, masquerading as an organisation that acts in the interests of farmers by giving farmers access to such new technologies. However, the AATF is just another GE industry front organisation, like Europabio, Africabio or ISAAA, that



gAway and Imidazolinone

acts as an intermediary between multinational corporations and public opinion. The role of the AATF in this deal has been to assist in the development of the intellectual property-sharing agreements, the registration of the technology in Kenya, the launching of the product, the expansion of the product marketing, and the liaising with NGOs and farmer organisations to ensure implementation of BASF's intellectual property rights and the correct handling of the seed.

The StrigAway maize is being distributed through an impressive marketing system, which co-opts public institutions, NGOs and farmer associations. First, a large-scale demonstration programme was launched in 2005 and 2006, with Ua Kayongo field days, and the distribution of 7,000 packets of seeds for free. Three seed companies, Kenya Seed Co., Western Seed Co. and Lagrotech Co., will commercialise the technology and are being trained in the application of the herbicide and the selling of the seed. AATF works through a network of 12 NGOs and 4 farmer associations to market the technology on behalf of BASF and to train and monitor farmers. Currently (September 2006) the seed is being bulked and has to undergo certification by the Kenya Plant Health Inspectorate (KEPHIS), after which the aim is to release it to farmers in November, ready for the next planting season.

Issues with Imidazolinone-resistant technology

In Africa, Clearfield technology is marketed as the StrigAway Production System, which consists of a herbicide-tolerant maize seed and herbicides. The maize seed is coated with the herbicide Imazapyr, which provides protection against Striga, a major problem for maize farmers in Africa.

The development of herbicide-resistant plants has led to a huge increase in the use of herbicides, as it makes it possible for farmers to spray more often and to neglect other weed-management practices. The increased risk of this practice to health and the environment is often neglected. Imazapyr is a poison, and its widespread use will have health and environmental impacts that cannot be ignored.

Of great concern with Imazapyr use are the environmental risks, which include the impact of herbicide drift on non-target species, because Imazapyr kills almost all plants it comes into contact with. Imazapyr is mobile in soil, and is able to contaminate water and groundwater. In an International Survey on Herbicide Resistant Weeds, 79 common weed species worldwide have developed resistance to the group of herbicides that Imazapyr belongs to.

Imazapyr is a persistent herbicide, and in field studies its persistence in soil varied between 60 and 436 days. The residue in soil could have an impact on intercropping, which is commonly practised by farmers. In Kenya it is recommended that farmers carry out rotation cropping with legumes. In the US, farmers are required by contract to intercrop with soya or leave the land fallow. But if farmers want to plant a food crop rather than a cash crop like soya, they cannot do so, as their seeds are unlikely to survive or they may experience yield drag. A study in Brazil showed that maize is one of the most sensitive crops to soil persistence of Imazapyr, the effect of which is yield drag.

References

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(NOTE: more references for this page are available online at www.grain.org/seedling/)



same issues as GM crops and, while the benefits for BASF are clear, the project presents a number of significant risks for farmers that could easily trump any potential benefits.

Is BASF helping farmers or opening new seed and herbicide markets?

The problems with StrigAway begin with the claims over intellectual property (IP). BASF owns patents over the Clearfield technology that it guards ruthlessly in all the countries where Clearfield crops are commercialised. BASF is one of the world's largest agricultural biotechnology corporations and it hopes that its Clearfield crops will secure its competitiveness in the lucrative market for herbicide-tolerant crop systems.² The company's strategy is to form licensing agreements with breeding centres and seed companies, and it expects royalties from its Clearfield technology shortly to bring in US\$300 million a year.³

Farmers who purchase Clearfield seeds have to sign a contract called a "stewardship agreement", which BASF enforces aggressively.⁴ In the US state of Arkansas, the company, responding to tips from other farmers, sued 25 farmers for the US\$2.5 million by which, it said, they economised in 2005 by planting saved seeds. Early in 2006, BASF successfully sued a father and son for US\$400,000 for sharing seeds with one another without its authorisation.⁵ There is a toll-free phone number that BASF urges US farmers to call to report on other farmers breaking or sidestepping the BASF contract.⁶

BASF insists that its contracts are mainly there to ensure that farmers use the technology correctly. They claim that, if farmers save their own seeds, they increase the risk of weeds developing resistance to Imazapyr, thus destroying the advantages of the technology. Of course, the contracts are also a convenient way for BASF to increase seed sales.

When it comes to StrigAway, BASF claims that it is donating the technology and will not be collecting royalties. But the complete story is not so cut and dried. A web of contracts is involved in this project and the different players have been sending mixed messages. CIMMYT claims to have no involvement in contracts with farmers, saying that it is AATF's role to develop and implement such contracts.⁷ AATF is vague about contracts and says that it will focus on working with NGOs and seed companies in training and monitoring farmers to ensure that they use the technology correctly.^{8,9} BASF has an IP agreement with



Striga hermonthica (shown above) and *Striga asiatica* are parasitic weeds that attach themselves to a crop such as maize, millet, sorghum or cowpea. *Striga* species grow naturally in grasslands where they live with their host plants with little damage. But with the intensification of agriculture and the loss of crop rotations and intercropping, *Striga* plants are able to produce abundant flowers and seeds and each subsequent crop plant can be parasitised by several *Striga* plants.

CIMMYT, and it has signed herbicide supply agreements and trait technology sub-licences with the local seed companies. Local seed companies will be responsible for "stewardship", and it seems that they will have leeway to set their own seed prices. AATF says that the price of StrigAway seed will not exceed the price of other maize hybrids, but other reports say that the seed is likely to cost US\$4/ha extra.

Meanwhile, it has also been reported that CIMMYT is pursuing plant breeder's rights over the StrigAway varieties in Kenya, which would impose harsh legal restrictions on what farmers can do with the seed.¹⁰ Complicating all of this is both the common practice among Kenyan farmers of crossing and selecting among their maize crops and the fact that the Clearfield trait is genetically dominant, making it highly likely that the trait will transfer to other varieties of maize, including the traditional farmers'

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4 - S Cox, "Aimin' at the public's stomach", *Crop Choice*, 23 April 2003, tinyurl.com/y7u6d7

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6 - Horizon Ag, "Protect Your Investment", *New Horizons*, Vol 1, No 1, Page 4, August 2006, tinyurl.com/ynhc83 (PDF)

7 - Personal communication, Fred Kanampiu, CIMMYT, September 2006

8 - See also: World Bank, Intellectual Property Rights. Designing Regimes to Support Plant Breeding in Developing Countries, Report No. 35517-GLB, 2006, tinyurl.com/yd9wva (PDF)

9 - Personal communication, Gospel Omanyia, AATF, September 2006

10 - GRAIN, "Africa's seed laws: red carpet for the corporations", *Seedling*, July 2005, p.28-35, grain.org/seedling/?id=342. Kenya passed a revised Industrial Property Act in mid-2001, placing very little restriction on the patenting of life forms, including even human genetic material.

varieties.¹¹ So, while the consortium is clear that farmers will not be permitted to save seeds under the StrigAway system and that the various IP claims will be respected, no one is taking responsibility for ensuring that farmers fully understand the tangle of IP that is involved.

Complex technology

The Clearfield system was designed for industrial monoculture farms, not Kenya's traditional mixed farming systems. The requirement that farmers purchase seeds every year is at odds with the deeply rooted cultures of seed-saving and exchange in Kenya. Over 50 per cent of the area planted with maize is still planted with farmers' own varieties, and farmers regularly multiply and integrate purchased varieties, including hybrids, in their own seed systems.¹² BASF has decided to withdraw its Clearfield technology from Eastern Europe because it says that farmers there were not "technified" enough.¹³

The use of a herbicide seed coating is also completely alien to Kenya's small farms. Farmers will be vulnerable to a number of risks. If they plant the StrigAway maize too close to other crops they will harm them. The StrigAway system can also leave herbicide residues in the soil that can harm crops in subsequent seasons. To avoid this problem, farmers are supposed to rotate their crops, but economic considerations often make this impossible. Moreover, the herbicide resistance of the Clearfield crops is not guaranteed. There have been a number of cases in the US where Clearfield crops seem to have lost their resistance and to have been damaged by herbicides.¹⁴ CIMMYT admits that this is just a stopgap technology and that Striga can develop resistance to Imazapyr, and say that to control Striga, farmers must integrate this technology with other methods. The long-term solution, they say, is to develop genetic materials with Striga resistance. So, even though CIMMYT is currently making a virtue out of the fact that Clearfield crops are not genetically modified, it is suggesting, indirectly, that the future lies with GM. CIMMYT is already testing Syngenta's Bt maize in Kenya.


CIMMYT says that while it is not practical to have stewardship agreements with farmers, it would be practical to educate each and every farmer in the use of the technology. During a meeting to launch StrigAway in July 2005, Kenyan farmers expressed interest in accessing the herbicide as a treatment for their own traditional seeds, so that they could avoid the high costs of purchasing new seed. Clearly they did not understand that if they applied the

StrigAway seed coating to their own seeds it would immediately kill the seeds, producing a disastrous loss of their own varieties. Indeed, it is very easy for a farmer to make a mistake with the StrigAway technology and accidentally kill off her or his own seeds. Farmers can destroy their own seeds simply by not washing their hands properly after coming into contact with StrigAway seeds. In short, with the StrigAway system, there is always the risk that the herbicide will contaminate and destroy the farmers' other seeds, as has already happened during preliminary field trials.¹⁵

In Conclusion

Clearfield technology clearly presents almost all of the risks of GE crops, but has escaped scrutiny because it is developed by mutagenesis and not transgenesis. So BASF enjoys the same protection of its intellectual property rights without any of the public scrutiny.

Clearfield, or StrigAway, is another misguided attempt to introduce an excessively complex and risky technological solution into African farming systems. It is also too expensive to be widely affordable and it ties farmers into a disempowered relationship with seed companies and multinationals. CIMMYT has collected germplasm from farmers' varieties over the years, and it is these public seed-breeding resources that are being sold off to a multinational company so that it can market them all over Africa and stand to make a big profit from the substantial seed market. Ultimately the farmers will be left at the mercy of local seed companies, and it is these local seed companies that the project is supporting with the larger goal of breaking the Kenya Seed Company monopoly and giving multinationals like BASF a foot in the market. This is of course completely in line with the goals of Rockefeller and the new Gates Foundation Initiative (see page 22), which are using organisations like AATF and ISAAA to implement their strategy.

There is no doubt that Striga is a very serious problem for farmers, but, with the same amount of resources and education that are being put into promoting Clearfield, they could make substantial headway in controlling this pest with more sustainable and readily available methods of weed control. Are these farmers merely exchanging the stranglehold of the parasitic weed for the stranglehold of patented seed and the chemical treadmill? And how is this different from a GE crop? 

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