V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Global Food Security and Hunger - Plant genetic resources, breeding and production systems

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms			12%	
202	Plant Genetic Resources			30%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			20%	
204	Plant Product Quality and Utility (Preharvest)			5%	
205	Plant Management Systems			33%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	17.0	0.0
Actual Paid Professional	0.0	0.0	11.3	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	1200786	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	1174175	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Last year work continued on the selection and purification of germplasm of traditional crops and on the development of improved cultivars. White-seeded bean lines with resistance to BGYMV, BCMNV and bruchids were selected at the Isabela Substation. We also selected white-seeded lines with BGYMV and BCMNV resistance and earlier maturity. These lines will provide local growers with greater flexibility in the harvest of green-shelled beans.

Evaluation of germplasm collections of different crops also continues around the island. Citrus germplasm collections are being maintained in screenhouses at Isabela and Rio Piedras. Rootstock evaluation of 'Tahiti' lime at Corozal and Isabela is in its third year of harvest. At both localities, rough lemon is the highest yielding rootstock. New citrus rootstocks will soon be released. Regarding our musa gene bank, the FHIA 21 plantain hybrid shows a higher tolerance to the Black Sigatoka disease compared with the Maricongo clone, when the disease is not chemically managed. In root crops, five tropical-type genotypes of sweet potato, previously imported from the Sweet Potato Clonal Repository of the USDA, have been selected as potential releases. This group has improved ability to sustain low irrigation regimes.

Lack of quality seed continues to be one of the major production constraints identified by growers in our yearly meetings with stakeholders. To help palliate this need, the seed production programs established at the Isabela and Lajas substations continue to increase the seed bank. At Isabela, seed sales generated $70,000 in gross income; the economic benefits to farmers far exceded this amount. Production of certified organic seed of adapted crop varieties at the Lajas substation makes an important contribution to the development of an organic agriculture industry in Puerto Rico. Since its inception three years ago, over 15,000 packages of organic seeds have been distributed to growers, homeowners, gardeners and nonprofit organizations throughout the Island.

Research activities on production systems focused on devising alternatives to inorganic fertilizers, given the increase in the price of this input in recent years. Accordingly, studies continued on the evaluation of controlled release fertilizers on plantain; on the liming of acid soils as an approach to increase fertility; on evaluating non-conventional fertilization systems for citrus and pineapple; and on the efficacy of slow and controlled release nitrogen and potassium fertilizer in coffee production.

Collection of information from stakeholders on issues of importance to this program was also an ongoing activity. A survey for the detection of Phytophthora fungus was conducted on citrus commercial fields with different rootstocks on the San Sebastián area, and in experimental plantings at UPR's substations. Program participants continued making the results and accomplishments of their activities available to the research community and to the public at large through field days, scientific journal publications, web-based publications, participation in conferences, and through radio programs.

2. Brief description of the target audience

Targeted audience consists of farmers, government professionals, legislators, county agents, scientists, USDA professionals, agricultural professionals from the private sector, organic producers, gardeners, and nonprofit organizations.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2012

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	16	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of farmers planting newly released varieties developed by PRAES.
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Focus groups of collaborators' opinion of the new technologies being validated
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- The number of 'hits' on project-related web sites. Records of the sale of hard copies of AES publications.

Year **Actual**

2012	6000

Output #4

Output Measure

- Records of the number and type of germplasm accessions distributed to scientists and the public.

Year	Actual
2012	1951

Output #5

Output Measure

- Number of participants in the field days coordinated with Extension

Year	Actual
2012	388

Output #6

Output Measure

- Number of students attending field days to seed production fields, germplasm collections and other experimental fields.
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of refereed publications.

Year	Actual
2012	16

Output #8

Output Measure

- Number of non-refereed publications.

Year	Actual
2012	14

Output #9

Output Measure

- Number of presentations in scientific meetings.

Year	Actual
2012	26

Output #10

Output Measure

- Number of research proposals submitted addressing Global Food security and hunger.

Year	Actual
2012	8

Output #11

Output Measure

- Number of MS Thesis related to Global Food security and hunger.

Year	Actual
2012	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of stakeholders to adopt the proposed BMPs.
2	Records of the sales of seed of improved cultivars at the Substations.
3	Percentage of locally produced food.

Outcome #1

1. Outcome Measures

Number of stakeholders to adopt the proposed BMPs.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farmers in Puerto Rico need to increase yield and reduce production costs in order to be able to compete in a global economy. In addition to greater efficiency and profitability, more sustainable agricultural practices need to be developed to take advantage of natural services and to minimize negative impact on the environment.

What has been done
Printed copies of technology packages for different crops are distributed to farmers. Electronic versions and organic fact sheets are available on the internet. BMPs are also discussed at field days and workshops sponsored by the PRAES and the Extension Service. Improved cultivars are an important component of BMPs. Seed of these improved cultivars are produced by the PRAES. Organic demonstrative gardens and field plots have been established at two substations.

Results
The PRAES seed program offers for sale seeds and seedlings of improved cultivars that are adapted to local conditions. PRAES provides vital support for the continued production of traditional crops because seed is not usually available from the private sector in Puerto Rico. The number of stakeholders, especially farmers, attending activities sponsored by the PRAES has continued to increase, which suggests an increased willingness of producers to adopt BMPs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #2

1. Outcome Measures

Records of the sales of seed of improved cultivars at the Substations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1951

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farmers frequently comment that a lack of high quality seed and propagation material limits the acreage and production of food crops.

What has been done
The PRAES seed programs offered for sale seeds and sets of varieties adapted to local conditions and management systems.

Results
The sale of seeds and seedlings of improved cultivars remained strong during 2012. We believe this is an indicator of farmer support and adoption of improved cultivars developed by the PRAES plant breeding programs. Recorded statistics improved markedly after a digital database was established to monitor the sale of seed at the Isabela substation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #3

1. **Outcome Measures**

Percentage of locally produced food.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

Factors affecting our performance showed little change from those portrayed in past reports. The prolonged economic recession affecting Puerto Rico and the strategies adopted by the government to handle it have resulted in falling appropriations for the state university and concomitant reductions in the local funds available for research. The price of fertilizers and other inputs also remained high, directly affecting the profitability of crop production and farmers capacity to incorporate more of the recommended practices into their operations.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No formal evaluation results are yet available for this program.

Key Items of Evaluation