



CIMMYT_{MR}

IRMA Updates

Insect Resistant Maize for Africa

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The IRMA project was launched in 1999 with the primary goal of increasing maize production and food security for African farmers through the development and deployment of improved maize varieties that provide high resistance to insects, particularly stem borers. To achieve this goal, KARI and CIMMYT scientists will identify conventional and novel sources of stem borer resistance and incorporate them into maize varieties that are well suited to Kenyan growing conditions and to farmer and consumer preferences. Major funding for the project is provided by the Syngenta Foundation for Sustainable Agriculture.

IRMA Annual Meeting for 2001: Progress Continues on All Fronts

The Insect Resistant Maize for Africa (IRMA) project took stock of its accomplishments and occasional setbacks at its annual meeting, held 21-22 of November in Nairobi. Researchers and staff from KARI, CIMMYT-Kenya and CIMMYT-Mexico, as well as representatives of the Syngenta Foundation for Sustainable Agriculture and various Kenyan governmental organizations participated in the meeting, which was followed on 23 November by the Steering Committee's session.

Project subgroups reported to the larger gathering on their progress and developed workplans for 2001. The subgroups addressed product development/genetic engineering, product development/insect resistant germplasm, product dissemination, impact assessment (socio-economics), and documentation and communication. Activities related to technology transfer were covered by all the subgroups.

"I saw the team mentality starting to build. This is a trend that has picked up even more momentum as we saw the subgroups interact with one another and look for ways they could help each other out."

After listening to the presentations by the subgroups, David Hoisington, Director of CIMMYT's Applied Biotechnology Center and IRMA Project Director commented on the progress made thus far. "The project seems to be moving ahead on all fronts," Hoisington remarked. "There were a few areas where I had hoped things would move ahead more quickly, the most prominent being the testing of Bt maize



KARI and CIMMYT scientists, together with representatives of the Syngenta Foundation for Sustainable Agriculture, gathered in Nairobi in late November to give presentations on their progress and produce workplans for the coming year.

under tightly controlled field trials. But we have to remember that we are treading on new ground here, learning as we go, so some delays are inevitable. Still, this does not overshadow the very significant results we've achieved to date."

Hoisington was particularly pleased with the way the various groups have coalesced—both between KARI and CIMMYT and across disciplines—into an effective team. "At last year's annual meeting," he reflected, "I saw the team mentality starting to build. This is a trend that has picked up even more momentum as we saw the subgroups interact with one another and look for ways they could help each other out. Seeing this team spirit develop is extremely gratifying."

Stephen Mugo, IRMA Project Coordinator, was also pleased. "We're seeing the parts of the puzzle come together quite nicely," he said. "The work in socio-economics and product dissemination (environmental impacts and insect resistance management) is right on schedule and providing the input we need to produce a product the farmers want and will

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(IRMA Annual Meeting cont'd...)

use. We are hitting most, though not all, of our milestones and we really seem to be on track."

Significant activities and accomplishments for 2001 include the following:

Top priorities for **product development/genetic engineering** in 2001 were:

- (1) produce full molecular characterization of all Bt gene events;
- (2) continue to develop second-generation Bt events;
- (3) backcross first generation events to BC4 level;
- (4) produce combinations of available first generation Bt genes;
- (5) leaf bioassays of Bt genes;
- (6) apply for and conduct field trials in Kenya of individual and combined Bt genes.

Considerable time and effort went into the molecular characterization of the first generation Bt events. To minimize potential adverse effects, IRMA will develop "clean" Bt maize events, which carry only the gene of interest. Final products will not carry selectable markers such as the selectable Basta herbicide resistance (the *bar* gene) marker or antibiotic markers. The Bt and *bar* genes are kept separate (co-transformed), rather than linked in a single construct, to more readily enable the removal of the marker gene in the final product. Six events were isolated (58, 93, 127, 216, 223, and 224) that showed negative for the *bar* and positive for *cry* genes. Although this requires much additional lab work, this approach clearly demonstrates IRMA's responsible approach to the development of safe and effective Bt maize varieties for Kenya's farmers. Development of second-generation events continued during 2001 and is ongoing in 2002.

Following approval by Kenyan authorities, leaves from Bt maize were brought into the country in February 2001, and leaf bioassays at the National Agricultural Research Laboratory (NARL) were conducted shortly thereafter. Several *cry* genes proved effective against Kenyan stem borers: control was found for *Chilo partellus*,

Chilo orichalcociliellus, *Eldana saccharina*, and *Sesamia calamistis*, however, control of *Busseola fusca* was incomplete (60%).

An application to introduce Bt maize seeds was prepared and submitted to the KARI Institutional Biosafety Committee (IBC) in September 2001. The purpose of the proposal was to verify, under field conditions, the results recently obtained from the bioassays performed in the KARI Biotechnology Laboratory. As of the end of the year, the application was still under consideration, with the strong likelihood that the final recommendation would call for tests under both biosafety greenhouse and open quarantine conditions.

As part of IRMA's holistic approach to the development of insect resistant maize, CIMMYT commissioned a study to determine whether there are any potential intellectual property (IP) rights obstacles to possible future releases of Bt maize in Kenya. The "freedom to operate" study was conducted by the Strategic World Initiative for Technology Transfer (SWIFTT), a division of the College of Agriculture and Life Sciences at Cornell University. At this time, it appears that any future release of Bt maize in Kenya will be subject to considerably fewer IP restrictions than would be found in many other countries and that IP rights of third parties appear to be quite manageable.

The major activities in terms of **product development/insect resistant germplasm** was the methodical search for sources of resistance and the development of source germplasm. In addition, researchers looked for stem borer resistance in elite germplasm.

In the search for and development of sources of insect resistance, IRMA scientists evaluated 216 genotypes from CIMMYT and KARI, 42 multiple borer resistant (MBR) S4 lines from CIMMYT-Mexico, and 500 MBR/MDR inbred lines from Mexico. These were evaluated during the 2001A season for adaptation, resistance to *Chilo partellus* and *Busseola fusca*, and leaf toughness. Crosses were also made to two testers

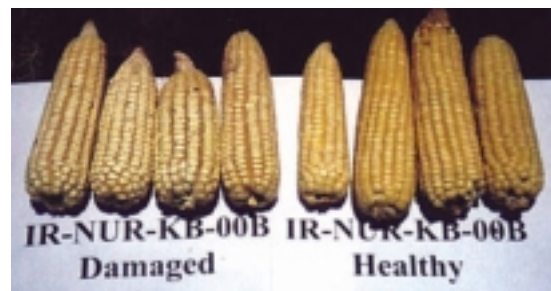


Screening maize OPV under artificial infestation with *Chilo partellus* at Kiboko, Kenya during 2001B season

(CML 78 and CML 444). These were also evaluated at Kakamega for low-nitrogen (low-N) tolerance, at Muguga for turicum blight resistance, and at Embu and Kiboko for insect resistance. They will be screened for resistance to maize streak virus (MSV) at Embu. Good lines will be used to form synthetics and hybrids for use as sources of resistance.

IRMA also conducted research aimed at adding value to its selections, specifically by screening germplasm for weevil resistance in kernels. Quality protein maize (QPM) and elite source germplasm were screening for weevil resistance at Kiboko, Kakamega, and Mtwapa.

As part of its work on product dissemination/insect resistance management, studies were initiated by IRMA scientists aimed at developing insect resistant management (IRM) strategies for Kenyan ecosystems, based on existing cropping systems. To be accepted by farmers, IRM strategies must conform to existing cropping systems, and the refugia crops (which sustain insect populations that are



Ears damaged by *Sitophilus zeamais* storage weevil at Mtwapa Kenya.

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vulnerable to Bt maize) must be economically viable and socially acceptable to those making the management decisions at the farm level. After evaluating 30 different alternate hosts for stem borers, preliminary results show Columbus and Sudan grasses to be the most effective refugia for *C. partellus* and *B. fusca*. Sorghum was the best host for *C. partellus* and *B. fusca*. Napier grasses attracted oviposition, but were not good hosts for larval development.



Evaluation of crop and fodder species for suitability as refugia in development of IRM strategy for lowland humid tropics at Mtwapa, Kenya.

The IRMA project is committed to determining what—if any—effects transgenic maize will have on the Kenyan ecosystems. These activities, classified as **product dissemination/ environmental impact**, have focused on establishing the diversity and relative abundance of target and nontarget organisms that could potentially be affected by the introduction of Bt maize into Kenya's major maize cropping systems. Using pit-fall traps to trap soil crawling arthropods, water traps and sticky traps for flying arthropods, and destructive sampling to recover organisms on and in the plant, the diversity of organisms associated with maize cropping systems were recovered, characterized, and catalogued. This will serve as a technical reference during the monitoring phase of the IRMA project and also provide important baseline data for other research activities.

One study conducted as part of this research thrust compared the impacts of Bt-biopesticide and conventional

insecticides on both stem borers and nontarget arthropods in a maize/bean cropping system. It revealed that Bt-spray was more effective in controlling stem borers, while preserving a greater number of parasitoids compared to synthetic insecticide treated plots.

IRMA's **impact assessment** group of social scientists focused on assessing various aspects of insect losses, suitability and demand of the new insect management technologies, farmers' perceptions of crop losses and control options, and assuring that the technology fits within Kenya's institutional framework. Through continuous dialogue with different stakeholders such as environmental groups, local research institutes, seed companies, and above all the farmers, IRMA has gained a clearer understanding of social, environmental and economic impacts of insect resistant maize in Kenya.

Participatory rural appraisals (PRAs) were organized in the five maize growing ecological zones of Kenya. Group interviews and discussions with more than 900 farmers were conducted. Over all zones, most farmers plant local varieties in the low-potential areas while improved varieties dominate the high-potential areas. The most important selection criteria are early maturity and yield, followed by drought tolerance, then tolerance to field and storage pests. The major constraints to maize production were lacks of cash, technical know-how, or quality seed. The major pest problems, according to farmers, were stem borers and weevils. Farmers showed a keen interest in new insect resistant varieties if they fit their selection criteria, even if they were moderately more expensive. However, since seed supply and quality are problems, the quality of seed needs to be guaranteed.

Results of the maize sector study show that most restrictions on maize marketing have been lifted, and that markets for fertilizer and pesticides are fairly free. Poor infrastructure, market information, and access to rural credit markets remain problematic.

Average crop loss over the years at the national level due to stem borers is 15%, with a value of US\$ 91 million, according to a calculation based on farmers' estimates. As a check, IRMA conducted crop loss assessment trials in farmers' fields. The measured yield difference between plots provided an estimate of the loss due to stem borers of 14% in 2000, with a value of US\$ 60 million at the market price that year. These trials were repeated in 2001, and preliminary results showed losses between 6.5% in the highlands and 10.5% at the coast. Crop loss assessment will be a continuous exercise in the IRMA project.

IRMA deals with the development of new technology, consequently, **technology transfer and capacity building** are critical to success and sustainability. KARI scientists underwent training in Mexico and on-site in Kenya, with special attention given to insect bioassays, biosafety greenhouse operations, and basic molecular analyses of transgenic plants. Upgrading of infrastructure was also addressed. Plans and blueprints were made for laboratories at the KARI Biotechnology Center, including a biosafety level 2 laboratory. Computers, software, and communication equipment were purchased, as were vehicles, laboratory equipment, and critical supplies to support the insectaries and entomology laboratories at two KARI centers.

The capacity for mass rearing various stem borer species for resistance screening studies, insect bioassays, and for resistance management studies was improved. During 2001, production increased, and rearing of *B. fusca* improved dramatically. Record-keeping has also improved, promoting greater synchrony of demand and supply.

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High priority has been given to **project documentation and communication**, as part of a broad effort to encourage dialogue and raise awareness in various audiences about Bt and insect resistant maize, and biotechnology in general.

Emphasis during 2001 was given to improving communication with the media and this paid off in significant and generally positive coverage of the project in both print and broadcast media. Highlights included a press conference on the Bt bioassay, Stephen Mugo appearing on the front page of the Horizon section of *The Nation* in a glowing report on the project, and TV interviews with Klaus Leisinger, David Hoisington, and David Bergvinson, among others.

A more structural approach to communication was also taken during 2001. A Stakeholders Meeting was conducted on November 26, 2001. More than 120 people, from farmers to extension workers to high government officials, attended and participated. IRMA also was a major player in a workshop held in November to improve scientists' ability to work with the press. Scientists, regulators, and journalists from Kenya, Ethiopia, Uganda, and Ghana, as well as representatives from international institutions dedicated to science and agriculture, participated in the workshop, which featured considerable hands-on activities and interactive sessions. Finally, a one-day workshop with 33 participants was organized by IRMA to bring together parties in Kenya who are interested in improving communication on biotechnology.

IRMA activities planned for 2002 may be seen in the accompanying box.

—Dr. Stephen Mugo, IRMA Project Coordinator

Major IRMA Activities Planned for 2002

Product development/ Genetic engineering

Based on the feedback from the KARI Institutional Biosafety Committee (IBC) and KEPHIS, we plan to submit a request to import additional maize leaves containing combinations of the Bt genes for testing in leaf bioassays at the NARL laboratory. This experiment will be similar to the bioassays performed previously and will provide important information regarding possible complementarities of the different Bt genes, especially for better control of *Busseola fusca*. This importation, we understand, can be performed under the existing biosafety permit following approval by KEPHIS.

We will also continue to work with the KARI IBC and the Kenya National Biosafety Committee regarding the current application to import, grow and test second-generation Bt events. As part of this, an appropriate biosafety greenhouse facility will be constructed at NARL, Kabete for the initial growth and evaluation of all imported seed. We will also complete the open quarantine field site located at Kiboko for use in field evaluations following the greenhouse tests.

The identified *cry1B* second-generation events will be fully characterized at the molecular and protein levels to provide the necessary information regarding gene integration, stability and expression. Additional second-generation events will be produced for other high-priority genes such as the fusion gene *cry1B-1Ab*. One component of the IRM strategy is to stack various complementary Bt genes into a single maize variety. Towards this, we are seeking additional Bt genes from the public sector (*cry1C*, *cry2A* and *cry1F*) and will discuss with the private sector options to obtain for testing their commercialized events for *cry1Ab* (Mon810) and *cry1F* (Herculex). These latter two materials could be critical in developing necessary gene combinations to target *Busseola* and could allow the IRMA project potential access to food safety data necessary for future consideration by Kenyan authorities.

Product development/ Insect resistant germplasm

Emphasis will be given to identifying insect resistant (IR) germplasm through screening putative source germplasm from CIMMYT-Mexico, Zimbabwe, and Kenya, such as (1) screens of multiple borer resistant (MBR) lines, (2) screens of single-cross hybrids of MBR lines, (3) screens of QPM lines and hybrids, (4) screens of inbred lines, hybrids, and varieties from CIMMYT and other sources (including combining ability studies), and (5) screens of other germplasm with special traits, e.g., herbicide resistance, MSV, low-N, QPM. Varieties and source populations will be formed from insect resistant inbred lines, such as synthetics from MBR lines. Advancement of segregating lines and development of populations will also be undertaken. In the process of identifying target germplasm to backcross to Bt maize, we will screen germplasm under different biotic and abiotic stresses (MSV, stem borers, turicum blight and leaf rust, and low-N and drought).

Product dissemination/ Insect resistance management

Research aimed at developing IRM strategies will continue in Kitale, Kakamega, Embu, and Mtwapa. These field studies focus on identifying alternate hosts for refugia and will include development of a protocol for characterizing alternate hosts. A survey of alternate hosts (distribution and abundance) in five major maize ecologies will be carried out as well as an assessment of current cropping systems as refugia. Methodologies will be developed for bioassays of alternate hosts, and studies will follow.

Finally, a gene-flow study will be conducted to (1) determine the rate and distance of gene flow by using yellow maize in white maize trials, (2) determine the criteria farmers use in selection for seed recycling, and (3) estimate the rate of introgression at the farm level based on the cited parameters.

Product dissemination/ Environmental impact

The diversity and relative abundance of target and nontarget organisms will be assessed in Embu, the only ecology that remains to be studied for these factors. Organisms from traps and from maize plants will be sorted and identified. The captured insect collection (in digital format to generate nontarget database for Kenya) will be expanded. Other activities will focus on the effects of insecticides vs. Bt spray on target and nontarget arthropods in maize/bean cropping systems, and determining the potential of different stem borers to develop resistance to Bt. We will also determine the effects of Bt toxins on important target organisms and develop a reference collection for Kenya.

Impact assessment/ Socio-economics

The impact assessment team will conduct a baseline survey to build a database for impact assessment. A questionnaire has already been developed and pre-tested in the Embu region, which will be a pilot site for the survey. By late 2002 baseline data will be collected, analyzed, and reported. Crop loss assessments, PRA follow-ups, and stocklist analysis will continue.

Technology transfer

Training will continue in Kenya and CIMMYT-Mexico. A biosafety level 2 greenhouse and a field facility will be completed, and training related to the operation of the greenhouse will be carried out. Applications will be submitted for the Bt related activities, and an IPR workshop is planned.

Project documentation and communication

A group we wish to address in this area is extension agents, who are increasingly queried on IR technology. Workshops are planned to familiarize them with the technology and identify effective communicators and support materials. A new IRMA brochure and a series of factsheets are planned. Efforts to improve researchers' rapport with the press in Kenya and throughout East Africa will continue.

IRMA Team Pitches In for Communication Workshop

IRMA team members found themselves on both the teacher and student side of the learning equation during a late November workshop aimed at enhancing the skills of scientists in dealing with the media.

"Many scientists tend to be wary of the press, seeing journalists as antagonists. So they shy away from dealing with them," says David Poland, CIMMYT science writer/editor, and a member of the IRMA team. "This attitude, in turn, engenders a skeptical attitude on the part of journalists, which can be interpreted as being aggressive. This workshop is part of an effort to break this cycle. It is critical that scientists, particularly those working in a controversial area such as biotechnology, communicate with the public, and the best way to do this is with the mass media. So we've tried to provide the scientists at the workshop with some tools and the confidence to work effectively with the press."

Ethiopia, and Ghana. The workshop, held at the International Center for Agroforestry (ICRAF) in Nairobi, was organized by Dr. John Wafula and Beatrice Anyango of the African Biotechnology Stakeholders Forum (ABSF) and David Poland and Stephen Mugo of CIMMYT, with outstanding support from Dorothy Kimoro of ABSF and Ebby Irungu and Linda Alondo of CIMMYT-Kenya. Funding was provided by United States Department of Agriculture.

The workshop included a wide variety of lectures and exercises. Journalists attended sessions conducted by David Hoisington, Director of CIMMYT's Applied Biotechnology Center, on the "Basics of Biotechnology," with Jurg Bürgi, a freelance writer, on science writing, and with Otula Owuor, a well respected Kenyan print journalist, on developing constructive suggestions for scientists on how they could work more effectively with the press.



Scientists, journalists, and administrators from Ethiopia, Uganda, Ghana, Kenya, and several international organizations came to Nairobi to participate in the workshop on "Enhancing Scientists Communication with the Media."

The workshop, entitled "Communication on Biotechnology: A training workshop on Enhancing Scientists' Communication with the Mass Media," brought together 38 scientists and journalists from Kenya, Uganda,

Scientists meanwhile attended sessions conducted by Klaus Leisinger, of the Syngenta Foundation for Sustainable Agriculture, on how to prepare for an interview or press conference, and by David Poland on how to write a press release and Letter to the Editor.

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A number of joint sessions were held, including Basic Communication Principles and Skills by psychologist Helgo Schomer, Understanding Consumers and the Language of Food Biotech, by Katie Thrasher of International Food Information Council Foundation, and on "Essential Points on Working with Television," by Mbuwugu Gikunda, KTN-TV. There were also breakout groups where the scientists got some "hands-on training" with the journalists when they were interviewed on the basis of the press releases they had prepared on their actual work.

"Initially we were very apprehensive as scientists to interact with the media people," says Christopher Ngichabe, a KARI scientist working on the IRMA project. "We are used to holding journalists in distrust, we thought that they were a threat of a sort, out to go around corners to get information, and more or less try to put you on the spot. But after that meeting we felt like we could work together, possibly towards a common goal.

"Clearly we learned that if scientists and journalists are open to each other, it is good for both parties," Ngichabe emphasized. "By working together we can deliver some information to the

public in an accurate and effective way. In this new era where biotechnology is really an issue, this kind of interaction is even more important. At each stage, from development in the laboratory to trials on the farm, it is critical to keep the public informed. So we have to work in partnership with the media and I think that this was a really great start."

Indeed it was a great start as several articles about the workshop and biotechnology generally appeared in several East African newspaper and some of the resource persons were interviewed for pieces that appeared later on Kenya television.

—David Poland, CIMMYT Writer/Editor

Directly Estimating Maize Crop Losses Due to Stem Borers in Kenya

To assess the potential demand for insect resistant varieties, an estimation of crop losses due to stem borers is necessary. But until IRMA initiated work in this area, no systematic study of stem borer damage had been undertaken in East Africa. Combining such research together with an estimation of adoption of new varieties will allow us to assess the potential benefits of this new technology, to which the cost of the development can then be compared.

In the past, yield losses in Kenya due to stem borers were estimated, based on artificial infestation, to be between 34% and 43%. The extrapolation of artificial infestation trials, however, can be misleading, so it is important to estimate crop losses under farmers' conditions, in farmers' fields. To date, the only national crop loss assessment from natural infestation in Africa was done in Cameroon, West Africa.

Crop losses were measured by the IRMA project in a representative sample of 25 farmers' fields in each agro-ecological zone, starting in 2000, to estimate the economic value of crop losses due to stem borers in Kenya, based on natural infestation in farmers' field. We now have available the

preliminary results of the first three seasons (two seasons in 2000, one in 2001).

Crop loss can be defined as the difference between the potential yield and the actual yield, usually expressed as a percentage of the potential yield. Crop loss for an area or for a country can be defined as the difference between potential production and the actual production (expressed in kg or tons). Once the relative crop loss has been estimated by zone, we can use maize

production statistics to calculate regional losses. Finally, economic evaluation can be obtained by multiplying crop loss by prices.

All the villages involved in the study had previously been visited for the participatory rural appraisal (PRA). For the crop loss assessment, an introductory meeting was organized to explain the purpose of the study and to select the farmers. During each season, the farmers were visited three

times. During an introductory visit, the field was agreed upon with the farmer and a short questionnaire about farm and farmer characteristics was administered. Two adjoining plots of 50 m² were staked out. During a second visit, one subplot was treated with a systemic insecticide for borer control at about 2-3 weeks or at the 6-leaf stage. When required, the treatment was repeated. During this visit, plants and dead hearts were counted, and damage parameters observed.



Maize is harvested to be weighed to compare plots that are vulnerable to stem borer infestations to the control group treated with insecticide. This allows scientists to determine the actual levels of losses inflicted by the borers in farmers' fields.

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(Directly Estimating cont'd...)

During the final visit, both plots were harvested. The harvest of cobs was weighed and moisture content sampled to adjust the estimated yield. The adjusted yields of the two subplots were compared and the difference was attributed to loss from stem borers. Using secondary data on maize production and prices, the crop loss was extrapolated over the different zones and its value calculated.

Preliminary study results show that stem borers are indeed a very important pest, inflicting losses of 13.5% of maize production nationwide. This is only slightly less than the previous calculation of 15% based on farmers' perception. Measured crop losses varied from 8.5% in the lowlands to 16% in the moist transitional zone, which is the most important maize growing area. The coast accounts for only 2% of the losses, and the other zones between 4 and 7%. The moist transitional zone accounts for 59% of national crop losses, followed by the highlands (22% of national losses). It follows that the potential impact of insect resistant maize is by far highest in the moist transitional zone, followed by the highlands. To give these comparisons some perspective, stem borer losses estimated in the moist transitional area (245,000 tons) are five times greater than those of the coast (53,000). Moreover, these high potential areas have much higher adoption rates than the low potential areas.

To calculate the economic value of these losses, they need to be multiplied by maize prices. The value for 1999 was estimated at US\$ 230/t, resulting in an estimated crop loss of US\$ 91 million. In 2000, the value of maize was estimated at \$160/t. The average price from 1997 to 2000, calculated over the available market data, is \$193/t. This last price generates a broad estimate of crop loss value of US\$ 80 million.

These crop loss figures, however, need to be interpreted with caution, especially since variance is high and sample size small. For the future, we need to add a few seasons and increase the sample size.

Summarized by **Hugo De Groote**,
IRMA Economist based on the work of

Hugo De Groote, Charles Bett, James Ouma Okuro, Martins Odendo, Lawrence Mose, and Elizabeth Wekesa

Strengthening IRMA's Capacity to Work with Patent Systems in Sub-Saharan Africa: A Firsthand Report by IP Counsel Shawn Sullivan

The week of the 2001 IRMA Stakeholders Meeting was a busy one for me, as CIMMYT's newly-appointed intellectual property (IP) counsel. In addition to attending the meeting, introducing myself to IRMA personnel from CIMMYT and KARI, and generally learning more about the science and economics of the project, I had the pleasure of visiting and conversing with Dr. Norah Olembo, the Director of the Kenya Industrial Property Office (KIPO). Dr. Olembo, a professor of biochemistry at the University of Nairobi, is very familiar with those of us working for CIMMYT, through her role as a member of CIMMYT's Board of Trustees. Following a cordial round of introductions, Dr. Olembo took me on a personal tour of KIPO's facilities and introduced me to many of the patent and trademark examiners who work under her direction.

This introduction to the Kenyan industrial property system, and to some of the bright, confident, young professionals who are modernizing Kenya's economic infrastructure, left a deep and lasting impression on me. In addition to having obtained science or law degrees from Kenyan universities, many of Dr. Olembo's staff had received specialized degrees in intellectual property-related subjects, from European or United States universities. Their enthusiasm for their work, and their eagerness to assist people who want to know more about the patent system in Kenya, are evident, and can only bode well for Kenya's future.

CIMMYT has long considered its relationship with Dr. Olembo and KIPO to be of utmost importance. I like to think that my visit, at least in a small way, helped to solidify that relationship.



Dr. Norah Olembo.

Certainly KIPO has helped us considerably as we have tried to clarify the IP issues related to the IRMA project. After our visit, I asked Dr. Olembo if KIPO would search the published and issued patents in Kenya, to determine whether certain Patent Cooperation Treaty (PCT) applications relevant to Bt maize had been pursued in the "national phase" in Kenya.

This information is important because, under the PCT, a patent applicant may file a single application in one PCT member country, while indicating that the applicant may later wish to seek patents, based on that initial application, in other, specifically designated PCT countries. If the applicant, up to 30 months after the initial application, chooses to proceed with the application in another such designated country, the application is said to "enter the national phase" in the subsequently-selected country, and will begin undergoing an examination for

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compliance with the subsequently-selected country's laws. The primary benefit of the PCT system to the patent applicant, apart from possible cost savings in certain circumstances, is that the application is treated as having been filed in the subsequently-selected country on the same date that it was first filed in any PCT member country.

In response to our request, in virtually no time, we received a detailed search report from KIPO, which revealed that the applications in question had not entered Kenya's national phase. This was yet another very helpful bit of information for the IRMA project, since it revealed that, while certain, potentially relevant PCT applications filed in other PCT countries had indicated that the applicant might choose to proceed to Kenya's national phase, to date there was no evidence that any of them had done so. The rapid and comprehensive service that KIPO provided us in assembling this information was exemplary, and we are very much indebted to Dr. Olembo and KIPO.

My other principal "extracurricular" activity during this trip to Kenya was to attend portions of a workshop entitled "Regional Cooperation on

Biotechnology and Intellectual Property Rights in the Eastern and Southern Africa Region." Sponsored by the Biotechnology Trust Africa, this highly informative meeting was attended by representatives of patent offices in South Africa, Botswana, Swaziland, Lesotho, Namibia, Mozambique, Zimbabwe, Mauritius, Malawi, Zambia, Tanzania, Uganda, Ethiopia and Kenya. It focused on a number of topics of concern to national governments in the region, including the following:

- Developing a coherent national biotechnology policy
- Providing incentives for foreign and domestic research and development (tax regimes, venture capital incentives, etc.)
- Ensuring public awareness at all levels (communication with the public about the rationale for decisions and the risks and benefits of biotechnology)
- Establishing effective biosafety and food safety regulations
- Enacting IP legislation to establish a regime consistent with legal obligations (e.g., the Trade-Related Aspects of Intellectual Property Rights Agreement of the World Trade Organization, adopting appropriate antitrust laws, dealing with *sui generis* issues and plant breeders acts).

The workshop also provided a view of each participating nation's legislation related to the legal protection of plant breeding and biotechnology, and addressed many of the problems that make the adoption of developed country IP standards difficult for developing nations, such as limited economic capital, scarce human resources in required areas of expertise, etc. As the IRMA project progresses, CIMMYT will be following such regional IP law developments and issues with keen interest, in order to assist KARI with such matters, both in Kenya and in neighboring countries that may be viewed as potential export markets for insect-resistant maize.

I must confess, at times this trip to Nairobi seemed like a veritable whirlwind of meetings. However, I did not go to Nairobi to rest, and I came away from the trip more than satisfied with at least two things: (1) that our relationship with KIPO is strong, and is based on a mutually-held desire to serve the developing world; and (2) CIMMYT has collectively learned a great deal about the IP environment where products of the IRMA project will be deployed. The future indeed looks encouraging.

—Shawn Sullivan, CIMMYT IP Counsel

Do you have a question or comment about the IRMA project or the quarterly newsletter articles? Or perhaps you have an article you would like to contribute. If so, please contact the IRMA Quarterly Newsletter editor at d.poland@cgiar.org or IRMA Coordinator Stephen Mugo (s.mugo@cgiar.org).

Identifying NGOs to Enhance Extension Activities: A Look at the Coastal Region

With the implementation of the structural adjustment programs, there has been a drastic and continuous decline in the funding for extension activities. Non-governmental organizations (NGOs), on the other hand, have become important parties in assisting with the delivery of extension services, especially where institutional support has dwindled. Under the auspices of IRMA, KARI and CIMMYT economists conducted a study in the coastal region to establish an inventory of these nontraditional partners in agricultural development, with the medium-term objective of identifying potential collaborators to help disseminate useful technologies to our mutual clients, the resource poor farmers.

NGOs are active in the coastal region, helping local communities to increase household incomes and reduce poverty. The IRMA study used a questionnaire to identify NGOs active in the coastal region and particularly those oriented toward improved agriculture and maize. The NGOs are independent organizations with agendas, goals, and objectives for assisting their client communities, and the prominence given to agriculture, not surprisingly, varies from group to group.

Within the overall scope of poverty reduction, CIMMYT, KARI, and the Ministry of Agriculture have worked over the years to improve the livelihoods of Kenya's farmers by generating appropriate technologies to enhance agricultural production and increase farmers' incomes. But technologies in and of themselves mean little if they do not make it to farmers' fields, accompanied by the backstopping needed to ensure their proper and effective use.

To help lay one part of the foundation for this technology transfer, the IRMA study set the following objectives:

- Establish an inventory of nontraditional partners in agricultural development.
- Understand the extent of their involvement in agricultural extension.
- Establish a list of promising partners interested in collaborating with agricultural research institutions to enhance the dissemination of new agricultural technologies, in particular stress resistant maize varieties.

Visits were made to the Ministry of Agriculture district headquarters in Kwale, Kilifi, Mombasa, and Taita Taveta to seek information on extension work and collaborations with NGOs. Visits were also made to interview NGO staff and to project sites to talk with local community leaders and representatives, the purpose being to verify information and gather different perspectives on extension aspects of the NGO's work. A list of the NGOs working in each of

the districts was generated and those working in agriculture were highlighted. Following interviews and questionnaires, a more complete summary of their activities was produced.

Indeed, the coastal region has its fair share of organizations working to alleviate poverty in the region. These organizations help mobilize scarce resources for the betterment of the coastal population. The organizations vary in composition and structure, as some are truly non-governmental in nature, while others are organized by the District (project-based), e.g., K. D.D.P. (Kilifi District Development Programme). Activities vary widely among the organizations, as does their geographic dispersion. The NGOs that work in agriculture typically do not focus solely on maize, but take a broader approach that includes intercropping and diverse plantings with other crops (fruits, vegetables, etc.). Often the approach is toward community development and includes activities in health and education.

The number of visits made to farmer groups

NGOs	Visits
Action Aid Kenya	--
Kilifi District Development Programme	Monthly
Mwangaza Integrated Development Organization	--
Foster Parents Plan International	Monthly
Community Based Development Agency	Twice/ weekly
Ken Aid Fund	Monthly
Agricultural Business Services	Twice/ month
Taita Taveta Agricultural Project	Three times /month
World Vision Kenya	*
Lunga lunga Integrated Community Development organization	Three times /month
Kwale Rural Support Programme	Monthly

* The number of visits to farmers depended on the season; certain projects at certain times involved more than 10 visits a month, whereas at other times there were fewer than 10.

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(Using NGOs to Enhance cont'd...)

The NGOs do provide some support for maize farming, such as the provision of credit for various agricultural inputs, training, support services, planting certified seed, pest and disease control in maize, water harvesting technologies, use of organic and inorganic manure, ASAL technology in maize production, and drought tolerant varieties. For the most part, the group approach to dissemination is more widely employed than the individual approach.

In the group approach, many farmers come together for a common purpose. Farmers form groups of ten or more

persons and pursue an agenda of activities that are set within the group. Typical of this approach are farmer field schools, also known as “schools without walls.”

The future development and uptake of better technologies will undoubtedly mean working more closely with NGOs and utilizing their grass-roots connections with farmers and local extension staff to further agricultural development objectives. In addition, there are many opportunities for scientific organizations to partner with NGOs on research, including joint research programs, limited research and

development (R&D) partnerships, contractual R&D, and long-term institutional collaborations.

In conclusion, the reach of these NGOs should not be underestimated. Just within our study sample, the NGOs were able to reach a total of 5,320 farmers and 196 farmer groups. The NGOs were also reaching more of the critical female farmers (3,975) than male (1,515), despite a field staff numbering only 39. Clearly there is a role for NGOs, and this initial study may help us to identify and benefit from their unique attributes.

—Dr. Hugo De Groote, CIMMYT Economist, and
David Poland, CIMMYT Writer/Editor

Contacts

CIMMYT-Kenya

Drs. Stephen Mugo and
Hugo De Groote
P.O. Box 25171, Nairobi, Kenya
Tel: (254) 2-522878
Fax: (254) 2-522879
Email: s.mugo@cgiar.org;
h.degroote@cgiar.org

KARI

Dr. Ephraim A. Mukisira
Kenya Agricultural Research Institute (KARI)
P.O. Box 57811 Nairobi, Kenya
Tel: 254 2 583149 or 583301-20
Fax: 254 2 583344
Email: eamukisira@kari.org

CIMMYT-Mexico

Dr. David Hoisington
CIMMYT, Apdo. Postal 6-641;
06600 Mexico D.F., Mexico
Tel: (52) 55 5804 7575
Fax: (52) 55 5804 7567
Email: d.hoisington@cgiar.org

Syngenta Foundation for Sustainable Agriculture

WRO-1002.11.51
P.O. Box
CH-4002 Basel, Switzerland
Tel: +41 61 323 56 34
Fax: +41 61 697 71 04
Email: syngenta.foundation@syngenta.com
WWW: www.syngentafoundation.com