Project Concept Note

Really Green Beans: Reducing Pesticide Abuse in Snap Bean Production in the Tropics of Africa and Latin America

Presented by: Centro Internacional de Agricultura Tropical
CIAT

May, 1998

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Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

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1. Project Details

Title: *Really* green beans: Reducing Pesticide Abuse in Snap Bean Production in the Tropics of Africa and Latin America

IARC: Centro Internacional de Agricultura Tropical (CIAT)

IARC Priority: IP-1 and IP-2: Improving Productivity and Sustainability

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Collaborators:

CORPOICA-Colombia; INIAP-Ecuador; CIF-Cochabamba, Bolivia; ICTA-Guatemala; KARI-Kenya; Uganda; Burkina Faso, Mali; Senegal; Ethiopia

Total cost of project: US$ 2.666,338 over four years, for a first phase of an eight year effort.

Duration of project: 4 years

Date of submission: May 1998

Location of project: Uganda, Tanzania, Malawi, Rwanda, Colombia, Guatemala, Ecuador

Related donor projects: IDRC, IPM in the Andean hillsides

2. Background

The Problem And Why It Is Urgent

As vegetable consumption grows in urban areas of developing countries, small farmers seeking to augment their incomes are increasingly turning to vegetable crops as a lucrative alternative. At the same time, vegetables are becoming an important export option as developing countries ship fresh produce to affluent markets in the US, Europe and Japan. Snap beans rank among the most preferred vegetables, and projections indicate that supply may not keep up with demand. In Latin America the highest production occurs in Argentina, Brazil, Colombia, Peru and Guatemala. In Africa where most snap beans are exported to Europe, production is significant in Kenya, Uganda, Burkina Faso, Cameroon, Mali, Senegal and Rwanda.

Nearly all the varieties of snap beans produced in the tropics were developed for the temperate zone. Therefore they are highly susceptible to a wide range of tropical pests and diseases, including bean rust, anthracnose, ascochyta blight, Oidium, whiteflies, leafminers, beanfly, and spiny bugs. Sources of resistance are available for the fungal diseases and are already being deployed in breeding of dry bean breeding which is the same species. Since the crop represents considerable cash income, the farmer is willing to invest in large quantities of insecticides and fungicides to protect the harvest. Pesticide abuse is well documented. For example, in central Colombia farmers were found to spray their snap beans up to 22 times in a three month cropping cycle. In Africa a similar situation is developing: in one district in Kenya: farmers were found to routinely use 36 different pesticides. As in Latin America, most of the insecticides used in Africa are of Category I (extremely toxic).

The excessive use of pesticides on snap beans has serious negative effects:

- Farm laborers are in critical danger of intoxication, including women and children who often are an important part of the family labor force
- Residual pesticides put consumers at risk of poisoning
- The ecological balance of the production region is disturbed and the sustainability of the cropping system compromised
- Pests acquire resistance to insecticides and pest resurgence is common
- As farmers become accustomed to routine preventative spraying without necessity, the risk increases and crop profitability drops

It is obvious that an Integrated Pest Management strategy is sorely needed to protect the health of small farmers and their families; to assure consumers of a safe product; and to protect the ecological balance of production regions. Such IPM must include both pest management practices and varieties of snap beans that are resistant to the diseases and pests that induce farmers to apply pesticides.

What Has Already Been Done

CIAT has participated actively in both IPM for snap bean production, and in the breeding of snap beans that are resistant to pests and diseases. IPM practices were developed that permit reducing pesticide applications by 60% or more. However, additional work with farmers was required to adapt these practices to farmer's conditions. CIAT is currently involved in an extensive inter-institutional project to combat the white fly which is probably the number one pest of snap beans. The effort which is proposed here would link to and complement that project. A recent survey of pesticide use has provided current and disturbing data on abuse of pesticides in Africa. CIAT maintained a project in snap bean breeding for several years and several lines were released for use as varieties from that work. Both the breeding project and the IPM work could be revitalized readily. Furthermore, advances in breeding techniques, especially with molecular markers for selection of disease resistance genes, would speed up progress beyond that attained so far. CIAT's research networks in both Latin America and Africa are positioned to extend snap bean activities.

3. Project Goal

To reduce environmental degradation due to excessive pesticide use, and reduce threats to food security, resulting from insect and disease damage.

4. Project Purpose

To reduce pesticide use on snap beans though the generation of diseases and insect resistant varieties and through the development and implementation of IPM systems.

5. Outputs

1. Tropical snap bean varieties resistant to diseases and insects are generated.
2. Pesticide use in target areas diagnosed.
3. IPM components developed.
4. IPM systems tested and implemented. Adoption rates measured.
5. Results are disseminated.

6. Activities

Output 1.
- 1.1. Verification of sources of resistant
- 1.2. Identification of new sources of resistance
- 1.3. Development and selection of populations
- 1.4. Testing of advanced lines with farmers through participatory methods

Output 2.
- 2.1. Surveys of pesticide use in target areas
- 2.2. Measurement of yield losses due to insects and diseases
- 2.3. Determination of insecticide resistance levels
- 2.4. Determination of insect and disease related crop protection costs

Output 3.
- 3.1. Testing of non-chemical methods of control
- 3.2. Development of action thresholds for rational insect control
- 3.3. Development of an IPM system

Output 4.
- 4.1. Testing in farmer's fields of adoptive technology
- 4.2. Participatory research trials
- 4.3. Economic evaluation of IPM in comparison with farmers'methods of control
- 4.4. Surveys to identify adopters and non-adopters
- 4.5. Surveys to measure adoption

Output 5.
- 5.1. Training of National scientist in IPM
- 5.2. Training of national scientist in measurement of IPM adoption rates
- 5.3. Manuals, leaflets, field days, farmer's tours
- 5.4. Publications

Inputs and Project Management

CIAT inputs and Project management: The project would require the participation of a CIAT pathologist and an entomologist (25% each). A full time breeder would be financed by the project, as would an entomologist/IPM specialist in Africa. In South and Central America the CIAT entomologist would be responsible for project coordination, while in Africa the IPM specialist would be in charge and would coordinate closely with the other CIAT staff on the continent. The breeder would be based at CIAT HQ, and would link with partners in both continents for the testing of genetic materials in production systems.

Partner inputs: Agronomists and entomologists in partner institutions would be responsible for the establishment of trials for the testing of genetic materials; for collaborating with CIAT IPM specialists in the diagnosis of the problem, in the testing of IPM components with farmers, and in the studies of adoption rates and limitations. Partners would bear principal responsibility for dissemination.

7. Beneficiaries, Outputs and Impacts

Outputs would benefit both producers and consumers, as well as the environment. Improved varieties combined with IPM practices would require fewer applications, thus farmers and their families would suffer less exposure to pesticides. IPM will reduce the load of pesticides on the environment, thus restoring the natural enemies of pests and contributing to the sustainability of the system. Farmers' experience with IPM could have spill-over effects to other components of the farmers production system. Farmer production would likely be at lower cost, thus maintaining or improving farm income. Consumers would also suffer less exposure to dangerous chemicals that occur as residues on the final product. Reduced residues would also improve the farmers' access to markets in the developed world.

8. Estimated Budget (in U.S. Dollars)

Item	Year 1	Year 2	Year 3	Year 4	Total
Latin America					
CIAT HQ					
Personnel					
.50 Breeder	60,000	63,600	67,500	71,500	262,600
.25 Pathologist	28,000	29,700	31,500	33,400	122,600
.25 Entomologist	28,000	29,700	31,500	33,400	122,600
.20 SocioEconomist	15,000	15,900	16,800	17,800	65,500
Supplies and Services					
Ops-breeding	60,000	60,000	60,000	60,000	240,000
Ops-entomology	35,000	40,000	45,000	35,000	155,000
Ops-pathology	45,000	40,000	45,000	40,000	170,000
Training	75,000	75,000	50,000	50,000	250,000
Strengthening NARS	25,000	25,000	25,000	25,000	100,000
Indirect Costs (29.5%)	109,445	111,775	109,828	108,000	439,048
Total	**480,445**	**490,675**	**482,128**	**474,100**	**1.927,348**
CIAT Africa					
Personnel					
.50 IPM specialist	60,000	63,600	67,500	71,500	262,600
Supplies and Services					
Ops-IPM	25,000	30,000	30,000	25,000	110,000
Ops-Uganda	10,000	10,000	10,000	10,000	40,000
Ops-Kenya	10,000	10,000	10,000	10,000	40,000
Misc. (seed, etc)	20,000	20,000	10,000	10,000	60,000
Training	35,000	35,000	30,000	30,000	130,000
Indirect Costs (15%)	24,000	25,290	23,625	23,475	96,390
Total	**184,000**	**193,890**	**181,125**	**179,975**	**738,990**
Grand total	**664,445**	**684,565**	**663,253**	**654,075**	**2.666,338**

Project Description

Project Goal:To reduce environmental degradation due to excessive pesticide use, and reduce threats to food security, resulting from insect and disease damage

Project Purpose
To reduce pesticide use on snap beans though the generation of diseases and insect resistant varieties and through the development and implementation of IPM systems

Output 1
Tropical snap bean varieties resistant to diseases and insects are generated

Activities

1.1. Verification of sources of resistant
1.2. Identification of new sources of resistance
1.3. Development and selection of populations
1.4. Testing of advanced lines with farmers through participatory methods

Output 2
Pesticide use in target areas diagnosed

Activities

2.1. Surveys of pesticide use in target areas
2.2. Measurement of yield losses due to insects and diseases
2.3. Determination of insecticide resistance levels
2.4. Determination of insect and disease related crop protection costs

Output 3
IPM components developed

Activities

3.1 Testing of non-chemical methods of control
3.2 Development of action thresholds for rational insect control
3.3 Development of an IPM system

Output 4
IPM systems tested and implemented. Adoption rates measured

Activities

4.1. Testing in farmer's fields of adoptive technology
4.2 Participatory research trials
4.3 Economic evaluation of IPM in comparison with farmers' methods of control
4.4 Surveys to identify adopters and non-adopters
4.5 Surveys to measure adoption

Output 5
Results are disseminated

Activities

5.1 Training of National scientist in IPM methodologies
5.2 Training of national scientist in measurement of IPM adoption rates
5.3 Manuals, leaflets, field days, farmer's tours
5.4 Publications