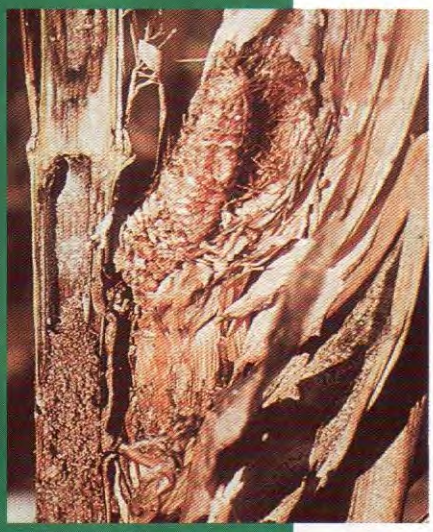
KARI

CIMMYT®

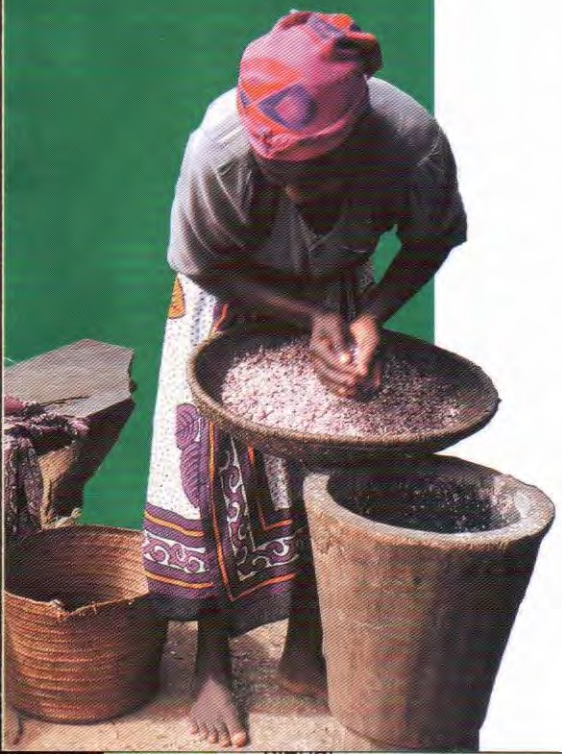
Insect Resistant Maize for Africa (IRMA) Project

The Problem



Maize is a major food crop in Africa, especially in the eastern and southern regions of the continent. For many, it is the main staple of their diet, as evidenced by annual consumption levels of 79 kg per capita in the region and 125 kg per capita in Kenya. Serious threats to this food source obviously endanger food security generally. Stem borers pose just such a threat in much of Africa. In Kenya alone, farmers estimate crop losses due to stem borers at 15% of their ultimate harvest, amounting to 400,000 tons of maize with a value of US $90 million—this in a country where many people live on less than $1 a day. Given that Kenya currently imports maize to meet demand, these losses are considerable. For individual farmers, infestations of these pests can decimate entire fields of maize—depriving a rural family of vital income and a year's supply of their main food source.

To tackle this problem, the Insect Resistant Maize for Africa (IRMA) project was launched in 1999, by the International Maize and Wheat Improvement Center (CIMMYT) and the Kenya Agricultural Research Institute (KARI), with financial support from the Novartis Foundation for Sustainable Development.



Goal

The overall project goal is to increase maize production and food security through the development and deployment of insect resistant maize, which significantly reduces crop losses. Conventional and novel sources of resistance to stem borers in particular will be enlisted in this effort and applied in various agroecological zones in Kenya. Based on the experiences and results generated in Kenya, appropriate technologies and varieties will be extended to other African nations.

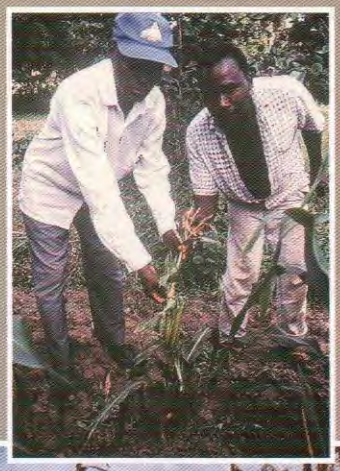
Objectives

The general objectives are to

- strengthen resistance to the major insect pests of maize in developing countries;
- provide experience in navigating and complying with the regulatory procedures in targeted developing countries; and
- facilitate the efficient dissemination of insect resistant maize to farmers.

The specific objectives are to

- develop and procure sources of insect resistant maize germplasm for Kenya;
- develop strategies for effective dissemination of insect resistant maize germplasm in Kenya; and
- assess the potential and actual impacts of insect resistant maize germplasm in Kenya.



Activities

The project will engage in three groups of activities:
1) development of insect resistant maize germplasm
2) development of effective dissemination strategies
3) impacts assessment

Development of insect resistant maize germplasm and procurement of genes for resistance will entail

- development of an infrastructure for screening insect resistant maize germplasm;
- identification of genes (e.g., (*cry*IAb, *cry*IAc, *cry*IB, and *cry*IE) that are active against Kenyan stem borers: *Chilo partellus, Busseolla fusca, Sesamia calamistis,* and *Eldana saccharina;*
- identification of target germplasm for transformation and for backcrossing to source germplasm;
- development of transgenic-based insect resistant maize germplasm;
- transformation of Kenyan adapted germplasm;
- backcrossing of adapted Kenyan germplasm with transformed germplasm; and
- development of high-yielding, improved, and adapted insect resistant germplasm.


Chilo partellus

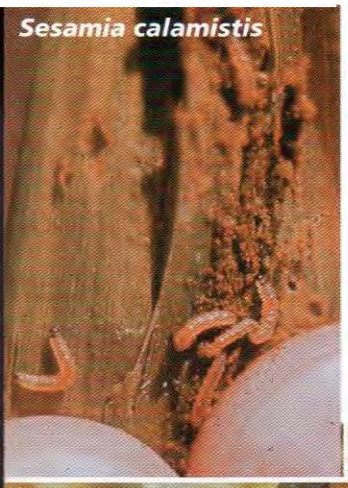

Busseolla fusca

Development of effective dissemination strategies for insect resistant maize in Kenya will entail

- development of insect resistant management (IRM) strategies;
- agronomic studies of insect resistant maize; and
- deployment of insect resistant germplasm to farmers.

Impact assessment and socio-economic analysis will entail

- assessment of the demand for insect resistant maize varieties through studies of the different maize-based farming systems, a survey of farmers' perceptions and preferences, and a survey of consumers' preferences;
- assurance that the technology fits within the country's institutional framework and an assessment of the intellectual property rights' (IPR) implications and costs;
- assurance of the safety of the technology to the public through continuous dialogue with environmental groups, local research institutes, and private or public companies involved with seed production;
- assurance that the technology is acceptable to farmers through farmer participatory research;
- comparisons of the costs of the new technology to its benefits at various levels, including the maize producer, the seed company, the consumer, and society as a whole; and
- impact assessment, and cost-benefit analyses of the research.

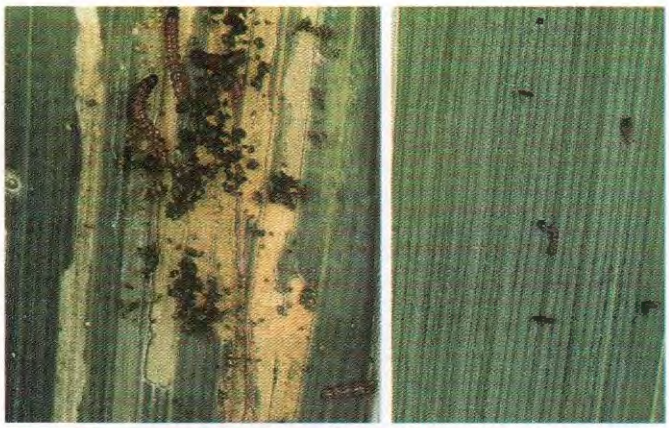

Sesamia calamistis


Eldana saccharina

Outputs

Expected outputs and impacts include

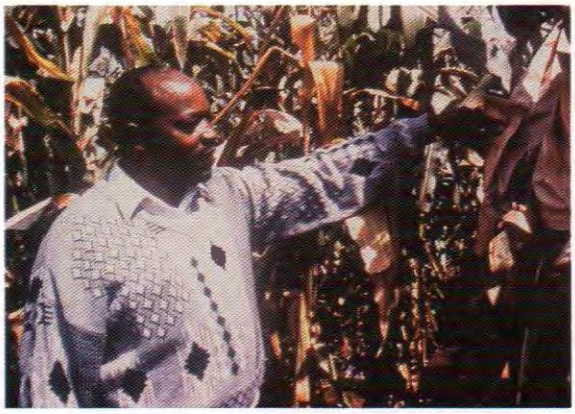
- the testing and release in Kenya of maize inbreds, hybrids, and open pollinated varieties (OPVs) that combine the most effective conventional and transgenic-based insect resistance;


Non-resistant maize (left); resistant (Bt) maize (right)

- the development of protocols and the training of KARI scientists in 1) the development and evaluation of insect resistant maize cultivars at the experiment station level and 2) the deployment and monitoring of insect resistant varieties in farmers' fields;
- an economic analysis to 1) determine likely farm-level profitability for different categories of farmers, 2) assess farmers' willingness to pay for the technology (strength of market demand), and 3) assess the overall private and public benefits of the technology;
- the development and implementation of insect resistance management strategies in all agroecological zones in Kenya where insect resistant maize is to be grown;
- Kenyan scientists, farmers, officials, and stakeholders trained in the production, evaluation, and dissemination of insect resistant maize;
- the accrual of practical experience for KARI in biosafety and IPR regulatory procedures in Kenya; and
- a thorough documentation of all lessons learned during the project, which will be made available to other developing countries that are interested in promoting similar technology.

Management

The IRMA project is being implemented and managed through a steering committee composed of Senior Directors from CIMMYT, KARI, and the Novartis Foundation. Co-coordinators for CIMMYT and KARI provide the operational management of the project.



CIMMYT has stationed a maize breeder in Kenya to identify suitable germplasm both for transformation and for backcrossing of the identified insect resistant genes into Kenyan germplasm. A CIMMYT economist, also based in Kenya, is implementing the impact assessment activities. As information is a major output of the project, a CIMMYT communication expert assists in preparing project documents, mainly related to public education and public relations issues. The project is supported at CIMMYT Headquarters by a cell biologist, an entomologist, and other staff from the Applied Biotechnology Center, the Maize Program, the Economics Program, and Information Services.

Project milestones and timelines have been developed and monitored jointly by the CIMMYT and KARI scientists and will form the basis for frequent project reviews. A stakeholder meeting, held at the beginning of the project, will ensure that relevant issues and perspectives are considered early in the project's life. The steering committee holds periodic meetings to evaluate project performance. Results, general information, and reports are produced regularly and made available to a wide audience.

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Project Partners

The International Maize and Wheat Improvement Center (CIMMYT) is an international, non-profit, agricultural research and training center dedicated to helping the poor in low-income countries. Its work concentrates on increasing the productivity and profitability of maize and wheat, particularly for small-scale farmers, in a sustainable and environmentally responsible manner. CIMMYT works in partnership with national agricultural research programs, universities, non-governmental organizations, and public and private funding agencies. It is a member of the Consultative Group on International Agricultural Research and it supports the global public awareness initiative Future Harvest. For more information on CIMMYT, access its web site (www.cimmyt.cgiar.org).

The Kenya Agricultural Research Institute (KARI) was established in 1979 with the express mission of increasing sustainable agricultural production by generating appropriate technologies through research, and disseminating these to the farming community. Inherent to this mission is the protection, conservation, and improvement of basic resources, both natural and human. Such resources are critical for Kenya's agricultural development and expansion of the nation's scientific and technological capacity. KARI has an extensive history of productive collaborations with national and international institutes and universities, as well as with the private sector.

The Novartis Foundation for Sustainable Development provides major funding for the project. The Foundation is dedicated to fostering sustainable development in poor countries of the South through its support of programs and projects in the areas of sustainable agriculture, health, and social development. It is also an active player in development policy debate through its preparation and dissemination of research analyses. Further information about the Foundation may be found at its web site (www.foundation.novartis.com).