



CIMMYT®

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 Novartis Foundation for Sustainable Development.

Stakeholders Meeting Publicly Launches IRMA Project

The Insect Resistant Maize for Africa (IRMA) Project was publicly launched in early March with the convening of a Stakeholders Meeting in Nairobi, Kenya. Approximately 100 people, representing different stakeholder groups—including farmers’ associations, womens’ groups, religious organizations, seed producers, regulatory agencies, NGOs, the media, and others—were in attendance. Representatives of the project collaborators, CIMMYT and the Kenyan Agricultural Research Institute (KARI), as well as the primary donor, the Novartis Foundation for Sustainable Development, were also on hand.

The specific objectives of the Stakeholders Meeting were to (1) introduce the IRMA project to stakeholders; (2) create awareness on the economic importance of stem borers in Kenyan agriculture; (3) create awareness on the control options for stem borers including conventional and novel approaches like Bt-gene technology; and (4) solicit responses from stakeholders on the need for and processes of developing insect resistant maize for Kenya.

The session was chaired by the Permanent Deputy Secretary and Director of Agriculture Wilfred Mwangi and was officially opened by the Minister of Agriculture, the Hon. Christopher M. Obure. Former KARI Director Cyrus Ndiritu provided some general remarks on the project, while CIMMYT-IRMA project coordinator Stephen Mugo gave a more detailed account. A letter on CIMMYT’s role in the project from Director General Timothy Reeves was read to the meeting and Dr. Klaus Leisinger gave a short speech on the role of the Novartis Foundation.

Following the opening, the stakeholders readily engaged the expert panel in the question and

answer period. Because of their intense involvement, the session ran well over its allotted time and was extended to accommodate additional questions and comments.

The stakeholders expressed the need to incorporate sound management strategies and to follow the national regulations strictly during introduction and testing of *Bacillus thuringiensis* (Bt) genes in the country.

The view shared by almost all was that Bt genes can only be evaluated if they are in the country. Importantly, Bt maize was viewed as having a high potential for closing the wide and increasing food deficit in Kenya.

Media coverage of both the Stakeholders Meeting and the preceding Africa Biotechnology Stakeholders Forum workshop (sponsored by CIMMYT and the Rockefeller Foundation) was extensive and generally positive.

Project director David Hoisington was very pleased with the kickoff of the project and attributed the success of the Stakeholders Meeting to the hard and close-knit work of the CIMMYT-IRMA staff in Kenya (Stephen Mugo and Hugo de Groote) and their KARI counterparts. The IRMA project is supported jointly by CIMMYT’s Maize, Economics, and Applied Biotechnology programs.

(Excerpts of the speeches by the Minister of Agriculture and Director of the Novartis Foundation may be found on page 2, respectively.)

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 (contact information on back page).

Minister for Agriculture Addresses the Stakeholders Meeting

(Following are excerpts from the Opening Speech by the Hon. Christopher M. Obure, Minister for Agriculture, to the IRMA Stakeholders Meeting)

“The Government of Kenya is committed to ensuring food sufficiency and food security and my Ministry shoulders the bulk of this responsibility. Although Kenya has a high degree of self-sufficiency, in recent years agricultural productivity has not kept up with population growth, and food-security therefore remains a top Government priority. . . .

“ . . . Intensification is of utmost importance for maize, our most important food crop. Unfortunately, crops under intensification usually face increased pest pressure. In Kenya, striga and stem borers, to name only two, are responsible for massive crop losses each year. Finding ways to decrease those losses would result in an increased and more stable maize production, improving our food security substantially.

“We must as a matter of urgency seek to adopt and adapt appropriate technologies already developed elsewhere. At the same time, however, we should not rely exclusively on imported technology. We need to develop our national capacity for designing new technologies, building on our own experience, our indigenous knowledge and our traditional methods.

“In this light, we are happy to gather here today as stakeholders to a new venture, the Insect Resistant Maize for Africa or IRMA project. This project, a collaboration between KARI and CIMMYT, aims to reduce yield losses in maize due to stem borers by combining conventional breeding and biotechnology to develop resistant varieties. . . .

“All new technologies need to be studied for apparent or potential hazards. Some reservations and criticisms directed at the Bt technology are understandable. There is concern about resistance breaking



Minister for Agriculture, the Hon. Christopher M. Obure.

down and of non-targeted insects being killed. However, it is the task of scientists and technology developers to study and reduce such risks. . . .

“Kenya upholds the right of stakeholders to be involved through all stages of project development and implementation. . . . Today you all represent major stakeholders in this project. Your opinions are important and will be considered in the IRMA project implementation. I therefore urge you to engage in candid and open discussions by expressing objective and constructive views and opinions. . . .

“I wish you all fruitful deliberations. . . . It is now my singular honour to declare this meeting officially opened.”

IRMA and the Role of the Novartis Foundation



Dr. Klaus M. Leisinger

(Excerpts from a speech to the Stakeholders Meeting by Executive Director of the Novartis Foundation, Klaus M. Leisinger)

“Why is the Novartis Foundation for Sustainable Development spending more than \$6 million to support this project?

The answer is quite simple: It is the mission of our foundation ‘to foster sustainable development in developing countries through the support of programs and projects in the areas of sustainable agriculture, health, and social development. . . .

“The problem to overcome—damage to the maize harvest inflicted by insects—is acknowledged, and innovative solutions

are available but not yet accessible in sub-Saharan Africa. We do not believe in scientific apartheid and do not want to exclude countries in sub-Saharan Africa from cutting-edge research. We therefore support scientific capacity building and transfer of technology, including on biosafety. . . . We are convinced that there can be no double standards with regard to quality of research, quality of field work, and quality of safety of all kinds.

“As there is nothing to hide, we also encouraged today’s conference in order to give all stakeholders the opportunity to ask questions to the different project partners rather than relying on insinuations or – even worse – rumours.

“We from the Novartis Foundation want to go on record for taking opposing views seriously and engaging in an ongoing stakeholder dialogue. We believe in the necessity and value of benefit/risk analyses and support consistency in standards as well as communication. We know that there are no simple solutions

to complex issues and therefore invite different parties with different values and differing interests to find common solutions. . . .

“Agricultural development that raises productivity and incomes, either directly or indirectly, for the poor is still an eminent precondition for other development processes to be initiated—it is certainly a precondition for alleviating absolute poverty. To initiate such a development in a sustainable way involves many political and social changes. But modern inputs such as genetically modified seeds that bring good yields on marginal land, are tolerant to pests as well as other stress factors, and deliver good quality food can be an important help for resource-poor small farmers. . . .

“Let us all work together to make this project a pilot for excellent partnership and co-operation. Let us all work together to make this project one that others can learn from and will refer to. It can be done – and if we all want it, it will be done.”

Groundwork Laid for IRMA Bioassays

CIMMYT entomologist David Bergvinson visited Kenya in May of this year to work on laying the groundwork for IRMA bioassay work with partners from KARI and ICIPE. He filed a report of the trip, the main points of which are included below. Note: For more detailed information, Dr. Bergvinson may be reached by email at d.bergvinson@cgiar.org

The main objectives of the trip to Kenya were to (1) view insect trials being conducted by the Africa Maize Stress (AMS) Network; (2) participate in trial planting to better understand constraints in outreach; (3) discuss stem borer research with KARI entomologists and ICIPE; (4) inspect future insect screening sites; (5) identify opportunities for post-harvest research within KARI; and (6) identify germplasm to exchange within the AMS network. Items 2, 3, and 4 are of particular relevance to the IRMA project.

Trial planting

Bergvinson went on site for station trials being planted at Kiboko (dryland), Embu (midaltitude), and Mtwapa (tropical).

In Kiboko, a simple trial was planted (alternating protected and naturally infested two-row plots). Furudan was not applied at the time of planting to the natural infestation plots. Bergvinson noted that monkeys were a problem in border rows. He also observed that careful monitoring of the casual staff is needed and that AMS coordinator Alfa Diallo had done a good job of training the KARI technicians to help ensure this monitoring and the quality of trial data.

At the Embu station, borer screening consists of two trials: Insect Tolerant Synthetics (ITS) from Headquarters-Entomology and a yield loss trial consisting of insect resistant (IR) populations, ITS, and local material. The trials were infested with African maize stem borers (*Busseola fusca*), which were well established after a week of feeding. "I was disappointed by the amount of feeding on the tropical ITS," says Bergvinson. "Clearly there is need to



In May, CIMMYT entomologist David Bergvinson played host to Deputy Director of Agriculture Mr. J. Ng'eno, Senior Research Officer Dr. Kiarie Njoroge, Director General of KEPHIS Dr. John C. Kedera, and KARI Deputy Director Andrew M. Mailu. The delegation conducted an in-depth tour of CIMMYT's bioassay facilities, biotechnology laboratories, and biosafety greenhouses.

cross some more resistance into these synthetics. This confirms our observations in Mexico under *Diatraea* infestation."

At Mtwapa, yield loss trials were also established for natural attack by *Chilo partellus*. Bergvinson discerned that the main insect priorities for farmers are the borers *Chilo partellus* and *Chilo orichalcociliellus*, web worms, and aphids. Armyworms (*Spodoptera exempta*) can also be a periodic but severe problem, and should be considered in product development.

Discussions with KARI and ICIPE

Bergvinson met with KARI entomologist Dr. Josephine Songa, who accompanied him to the Embu station (more on Dr. Songa's work in the next issue of IRMA Updates). Songa has conducted extensive research characterizing the stem borer complex in midaltitude maize and the associated parasitoids. According to her research, *Cotesia flavipes* is the most effective biocontrol for *C. partellus*. This parasitoid, according to Songa's research, attacks third-instar larvae. This behavior, Bergvinson notes, should make it compatible with Bt maize,

which kills borer larvae in the second instar. Consequently, the parasitoids will likely avoid larvae on Bt maize and concentrate on larvae in broad stem grasses, such as Napier grass. Further research in this area is planned. Potential screening sites for borers, non-target insects, and soil profiles were also a matter of considerable discussion.

Bergvinson also met with Dr. William Overholt, head of ICIPE's stem borer biological control program. Overholt confirmed that the native *B. fusca* is being displaced by the more aggressive *C. partellus*, an uninvited exotic from India. This is because the *C. partellus* has a higher reproductive rate, attacks maize earlier, has a shorter development time, and unlike *B. fusca*, it does not shun infested plants when laying its eggs.

Overholt, says Bergvinson, is particularly interested in working with the IRMA project to determine possible effects of Bt maize on biological controls and to examine its compatibility with the push-pull management strategy being promoted by ICIPE. This strategy is based on planting wild grass species within maize plots that repel the borers and/or grasses outside the plot that attract them. The technology is currently being tested in the Lake Victoria district in collaboration with KARI.

IRMA Economics Work Underway

“We have established good contacts with a team of Kenyan economists working for KARI in the different agroecological zones, reports CIMMYT/IRMA Economist Hugo de Groote, “and it is now clear that KARI economists will be carrying out the bulk of the socioeconomic field work.

A lot of that field work will rest on the participatory rural assessment (PRA) tools that were developed last year at a workshop and subsequently tested in several agroecological zones. In February 2000, de Groote reports, IRMA conducted another workshop to finalize the tools and to agree on sample size and budgets. Subsequently, KARI economists submitted budgets and, upon acceptance, received advances to start the work.

Participants in the February workshop also developed an on-farm experiment, basically protecting one half of a field against stem borers to compare its yield with the unprotected half. It was decided to use the same villages as used for the PRAs. Except for Kitale, all villages have been selected. Problems have surfaced around the random selection of fields for the surveys. The continuing lack of rain may also jeopardize this year’s harvest and with it, attempts to measure conditions in the field.

The coastal area took the lead and the economists surveyed their first two

villages in early March, completing their work there at the end of the month. Data analysis and a report will follow. Startup work, de Groote says, also commenced in Kakamega (April 25-26), where he accompanied the Kitale economist to start up the PRA. Area farmers had already started planting, and so they preferred doing the crop loss assessment first. De Groote also visited Katumani (April 27) and Embu (May 6), which will also undertake their crop loss assessments first.

Also of note in the Economics area: Dr. Caleb Wangia finished a first draft of a

marketing study, comprising a literature review and analysis of secondary data. The study shows that the government has largely withdrawn from market controls, except for a 25% import tax.

Data on the maize seed industry have been collected and are now being analyzed. Seed production has been liberalized and many companies have entered the market, but Kenya Seed Company still very much dominates the market. The old public sector distribution networks have broken down, and the private sector has not fully replaced them.



Elizabeth Wekesa, KARI economist at the Mtwapa station, administers a Participatory Rural Assessment survey in a Malindi district village.

CIMMYT Director General Meets with Kenyan Officials and Project Teams

Dr. Timothy Reeves, CIMMYT Director General, traveled to Nairobi April 10-13 to meet with CIMMYT/KARI project teams, a host of Kenyan government officials, and the media. Following is an informal and brief account of the trip he provided to the CIMMYT Informa newsletter.

Nairobi, Kenya – Greetings from Nairobi. As many of you know, my family and I lived and worked in Kenya 20 years ago so it is always a pleasure for me to be here and to practice my very

rusty Kiswahili and very limited Kikuyu! It is not the growing season here so I did not get the chance to visit the field . . . however, I’ve found another excellent CIMMYT team that is working in new and exciting ways to ensure an impact. In addition, I had the opportunity to meet with all of our key partners as well as conduct a very well attended press conference (over a dozen journalists from all the major national and international media).

Of course, one of the great pleasures was to spend time with Prof. Mwangi, now the Deputy Permanent Secretary of the Ministry of Agriculture and Director of Agriculture in Kenya. Prof. Mwangi and his colleagues are doing a splendid job of reform and redirection for Kenyan agriculture. Also, through Prof. Mwangi’s arrangements, I was able to have important meetings with Dr. Richard Leaky, Permanent Secretary of

(cont’d on page 5...)

Farm and Station Trials to Assess Borer Damage

Under the auspices of the IRMA project, Stephen Mugo, IRMA-Kenya Project coordinator, and KARI scientists (M. Gethi, K. Njoroge, O. Odongo, G. Ombaho, and W. Civatsi) began monitoring trials to measure yield loss due to maize borer damage during the first half of 2000. Trials were planted in the humid coastal region (Mtwapa), the dry midaltitude region (Kiboko), the moist midaltitude region (Embu), the moist transitional midaltitude region (Kakamega), and the highlands (Kitale). Only adapted cultivars (commercially available and experimental) were evaluated in each of the maize growing environments. Cultivars grown on-farm were under two treatments: plots protected against stem borer with a pesticide and plots without protection and therefore susceptible to natural stem borer infestation. On-station, a third treatment with artificial infestation was included.

Visits to farm trials and station trials during June 19–30 revealed the following according to Mugo:

Mtwapa: Two of the four on-farm trials were successful while the other two trials suffered from rodent damage and waterlogging. Due to stem borer dynamics over seasons, there was less stem borer damage incidence than expected in both the control and test plots. The on-station trial was in very good shape and plots with artificial and natural infestations showed stem borer damage. The resistant check (Pop 591 C2

bulk) had low foliar damage scores while the local cultivars showed heavy damage.

Katumani: Due to the severe drought stress in Central and Eastern Kenya this year, only the on-station trial, which was under irrigation, was successful in this area. Artificial infestation was successful and considerable natural infestation was also observed. The resistant check population (Pop 390 C2) stood out as resistant, while one local check, Makueni composite, proved most susceptible.

Embu: Drought claimed two of the four on-farm trials in this area. Of the two remaining plots, one showed good natural infestation, while the other was visited during very early vegetative stage before stem borer damage would be evident. The on-station trials were visited at flowering stage, but the stand was poor due to drought stress at germination. The resistant check (Pop 591 C2 bulk) had low foliar damage; H513 and Pioneer 3253, the two popular hybrids in the region, were heavily damaged; while EMAP II and EMCO, new OPVs, scored in the middle of the lot.

Kakamega: The stands on the four farmer trials were good to excellent and varietal differences were very clear in maturity, performance, and disease reaction. In fact, we recommend a field day on the farm of Mrs. Rufina Otinga to demonstrate varietal resistance to stem borer and yield performance. There



CIMMYT-Kenya project coordinator Stephen Mugo examines a maize trial for insect resistance.

was less stem borer damage than expected in the naturally infested plots. The on-station stand was excellent, nearly perfect, and though natural infestation was minimal, artificial infestation was successful. PHB 3253 and H513 showed high stem borer (and foliar disease) damage, while the resistant check (Pop 591 C2 bulk) showed less.

Kitale: Stands in three of the four on-farm trials were poor due to drought stress, and in one instance, heavy lodging from a recent storm. One trial was excellent (Mrs. Florence Nabwera) and has been proposed as a field day site. Little to no stem borer damage was recorded at all of the sites in the highland ecology. The stand at the on-station trial was good. Artificial infestation was good while natural infestation was minimal.

For more up to date information or further details on the trials, contact Dr. Stephen Mugo at the CIMMYT Kenya office (see contact information on page 6).

(CIMMYT D.G. cont'd...)

the Office of the President and also the Minister of Agriculture, Mr. Obure. In addition, at our press dinner the attendance of VIPs was unbelievable and included the Minister and the Permanent Secretary of Agriculture, the Permanent Secretary of Finance, and the Financial Secretary to the Treasury. Fittingly other seats at the 'top' table were Prof. Cyrus Ndiritu, (former) Director of KARI, Prof. Mwangi, and Prof. Norah Olembo, our CIMMYT Trustee. We had a very good visit to KIPO, Prof. Olembo's organization, where they have an excellent team

utilizing all of the latest and technologies for IP management and protection. Again, what impressed me about the CIMMYT Kenya team (our second largest in outreach) is that they have first-class exciting research and are working with a diverse range of partners to ensure impact. Those partners include KARI, the extension service, seed companies, NGOs (a whole range), farmers' groups, and universities. These are strong and genuine alliances—not just ideas on paper.

We had an excellent session with KARI and heard very good presentations on

our joint work. When you consider that all CIMMYT staff described their work for me, and I also gave a seminar at the press dinner, I think you'll see we didn't waste any opportunities! An additional note: Our nationally recruited staff in Nairobi are first-class and my particular thanks go to Ebby Irungu and Isaac Mutabai for all of their help.

As I have said before, we currently have the best technologies for Africa that we have ever had—a real opportunity for dramatic breakthroughs—and I see every possibility for more.

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