Final Report
Title: Enhancing Food and Feed Productivity of Pigeonpea in Guatemala
Institution: Virginia State University, Petersburg, VA 23806 (PI/PD: HL BHARDWAJ)
Funding: USDA-FAS-2014 Scientific Cooperation Research Program (SR-CR-14-001)

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Background:
This project was funded by USDA-FAS from July 14, 2014 to December 31, 2016 (FAS Agreement Number: SR-CR-14-001) with an objective of improving Pigeonpea production in Guatemala to reduce hunger. Pigeonpea is known as GANDULE and has a long history of production. However, pigeonpea yield level in Guatemala is quite low. The plan consisted of PI/PD of this project (BHARDWAJ) to supply several improved lines from Virginia State University’s pigeonpea breeding program to Guatemalan cooperator (Zurita) for production at several locations in Guatemala and to select high performing lines for multiplication and distribution to farmers. Additional plans included Guatemalan cooperator to visit VSU before the project initiation and three US investigators visiting Guatemala during project initiation to ensure appropriate execution of proposed activity.

Execution:
1. Mr. Zurita visited VSU in November, 2014 and was exposed to several aspects of pigeonpea production including field and greenhouse production, Biological N Fixation, harvesting, etc.
2. PI/PD of this project sent 100 improved pigeonpea lines from VSU’s pigeonpea breeding program to Mr. Zurita in October, 2015.
3. These 100 lines were grown at three locations in Petén region of Guatemala from November 2015 to May 2016 (First Planting). These lines were also grown at same three locations in Petén region of Guatemala from June – December, 2016 (Second Planting).
4. Based on results of first planting, one pigeonpea line (VSU#91) was identified to be a superior line for Guatemala. This line produced 2021.2 kg/ha in a replicated field trial as compared to traditional approximate seed yields of 400 kg/ha in Guatemala. Obviously,
this result was received with great satisfaction by investigators, administrators, and farmers.

5. Line VSU#91 was planted in 2016 in the municipality of San Francisco (Petén, Guatemala) with the collaboration of a local farmer to multiply the seed.

6. Three VSU investigators visited Guatemala from October 2-6, 2016 and observed the multiplication of VSU#91 line. This line's growth was quite impressive.

7. The local farmer obtained 109 kg seed of VSU#91 from his planting in December, 2016.

8. This seed will be distributed, during 2017, through the National Rural Extension System of the Ministry of Agriculture, Livestock and Food (MAGA), to 26 families of farmers in three regions of Guatemala (San Benito, San José and Flores) for further observations and to multiply the seed.

9. These 26 families will collaborate with the further development of this project to improve pigeonpea production in Guatemala as a source of food and feed in Guatemala and thus contribute to improving the quality of life of Guatemalan farmers.

10. The field trials at three locations over two plantings in Petén region of Guatemala have also identified three additional pigeonpea lines (VSU#17, VSU#33, and VSU#35) as promising lines. These lines will be planted during 2017 at several locations for further evaluation and to multiply the seed. Evaluations of all 100 lines from VSU will also continue during 2017 and beyond to continuously undertake identification of superior-yielding lines. It is expected that these efforts will be successful given that considerable out-crossing occurs in pigeonpea to produce hybrid progenies for future selections.

11. This project trained three undergraduate students (Edras Nehemias Lopez Tesucun, Jose Rafael Cuellar Dubon, and Henry Dinael Chan Chavez) for planting, maintenance, and harvesting of pigeonpea, data recording, and applied plant breeding. Each student fully managed pigeonpea production at one of the selected locations. It is expected that development of this scientific workforce will help in improvement in Guatemalan agriculture and food production in the future.

12. The three VSU investigators interacted with several Guatemalan research and extension personnel during their visit in October, 2016 and made them familiar with various aspects of introduction and establishment of food crops. Some discussions focused on expansion of this project via reciprocal visits of Guatemalan and US personnel and to include more crops (Moth bean, Mungbean, and Tepary bean from VSU's New Crops Program) in the future efforts.

13. The three VSU investigators also visited with senior personnel from Rural University of Guatemala, and Guatemalan Ministry of Agriculture, Livestock, and Food (MAGA) in Guatemala City and at the farms in Petén region of Guatemala including National Vice Minister of Guatemalan Agriculture. These personnel indicated their sincere appreciation for USDA-FAS and Virginia State University for this effort.

14. This project was considered HIGHLY SUCCESSFUL.

**Future of This Effort:**

- Preliminary discussions have indicated that a GREAT opportunity exists to expand the pigeonpea project in Guatemala via identification of additional pigeonpea lines adapted to Petén and other regions; introduction, evaluation, and establishment of additional crops in Guatemala (Mothbean, Mungbean, and Tepary bean) from VSU's New Crops Program.
- Training of Guatemalan Extension personnel and students at Virginia State University.
USDA-FAS supported Guatemala Pigeonpea Project in Pictures

Project Team (From left: Henry Dinael, Hugo Zurita, Dr. Michelle Corley, Dr. Reza Rafie, Dr. Harbans Bhardwaj, Edras Tesucun, and Rafael Dubon)

Visit to Plots during October, 2016
Visit with an Indigenous Community where seeds of Pigeonpea line VSU#91 were used to prepare food
Field of Pigeonpea line VSU#91 during October, 2016 (For Seed Multiplication)
Planning Meeting in Guatemala City before Project Initiation (Mr. Zurita made a presentation to Guatemalan Ministry of Agriculture officials)
Pigeonpea Production at three locations in Guatemala (Petén Region)
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Pigeonpea Production at three locations in Guatemala (Petén Region)
VSU#91 – Superior Pigeonpea line selected from 100 pigeonpea lines supplied to Guatemalan cooperator by Virginia State University. This line has performed extremely well in Petén region of Guatemala and is being multiplied to supply seed to several farmers.
VSU Investigators Visiting with Rural University of Guatemala Officials

Guatemalan Ministry of Agriculture and Rural University Personnel presenting an appreciation plaque to VSU investigators (October 5, 2016)

Plaque given to VSU Investigators (October 5, 2016)
VSU Investigators visiting with Vice Minister and staff, Guatemalan Ministry of Agriculture on October 3, 2016