

**The Department of Agriculture (USDA) – Foreign Agricultural Service (FAS)
Office of Capacity Building and Development**

**Notice of Funding Opportunity (NOFO)
Borlaug Fellowship Program**

A. Program Description

Program Overview, Objectives, and Priorities

The Borlaug International Agricultural Science and Technology Fellowship Program (Borlaug Fellowship Program) advances USDA’s agricultural research goals of promoting collaborative programs among agricultural professionals of eligible countries, agricultural professionals of the United States, the international agricultural research system, and United States entities conducting research by providing fellowships to individuals from eligible countries who specialize or have experience in agricultural education, research, extension, or other related fields. Fellowships promote food security and economic growth in eligible countries by educating a new generation of agricultural scientists, increasing scientific knowledge and collaborative research to improve agricultural productivity, and extending that knowledge to users and intermediaries in the marketplace. The collaborative nature of the training and research programs not only benefits the Fellow, his or her home institution, and partner country; the U.S. host institution, its professors, researchers, and students; and the global agricultural sector by improving agricultural productivity, systems, and processes in partnering nations through the transfer of new science and agricultural technologies.

USDA will identify Borlaug Fellows based on country-specific topics of importance to international, agricultural trade. USDA then places Fellows with U.S. research institutions for 10-12 week, intensive programs. These programs are expected to contribute to the strategic goals and objectives of the fellow and those institutions through a hands-on experience in a “real-world” agricultural research scenario, providing opportunity for application of research agendas where they can have a direct impact on food security and economic growth in an emerging economy. It is hoped that host institutions will share the knowledge gained through the program in their classroom and extension work with their faculty, students, extension officers, and constituents; and that they will continue to maintain professional contacts with the fellows after their departure from the United States.

Borlaug fellows may be identified in any of the topics listed below:

(A) Plant Health – Fall Armyworm

PLACE OF PERFORMANCE

- The applicant is expected to host fellows at a research facility on their campus in the United States.
- The mentor is expected to make a reciprocal visit of up to two weeks to the fellow’s home institution, which may be in a developing country.

EXPECTATIONS:

(1) Assignment of a Principal Investigator (Training Coordinator)

The host institution will designate a contact person as the Principal Investigator (PI) responsible for coordinating all administrative and programmatic arrangements.

(2) Assignment of a Mentor

A key component of the program is matching the Fellow with a mentor. The host institution will select an appropriate mentor for one-on-one work with the Fellow for the duration of the program.

- The mentor will establish a professional relationship, providing guidance and training in the Fellow's research and studies.
- The mentor will work with the Fellow before arrival to discuss appropriate work plan, site visits, and other arrangements. A work plan should be agreed upon and finalized no later than 2 weeks after the program start date.
- The mentor will provide draft of work plan through the PI to USDA/FAS for consultation and approval approximately 2 weeks before the commencement of the program.
- The mentor agrees to commit a significant amount of time each week for one-on-one work with the Fellow during the program.
- The mentor will continue communicating with the Fellow beyond the end of the program in the U.S. through the mentor visit.
- Mentor will submit quarterly progress reports that indicate all program activities conducted (form SF-PPR).
- The mentor may assign other faculty members to assist with Fellow's training and research activities.
- Mentor may not be assigned to multiple Fellows during the same time frame.

(3) Mentor Follow-up Visit

- The mentor visit is a required component of the Borlaug Fellowship Program.
- The mentor will work with the Fellow to plan a follow-up visit to the Fellow's home country. The trip should occur within 6 months to 1 year after the program ends.
- The PI should provide USDA/FAS with an agenda for mentor's travel, including goals and objectives. The mentor's travel information must be provided for emergency contact purposes and country clearance (if required by the cognizant FAS Overseas Office).
- The mentor will provide a trip report highlighting the trip's activities and results through the PI to USDA/FAS within 30 days after the visit.
- The mentor should plan to meet with the USDA/FAS Attaché or staff from the U.S. Embassy while they are traveling, if feasible. USDA/FAS can assist with coordination prior to the trip.

(4) Visa

- USDA/FAS will provide a DS-2019 for the Fellow to request and obtain a J-1 Visa. USDA/FAS will provide instructions to the Fellow regarding the application process, the amount of lead-time needed, and any paperwork required. The visa start and end date

will be coordinated with the host institution who will be responsible for purchasing round trip plane tickets for the fellow to come to the U.S. for his or her program.

- Fellows, including those already in possession of another valid U.S. visa, must still obtain a J-1 visa to participate in the program. Fellows will be refused entry if they arrive in the United States without the appropriate category of visa.

(5) Travel and Transportation

- The host institution must comply with the Federal Travel Regulations (41 CFR 300 et seq.).
- The host institution will provide round trip, economy class, international airfare from the Fellow's home to the university.
- The host institution is responsible for arranging and purchasing all domestic travel related to the Fellow's training program.
- The host institution will provide housing for the Fellow for the duration of the training program, taking into account gender and cultural norms.
- The host institution will pay lodging fees directly. The host institution will not require the Fellow to pay for his or her lodging expenses, whether through reimbursement or advance payment.
- Lodging will include a private bedroom, private or shared bathroom, access to a laundry room, and access to a kitchen with pots, pans, and utensils.
- Basic necessities, such as sheets, towels, and cleaning supplies (if not already provided), will be provided for Fellow's use. The Fellow should not have to pay for these items.
- Lodging will be within walking distance to the campus/training location or easily accessible by public transportation.
- If public transportation is required to access campus/training location, the host institution will provide the Fellow with a bus pass or proper allowance for transportation expenses.
- When planning lodging options, the host institution should check with the Fellow and account for any special dietary restrictions or preferences.

(6) Meals and Incidentals (M&IE)

- The host institution will provide each Fellow with meal and living allowances for the duration of stay.
- Daily M&IE allowance may not exceed current [GSA per diem rates](#).
- The host institution can determine the frequency of per diem allotments, but the Fellow must receive per diem within the first week of the Fellowship. The PI must inform the Fellow and USDA/FAS immediately if this cannot be accommodated.

(7) Emergency Health Insurance

- The host institution will purchase emergency health insurance for the Fellow for the duration of stay, as required for all J-1 Visa holders ([22 CFR 62.14](#)).
- The Fellow will not be required to purchase his or her health insurance and then be reimbursed.

- The host institution will educate the Fellow as to what is covered under health insurance policy, especially highlighting that pre-existing medical conditions are not covered.
- The host institution will alert USDA/FAS staff if any health/medical conditions arise during the Fellowship.

(8) Communication

- The host institution will initiate contact with the Fellow as soon as possible.
- The host institution will develop the training program in consultation with USDA/FAS and the Fellow.
- The host institution will keep USDA/FAS informed regarding any logistical or program planning.
- The host institution will notify USDA/FAS immediately upon Fellow's physical arrival and departure from the U.S. to comply with U.S. Department of Homeland Security requirements
- The host institution will provide USDA/FAS with the Fellow's temporary U.S. address and phone number, and emergency contact numbers for the PI, mentor, or other appropriate institution personnel. This information is required so that Fellow can be reached in the event of an emergency.

(9) Fellowship Program

- The host institution will provide educational materials and supplies to each Fellow necessary for their full participation in the fellowship.
- The host institution will pay for all fees related to the Fellow's training program, such as (but not limited to) technology fees, administrative fees, laboratory fees, etc.
- The host institution will arrange relevant field visits as applicable to the Fellow's training program.
- The host institution will ensure the Fellow submits an interim and final report (2-3 pages each) to USDA/FAS before the Fellow leaves the United States.

(10) Orientation

- The PI/Training Coordinator will communicate directly with the Fellow at least 4-8 weeks before his or her arrival in the U.S. to ensure that all pertinent information is provided, including:
 - Name and contact information of PI/Training Coordinator
 - Name and contact information of mentor
 - Institution information, weather information, and clothing needs
 - Housing and M&IE allowance
 - Program plan and anticipated site visits
 - Professional development expectations
 - Reminder to bring any necessary prescription medications
 - Explain what is and is not covered under emergency health insurance policy (e.g. no pre-existing conditions, no dental, etc.)

- Institution will provide an orientation upon the Fellow’s arrival to acquaint them with campus and community resources, such as:
 - Explanation and demonstration of local bus/transportation options
 - Explanation of cultural and legal expectations
- USDA will provide a welcome and orientation packet for mentors

Issued By

Foreign Agricultural Service, Office of Capacity Building & Development, Trade & Scientific Exchanges Division, Scientific Exchanges Branch

Catalog of Federal Domestic Assistance (CFDA) Number and Title

10.777

Norman E. Borlaug International Science and Technology Fellowship Program

Notice of Funding Opportunity Title

Borlaug Fellowship Program

NOFO Numbers

USDA-FAS-10777-0700-10.-18-0044 – Fellow 14, South Africa

USDA-FAS-10777-0700-10.-18-0045 – Fellow 15, South Africa

USDA-FAS-10777-0700-10.-18-0048 – Fellow 18, Zambia

USDA-FAS-10777-0700-10.-18-0049 – Fellow 19, Zambia

USDA-FAS-10777-0700-10.-18-0050 – Fellow 20, Zambia

Authorizing Authority for Program

The legislative authority for the Borlaug Fellowship Program is provided in Sec. 7139 of the Food, Conservation, and Energy Act of 2008 (PL 110-234), as incorporated in to the National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended.

Appropriation Authority for Program

Consolidated Appropriations Act, 2017 (PL 115-31)

Program Type

New

B. Federal Award Information

Award Amounts, Important Dates, and Extensions

Available Funding for the NOFO: Each award (for one fellow) is up to \$50,000.

Projected number of Awards: 5

Number of Project Budget Periods: 1

Projected First Budget Period: N/A

Projected Period of Performance Start Date(s): Subject to the availability of implementer and Fellows.

Projected Period of Performance End Date(s): 18 months after the start date

Extensions are allowable, please see Section H. Additional Information to see how to requests one should the need arise.

Pre-Award costs: Not Allowable

Cost Share or Match requirements: A cost match or cost share is not required.

Funding Instrument

USDA will enter into a cost reimbursable agreement under 7 USC § 3319a with selected universities.

C. Eligibility Information

Eligible Applicants

Proposals may be received from U.S. State Cooperative Institutions or other colleges and universities, including minority serving institutions (MSIs).

A single mentor may not host two fellows simultaneously. Both the PI and mentor must hold positions at an eligible U.S. institution.

Eligibility Criteria

All applicants must have an active registration in the SAM database at www.sam.gov – pending or expired registrants are not eligible. This requirement must be met by the closing date of the announcement and will not be waived. Please contact the program officer listed if you have questions about this requirement.

In addition to obtaining a DUNS number and registering in SAM, you must also obtain Level 2 eAuthentication to apply for this funding opportunity in ezFedGrants (eFG). You must submit an online form requesting access. Normally you will receive an email within 24 hours of your submission, if your request is approved. After this occurs, you will need to schedule an appointment with an LRA. Once you meet with the LRA, your Level 2 eAuthentication should be granted within 2 to 3 days after that meeting. See Section D of this NOFO for detailed information.

Maintenance of Effort (MOE)

MOE is not allowable.

D. Application and Submission Information

Key Dates and Times

Application Start Date:	05/21/2018
ezFedGrants Posting Date:	05/21/2018
Application Submission Deadline:	06/18/2018 at 11:59PM EST
Anticipated Funding Selection Date:	Approximately 2-3 weeks after the submission deadline, subject to the availability of funding
Anticipated Award Date:	Approximately 2-3 weeks after selection, subject to the availability of funding

Address to Request Application Package

This NOFO represents the full application information.

Applications will be processed through the ezFedGrants portal at <https://grants.fms.usda.gov> – prospective applicants are encouraged to register for this portal. Applicants that are unable to access the ezFedGrants portal should contact the program manager for alternative submission instructions. Note that if selected, registration is a requirement of performance.

Content and Form of Application Submission

Institutions must be able to host multiple groups over the period of performance and should submit a proposal following the guidelines below:

- Required forms and certifications, including:
 - [SF-424 version 2.1](#), with an OMB Expiration Date of 10/31/2019
 - [SF-424A version 1.0](#), revised July 1997. This should be accompanied by a detailed budget worksheet and a detailed budget narrative (NOTE: A budget narrative must be provided). All line items should be described in sufficient detail that would enable FAS to determine that the costs are reasonable and allowable for the project per federal regulations. An example budget narrative is included in the appendix, but is not required.
 - [AD-3030](#), revised February 2016
 - [AD-3031](#), revised February 2016
- Indicate the name of the institution applying to host the Fellows.

- Indicate the country, research interest, and reference number.
- Identify a Primary Investigator.
- Identify a Mentor. A Mentor may not be assigned to multiple Fellows who are in the U.S. at the same time.
- Provide a tentative research plan based on the Fellow's research proposal and action plan, including topics covered, field visits, and other activities.
- Include a narrative description of the proposed fellowship, how it will be administered, and the role of the university faculty and support staff.
- Provide a summary of relevant institutional capabilities for hosting international scientists and policymakers in the proposed field.
- Briefly describe the research expertise and international experience of the mentor in the Fellow's field of interest.
- Provide a one to two page curriculum vitae for the mentor and other collaborating researchers involved in the proposed program.
- Identify the expected skills or knowledge to be acquired by the Fellow at the end of the program
- If attending the World Food Prize, the budget should include time and funding for the Fellow and Mentor to attend. An adjustment to the Fellow's M&IE must be made for the time spent in Iowa.

The SF-424 and SF-424 A can be completed within the ezFedGrants platform. However, the other required forms must be downloaded from the Forms sections on Grants.gov. The Certification regarding Lobbying and the Grants and Agreement Coversheet will be sent to you along with this NOFO.

Unique Entity Identifier and System for Award Management (SAM)

The link below provides information on 2 CFR §25.110. Please read.

<https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=1&SID=7a45f973880240465cd255471f1380ef&ty=HTML&h=L&mc=true&n=pt2.1.25&r=PART>

FAS is using ezFedGrants to post NOFO's and issue agreements, which is an electronic grants management system. Applicant(s) with electronic access are to submit their applications electronically through:

<https://grants.fms.usda.gov>

Before you can apply, you must have a DUNS number, be registered in SAM, and have access to the ezFedGrants website).

Applicants are encouraged to register early. Due to recent changes in the SAM platform, the registration process can take 6-8 weeks to be completed. Therefore, registration should be done in sufficient time to ensure it does not impact your ability to meet required submission deadlines.

DUNS number. Instructions for obtaining a DUNS number can be found at the following website: <http://www.dnb.com/duns-number.html>

The DUNS number must be included in the data entry field labeled "Organizational DUNS" on the Standard Forms (SF)-424 forms submitted as part of this application.

System for Award Management. In addition to having a DUNS number, applicants applying electronically through ezFedGrants must register with SAM. Step-by-step instructions for registering with SAM can be found here:

www.sam.gov

Failure to register with SAM will result in your application being rejected during the submissions process.

ezFedGrants System Access and Electronic Signature

Level 2 eAuthentication. The next step in the registration process is to obtain a Level 2 eAuthentication account that will allow access to the ezFedGrants system. Instructions for getting a Level 2 eAuthentication account can be obtained by emailing ezFedGrants@cfo.usda.gov.

You may also request Level 2 eAuthentication online at:
<https://www.eauth.usda.gov/MainPages/index.aspx>

If you experience any issues with self-registration or have eAuthentication-related questions, please contact the eAuthenticationHelpDesk for assistance:
By email to eAuthHelpDesk@ftc.usda.gov

Requesting a role in ezFedGrants.

After obtaining eAuthentication, users will need a role in the system. Descriptions of the roles available and instructions on how to request a role can be obtained by emailing ezFedGrants@cfo.usda.gov

You may also go into the link below for instructions on requesting eFG access. The document is called "External Portal Access Request Submission".

https://www2.nfc.usda.gov/FSS/Training/Online/ezFedGrants/access_user_roles.php

Electronic Signature. Applications submitted through ezFedGrants constitute a submission as electronically signed applications. When you submit the application through ezFedGrants, the name of your Signatory Official on file will be inserted into the signature line of the application.

If you experience difficulties accessing information or have any questions please email the Helpdesk at ezFedGrants@cfo.usda.gov.

The Federal awarding agency may not make a Federal award to an applicant until the applicant has complied with all applicable DUNS and SAM requirements and, if an applicant has not fully complied with the requirements by the time the Federal awarding agency is ready to make a Federal award, the Federal awarding agency may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

Intergovernmental Review

This program is not subject to E.O. 12372.

Funding Restrictions

This will be a cost reimbursable agreement issued under 7 USC § 3319a. University indirect costs for cost reimbursable agreements are limited to 10% of modified total direct costs (MTDC).

Allowable Costs:

1. Salaries and Fringe Benefits:

Requested funds may be allocated toward salaries, fringe benefits, or the combination thereof. No more than 20% of the requested funds may be allocated toward salaries, consultant fees, fringe benefits, or the combination thereof. Only individuals that hold positions at eligible U.S. institutions should be listed in this category.

2. Travel:

For domestic travel, provide the purpose of the travel and information used in calculating the estimated cost, such as the destination, number of travelers, and estimated cost per trip. There are several restrictions associated with traveling on federal funds. In most cases, airfare must be purchased in economy class from a U.S. carrier. Travelers must also adhere to federally mandated domestic per diem guidelines. Additional information may be found in the circulars listed in the “Legislative Authority” section of this announcement.

3. Supplies:

All personal property excluding equipment, intangible property, and debt instruments as defined in this section.

4. Other Direct Costs:

Other Direct Costs are those anticipated charges not included in other budget categories, including materials and supplies, lab fees, publication costs, reasonable consultant fees, computer services, sub-awards (the level of detail required for the sub-award budget is the same as the recipient organization), equipment rental, facility rental, conferences and meetings, speaker fees, honorariums.

5. Indirect Costs:

Indirect Costs may not exceed 10% of direct costs (7 USC 3319a).

6. Tax Withholding:

Borlaug Fellows (as trainees, *not* students) are considered EXEMPT INDIVIDUALS under the IRS Substantial Presence Test for tax purposes. The exemption falls under one or both of the following categories: either the [Foreign Government-Related Individuals](#) standard or the [Closer Connection Exception](#). Tax treaties might also exist between the U.S. and the Fellow's home country. The only requirement is to complete [IRS Form 8843](#) (Sections 1 and 2). No taxes should be withheld from Borlaug Fellows since they are exempt.

Unallowable Costs:

General purpose equipment (no particular scientific, technical, or programmatic purpose) and scientific equipment exceeding \$5,000 or more; entertainment; any stipend or remuneration for the fellow, other than ordinary allowances for meals and supplies; capital improvements; thank you gifts, and other expenses not directly related to the project are not allowed. "Please note, Borlaug Fellows (as trainees, not students) are considered EXEMPT INDIVIDUALS under the IRS Substantial Presence Test for tax purposes. The exemption falls under one or both of the following categories: either the Foreign Government-Related Individuals standard or the Closer Connection Exception. The only requirement is to complete IRS Form 8843 (Sections 1 and 2). These funds are for federal financial assistance; as such no taxes should be withheld from Borlaug Fellows since they are exempt."

Management and Administration (M&A) Costs:

M&A costs are not allowable.

Indirect Facilities & Administrative (F&A) Costs.

By statute, indirect costs for cost reimbursable agreements cannot exceed 10% of direct costs.

Other Submission Requirements

All applications must be submitted electronically as indicated above.

E. Application Review Information

Application Evaluation Criteria

Prior to making a Federal award, the Federal awarding agency is required by 31 U.S.C. 3321 and 41 U.S.C. 2313 to review information available through any OMB-designated repositories of government-wide eligibility qualification or financial integrity information. Therefore application evaluation criteria may include the following risk based considerations of the applicant: (1) financial stability; (2) quality of management systems and ability to meet management standards; (3) history of performance in managing federal award; (4) reports and findings from audits; and (5) ability to effectively implement statutory, regulatory, or other requirements.

Technical Expertise and Experience (40 points)

Mentor must have appropriate technical background to provide the desired, advanced training. If necessary, other appropriate collaborating scientists should be identified to meet any of the objectives which the mentor cannot address. Mentor's experience and knowledge of relevant agricultural conditions within the Fellow's country or a similar location will be considered as appropriate. The trainer's experience with international training and adult-education will also be considered.

Overall Program (35 points)

The overall program plan and design should be relevant to the Fellow's objectives background. The program plan should be thorough, and it should help achieve the desired post-program deliverables and the Fellow's research goals and objectives. Relevant agricultural practices within the region of the university will be considered as appropriate. Relevant university resources should be identified. Additional resources/organizations should be identified as appropriate. Site visits and meetings should be meaningful to the content of the program, if included.

Budget (25 points)

The proposed budget should be appropriate for the number of Fellows and length of the program. The budget should include appropriate cost savings where available and narrative should accompany each line item. Host is strongly encouraged to use the Budget Worksheet provided in this NOFO.

Review and Selection Process

In all cases, the Program Manager will ensure application is submitted on time as specified in this announcement. Also, the Program Manager will ensure the organization is capable of delivering the program/activities as described in the announcement based on the applicant's project narrative.

Qualified applications will be referred to a panel of 2-3 program staff and/or technical experts, and adjudicated among the criteria described above. In general, the highest-rated proposal will be selected, however, FAS may occasionally select out of score order for policy reasons, such as geographic distribution, incorporation of minority-serving institutions, past experience, etc.

Confidentiality and Conflict of Interest

Technical and cost proposals submitted under this funding opportunity will be protected from unauthorized disclosure in accordance with applicable laws and regulations. FAS may use one or more support contractors in the logistical processing of proposals. However, funding recommendations and final award decisions are solely the responsibility of FAS personnel.

FAS screens all technical reviewers for potential conflicts of interest. To determine possible conflicts of interest, FAS requires potential reviewers to complete and sign conflicts of interest and nondisclosure forms. FAS will keep the names of submitting institutions and individuals as well as the substance of the applications confidential except to reviewers and FAS staff involved in the award process. FAS will destroy any unsuccessful applications after three years following the funding decision.

F. Federal Award Administration Information

Notice of Award

Notice of award will be given to the institution via email. This email is not an authorization to begin performance. The notice of Federal award signed by the grants officer (or equivalent) is the authorizing document through electronic means. It should also indicate if there are any pass-through obligations that successful applicants are required to meet upon receiving award funds, including specific timeline requirements.

Administrative and National Policy Requirements

All successful applicants for all grant and cooperative agreements are required to comply with Standard Administrative Terms and Conditions for Overseas Federal Assistance Awards, which can be found on the FAS website:

https://www.fas.usda.gov/grants/general_terms_and_conditions/default.asp

The applicable Standard Administrative Terms and Conditions will be for the last year specified at that URL, unless the application is to continue an award first awarded in an earlier year. In that event, the terms and conditions that apply will be those in effect for the year in which the award was originally made.

Before accepting the award the Recipient should carefully read the award package for instructions on administering the grant award and the terms and conditions associated with responsibilities under Federal Awards. Recipients must accept all conditions in this NOFO as well as any Special Terms and Conditions in the Notice of Award to receive an award under this program.

Reporting

Federal Financial Reporting Requirements. The Federal Financial Reporting Form (FFR), as known as the SF-425, must be submitted semi-annually (the reporting period ending every 6 months after the start date of the agreement) within 30 days of the end of the reporting period, with the final FFR submitted within 90 days of the end of the agreement. The required form is available online at:

<https://www.grants.gov/web/grants/forms/post-award-reporting-forms.html#sortby=1>

At the top of the website select **FORMS**, and from the drop down box select **POST AWARD REPORTING FORMS**.

Program Performance Reporting Requirements.

Performance Progress Reporting must be submitted semi-annually (the reporting period ending every 6 months after the start date of the agreement) within 30 days of the end of the reporting period, with the final PPR submitted within 90 days of the end of the agreement, and should include details the activities undertaken and progress made during the reporting period.

Program Performance Requirements.

- Ensure that each Fellow completes the Borlaug Fellowship Program Evaluation.
- A brief Fellow final report before the fellow departs the U.S. (Template will be provided).
- The Principal Investigator or Mentor will submit a final report to USDA/FAS within 30 days after the Mentor visit. (Template will be provided).
- The Principal Investigator or Mentor will submit semi-annual progress reports.
- Reports should include the following:
 - Summary of activities, accomplishments, and any problems encountered or overcome
 - Photographs, when possible
 - Completed program evaluations and action plan
- An invoice/claim cannot be paid if a progress report is past due, and will not be paid until the required report has been received.

Close Out Reporting Requirements.

Within 90 days after the end of the period of performance, or after an amendment has been issued to close out a grant, whichever comes first, recipients must submit a final FFR and final progress report detailing all accomplishments and a qualitative summary of the impact of those accomplishments throughout the period of performance.

After these reports have been reviewed and approved by OCBD, a close-out notice will be completed to close out the grant. The notice will indicate the period of performance as closed, list any remaining funds that will be de-obligated, and address the requirement of maintaining the grant records for three years from the date of the final FFR.

The recipient is responsible for returning any funds that have been drawn down but remain as unliquidated on recipient financial records.

G. Awarding Agency Contact Information

Contact and Resource Information

For all general questions, contact:

Tim Sheehan, Branch Chief

Hours of operation: 9:00 AM – 4:30 PM Eastern Standard Time

Telephone: (202) 690-1940

E-mail address: BorlaugProposals@fas.usda.gov

1400 Independence Ave, SW #3226-South

Washington, DC 20250-1031

H. Additional Information

1. Extensions

Extensions to this program are allowed.

Applicants may request a no-cost extension in order to complete all project activities. The request must be submitted 60 days prior to the expiration of the performance period. Requests for extensions are subject to approval by FAS.

2. Prior Approval

The Recipient shall not, without the prior written approval of the FAS Program Manager, request reimbursement, incur costs or obligate funds for any purpose pertaining to the operation of the project, program, or activities prior to the approved Budget Period/Performance Period.

3. Budget Revisions

a. Transfers of funds between direct cost categories in the approved budget when such cumulative transfers among those direct cost categories exceed ten percent of the total budget approved in this Award require prior written approval by the FAS Program Manager.

b. The Recipient shall obtain prior written approval from the FAS Program Manager for any budget revision that would result in the need for additional resources/funds.

c. The Recipient is not authorized at any time to transfer amounts budgeted for direct costs to the indirect costs line item or vice versa, without prior written approval of the FAS Program Manager.

Appendix A

Borlaug Fellowship Program for Africa Middle East

Index of Fellowships

Fellow Reference Number	Country	Gender	Fellowship Length (weeks)	Research Focus
14	South Africa	Female	12	Using molecular techniques to determine which strain/s of Fall Armyworm are present in South Africa and in the surrounding sub-Saharan countries with a view to improving current Integrated Pest Management strategies.
15	South Africa	Female	12	Effect and risk assessment of the application of pathogens as natural regulatory agents to suppress Fall Armyworm (FAW) in five different host plants (from the viewing lens of South African conditions).
18	Zambia	Male	12	My proposed project will evaluate the use of Silicon to enhance Biological control of Fall Armyworm (<i>Spodoptera frugiperda</i>) through increased attraction of its natural enemies, with a hope of developing a cost effective, sustainable and ecologically friendly option for management of this pest.
19	Zambia	Female	12	To research integrated pest management for Fall Armyworm and to find out which IPM management option(s) is most effective for the control of fall armyworm in Zambia.
20	Zambia	Male	12	The trial to evaluate the efficacy of bio-pesticides in the control of the Fall Armyworm in Maize seeks to provide cost effective methods for small-holder farmers.

Individual Proposals and Action Plans

Fellow #14, South Africa, Female/ NOFO: USDA-FAS-10777-0700-10.-18-0044

“I would like to use molecular techniques to determine which strain/s of Fall Armyworm are present in South Africa and in the surrounding sub-Saharan countries with a view to improving current Integrated Pest Management strategies.”

1. Goal

The goal of my research is to genetically characterize the strain/s of Fall Armyworm (FAW), *Sprodoptera frugiperda* (Lepidoptera: Noctuidae) present in South Africa and surrounding sub-Saharan countries.

2. Specific Objective(s)

- Development of a reliable molecular identification method for FAW in South Africa
- Molecular identification of the strain/s present in various locations of South Africa and other sub-Saharan countries
- Estimation of dispersal ability by measuring genetic diversity between the established populations
- Determining whether the strains behave differently based on their collection information

3. Background Information

The Fall Armyworm is a devastating crop pest native to tropical and subtropical regions of North and South America. The juveniles feed on the leaves, stems and reproductive parts of over 100 host plants including economically important ones such as maize, cotton, groundnuts, sorghum, wheat, potatoes, soybean and sugarcane. It established in Africa in 2016 and spread to South Africa in 2017 where it has become particularly damaging to maize. FAW has become a definite threat to food security in sub-Saharan Africa, with predicted yield losses estimated to equal US\$ 6.7 billion per year. It is therefore crucial to establish a coordinated regional approach in the monitoring, diagnostics, containment and management of FAW.

FAW is similar in appearance to a number of other caterpillar pests present on maize. At present, identification is routinely based on morphological characteristics, usually requiring the skill of a Lepidoptera expert. The insect needs to be a late stage caterpillar or adult to be reliably identified. Early stage larvae get lab reared until they are identifiable. It can take up to 22 days before a diagnosis is made, giving the pest a chance to establish before suitable control methods can be employed.

Accurate identification of FAW is a critical step in effective pest control. Molecular identification is faster and more reliable than morphological identification, allowing for diagnosis of juvenile or damaged specimens. The species comprises two strains that are morphologically indistinguishable, but genetically distinct (Cock et al. 2017). Their respective distribution throughout sub-Saharan Africa is unclear and we do not know whether one or both strains are present in South Africa. Knowing the distribution of each FAW strain would help us understand their spread, which in turn would help biosecurity. Using a combination of genetic and collection data, it would be possible to determine whether a correlation

between behavior and genetic variation exists. Any genetic distinctness between populations would help us understand their dispersal and the scale on which to implement Integrated Pest Management (IPM).

I would like to sequence the species-specific regions of DNA from FAW specimens collected from various locations in sub-Saharan Africa to determine the distribution of both strains and, if necessary, use other regions of DNA for population comparison. Ultimately the outcome would shed some more light on the biology of this pest, contributing to a more environmentally sustainable IPM strategy with less emphasis on pesticides, offsetting non-target effects and allowing room for more biocontrol options.

Cock, M.J.W., Beseh, P.K., Buddie, A.G., Cafa, G & Crozier, J. 2017. Molecular methods to detect *Spodoptera frugiperda* in Ghana, and implications for monitoring the spread of invasive species in developing countries. *Scientific Reports* 7, Article number: 4103

4. Describe what you hope to accomplish during your fellowship. How do your research interests and scientific background relate to the goals of your proposal? How will working with a mentor in the U.S. help you to achieve your research goals?

I hope to gather more information on the genetic identity and structure of FAW populations in sub-Saharan Africa with a view to complement development of targeted and effective IPM strategies.

I am interested in research concerning new and emerging agricultural pests, biosecurity, and invasion pathways. By carrying out this project, I will be able to contribute new information to FAW research in South Africa and open new avenues for further research. I also hope to promote the use of molecular identification for damaged or juvenile specimens.

Working with an experienced mentor will help me to streamline my methodology and provide necessary input towards my project. I would like to use this fellowship as an opportunity to strengthen my background in molecular biology so that I can continue to apply the new skills and techniques to this and new pests in the future.

5. How will a Borlaug Fellowship contribute to enhanced agricultural productivity, economic development, and/or food security in your country?

Dedicating an intensive three month period to the molecular research of FAW will provide valuable information to the current state of the invasion. Early, quick and reliable identification of new FAW invasions sites gives IPM a greater chance of succeeding without having to rely too heavily on the use of pesticides. If we can monitor the spread of FAW more efficiently the invasion may even be contained.

I hope that the outcomes of this project will contribute to strengthening biosecurity systems. Knowledge of its population structure and dispersal patterns will determine whether management needs to be undertaken at a broad scale (transboundary) or on a finer scale (farm or local basis), as is presently the case. This will improve border control and develop a collaborative effort in controlling this pest.

Effective IPM of FAW will reduce the losses in crop yield that have occurred over the past growing season. Due to maize being a staple food source in sub-Saharan Africa, this will result in far greater food security in the region.

Provide a weekly list of activities that links to your proposal's goals and objectives. Note that part of the first week is generally used for university and laboratory orientations and staff introductions.

Before leaving South Africa, I will source FAW specimens from its various locations in this country and others in sub-Saharan Africa.

Equipment:

- Molecular biology equipment, lab space, reagents and consumables necessary for DNA extraction, amplification of DNA by Polymerase Chain Reactions and sequencing
- Computer and software necessary for DNA sequence analyses

Week 1: Orientation

- Become familiar with the facility, order any outstanding equipment or reagents

Week 2: Organization of samples/equipment and method refinement

- Finalize action plan – decide on extraction kits, PCR protocols, sequencing services
- Create database of samples with all collection information

Weeks 3 and 4: DNA extraction

- Achieve good quality extractions for amplification

Weeks 5 and 6: Amplification of DNA using Polymerase Chain Reaction (PCR)

- Amplify selected region/s for successful sequencing, may take longer depending on success rate

Weeks 7 and 8: Sequence PCR products

- Either outsourced or done personally depending on equipment available

Week 9: Sequence analysis

- Analyze DNA trace files with suitable software

Week 10: Write up draft report

- Review literature, put together first draft

Week 11: Finalize report

- Write up final draft with help from mentor

Week 12: Upload sequences to NCBI and BOLD, finish up

- Make data freely available
- Tie up any loose ends, buffer in case of lab work repetition

Fellow #15, South Africa, Female/ NOFO: USDA-FAS-10777-0700-10.-18-0045

“Effect and risk assessment of the application of pathogens as natural regulatory agents to suppress fall armyworm in five different host plants (from the viewing lens of South African conditions).”

1. Goal

The goal of my research is to collaborate with other experts in the field of Plant Protection to further investigate the control methods of the invasive species (FAW) in South Africa.

2. Specific Objective(s)

To investigate the effect of application of pathogens in different host plants as natural regulatory agent and also to establish the natural enemies and their efficacy to manage FAW in South Africa since it's the new invaded species, lastly assess risk associated with the use of pathogens as natural regulatory agents with reference to South African conditions.

3. Background Information

For the construction of an effective pest management program for the most important quarantine pest in South Africa that attacks maize crop which is the country's staple food, a complete database of its management plan and methods is very important and urgently needed, so collaborative research with countries like USA most definitely is a point of departure to learn about the control since the pest occurs in the U.S. I believe U.S. is more knowledgeable and ready to share knowledge with other countries.

4. Describe what you hope to accomplish during your fellowship. How do your research interests and scientific background relate to the goals of your proposal? How will working with a mentor in the U.S. help you to achieve your research goals?

I am hoping to gain more knowledge about the management of Fall Armyworm since it's new in South Africa. Its management is currently not yet mastered, as I am currently responsible for Plant Health Training Unit of the NPPO of the country this exposure will surely be beneficial for future training and future management plans. My other intention is to have a clear understanding and explore other researches done in this topic as I am about to embark in the PhD journey so working with the mentor in the U.S. will also help me conclude and give me direction on my research topic for my future studies.

5. How will a Borlaug Fellowship contribute to enhanced agricultural productivity, economic development, and/or food security in your country?

This fellowship will be the most beneficial program because recently our staple food is under threat because of the new invasive species FAW, preparedness and information on its control is quite vital at this stage for Food security and Biosecurity.

Provide a weekly list of activities that links to your proposal's goals and objectives. Note that part of the first week is generally used for university and laboratory orientations and staff introductions.

2nd Week & 3rd Week - Learn about the background of the pest, its distribution and host plants in the U.S

The outcome will be to have a comparative scenario with South Africa's situation

4th- 8th Week - Engage to the surveillance, action plans and the whole integrated management activities with regards to the control of FAW in the US.

The outcome will be knowing the natural enemies, its population dynamics, other pathogens and laboratory processes that are followed or used in the US in order to adopt and propose collaborative research and Comparative studies to lay a foundation for the African continent on invasive mechanism and control measures.

9th - 12th Week- Familiarize myself and learn about current research about the pest

The outcome is to develop my research proposal for PhD studies.

Fellow #18, Zambia, Male/ NOFO: USDA-FAS-10777-0700-10.-18-0048

“My proposed project will evaluate the use of Silicon to enhance Biological control of Fall Armyworm (Spodoptera frugiperda) through increased attraction of its natural enemies, with a hope of developing a cost effective, sustainable and ecologically friendly option for management of this pest.”

1. Goal

The goal of my research is to develop a novel biological control method for sustainable management of Fall Armyworm (FAW) (Spodoptera frugiperda) on maize, based on silicon (Si) enhanced attraction of natural enemies.

2. Specific Objective(s)

- a. Compare the volatile compounds produced by Si treated and untreated maize plants.
- b. Assess whether the attraction of natural enemies to plants infested with FAW is affected by Si treatment.
- c. Develop a system in which Si can be practically integrated in IPM program for biological control of FAW.

3. Background Information

The importance of silicon (Si) in plants for defense against a range of diseases and pests is now beyond doubt, and could offer an alternative to toxic pesticides for management of FAW. Studies to date have shown that silicon acts against insect pests via two modes of actions. The first mode of action being mechanical facilitated by the deposition of Si in plant tissues i.e. leaves. Silicon deposition in plants is known to enhance the toughness of plant tissues, making it difficult for insect pests to penetrate, chew and digest. For example, research in Australia on maize treated with Si and its pest FAW showed a marked reduction in the pest feeding. Similarly, previous work on rice and one of its pests, rice leaffolder showed that Si treatments significantly reduced insect feeding and damage. The second mode of action is through biochemical means, in which Si alters the blend of defense chemicals (Herbivore Induced Plant Volatiles (HIPV)) produced by plants, which in turn increases the attraction of natural enemies to infested plants and indeed the pest.

There is overwhelming evidence that plants respond to insect damage or attack by producing a specific blend of volatile defense chemicals which attract natural enemies (biocontrol agents) and guide them to locate herbivores on infested plants. Previous studies on cucumber (Cucumis sativus) demonstrated that soil applied Si enhanced the attraction of natural enemies (i.e. Dicranolaius bellulus) to plants infested by one of its pests (Helicoverpa armigera), suggesting its positive effects on biological control. An associated field study with; cucumber, its pest (Helicoverpa armigera) and predator (Dicranolaius bellulus), equally showed an increased attraction of the predator to Si treated plants as compared to untreated plants.

While previous work on effects of Si treatment on mechanical resistance of plants to insects has been well elucidated, no studies have been published on the effects of Si treatment on enhancement of biological control; in particular increasing attraction of natural enemies (predators and parasitoids) to FAW infested maize plants. Previous findings highlighted above lead to the hypothesis that soil applied Si in maize

increases the attraction of natural enemies (biocontrol agents), both predators and parasitoids to plants infested by FAW.

4. Describe what you hope to accomplish during your fellowship. How do your research interests and scientific background relate to the goals of your proposal? How will working with a mentor in the U.S. help you to achieve your research goals?

While previous findings by previous researchers are significant, they are only just beginning to explore the mechanisms behind Si and host plant defense. During my fellowship, I hope to better understand the role and mechanisms of silicon in plant defense against FAW and subsequent attraction of biocontrol agents.

The research experience during my MS study motivated and empowered me in areas including teamwork, endurance, and persistence. I also acquired a suite of skills that complement my proposed project on Si, FAW and their biocontrol agents, including chemical ecology (e.g. olfactometer bioassays, collection and analysis of insect/plant volatiles chemicals using GC-MS, use of insect behavioral software-The Observer®), insect pest sampling/monitoring and insect rearing.

Most of the Agricultural universities in the U.S. including research departments in the USDA have a strong scientific community on Ecology and Entomology, and so I believe working with a mentor from these institutions would enhance my research experience and realization of my research goals. This expertise is paramount to navigate the mechanisms behind how silicon increases attraction to the third trophic level, i.e. predators and parasitoids of FAW. I aspire to develop my research career with a major focus on exploiting this increasingly important area of biological control..

5. How will a Borlaug Fellowship contribute to enhanced agricultural productivity, economic development, and/or food security in your country?

In Zambia, maize is the most important staple cereal crop and is mostly grown by smallholder farmers, who account for over 80 % of farmers involved in its production. Furthermore, the crop accounts for over 50 % of cereals produced in the country, with annual production of approximately 2.9 million metric tons. Since its first report in Zambia last year (2016), the FAW has become an invasive and economically important pest of maize. A recent survey (2017) during the just ended maize growing season showed that the country suffered approximately 40 % (~ 1.5 million tons) maize yield loss due to FAW damage.

Control efforts using synthetic pesticides, as currently practiced in Zambia appears to have variable success (unpublished data). This is most likely due to FAW being resistant to these chemicals since resistance is well known in its native range in the Americas. In addition, many of the poorest farmers in Zambia cannot afford to buy synthetic pesticides to control FAW and therefore, cheaper, safer and sustainable alternatives such as biological control are needed.

The use of Si to manage FAW on maize as proposed in my research would benefit Zambia by enhancing maize productivity while reducing pesticide use and their impacts. In addition, this would increase profitability of maize production due to reduced expenses on pesticides. Increased production of maize would also contribute to food security and general economic development in the country, especially that maize is a major staple crop and commodity in agro-trade. Furthermore, reducing the input of toxic

pesticides in maize production could ensure less chemical residues on food, improved human health, and enhanced conservation biocontrol. Therefore, the Borlaug Fellowship would greatly help my country to restore its maize productivity by facilitating the proposed research.

Provide a weekly list of activities that links to your proposal's goals and objectives. Note that part of the first week is generally used for university and laboratory orientations and staff introductions.

Week 1: (Initial meeting with supervisor held)

- Apply and obtain ethical clearance for the proposed research,
- Discuss the project in detail with mentor/supervisor
- Secure maize seed for the study

Week 2: (Research methods developed and materials mobilized)

- Planning of research methods (Experimental designs, Volatile analyses, Insect bioassays)
- Mobilization of research materials (Silicon, Insect rearing cages, artificial diet for insects, planting pots, growing media, and securing Climate controlled room/s for the study)
- Initiate planting of maize (to be planted in batches of 20 plants per week for 4 consecutive weeks, to ensure continuous availability of plants for preliminary and final trials).

Week 3: (Research proposal presented)

- Preparation of a full research proposal
- Presentation of proposal in form of a seminar

Week 4: (Insect rearing protocols developed)

- Develop protocols for rearing the FAW and natural enemies

Week 5: (Insect cultures established)

- Source insects to initiate laboratory cultures of FAW and parasitoids
- Initiate rearing of insects

Week 6 & 7: (Strain of FAW and associated natural enemies identified)

- Conduct field trips to collect FAW larvae from maize farms, in order to identify the types of parasitoids associated with the pests
- Setting up pheromone traps in selected maize farms to collect adult FAW for molecular identification

Week 8: (Study techniques developed)

- Conduct preliminary maize volatile analyses with GC-MS
- Conduct preliminary insect behavioral trials using a Y-Tube olfactometer

Week 9: (Study techniques optimized and quality data obtained)

- Repeat volatile analyses to obtain final data
- Repeat insect behavioral trials to obtain final data

Week 10: (Research data analyzed)

- Conduct data analysis and interpretation of results

Week 11: (Research results presented)

- Presentation of results in form of a seminar
- Compilation of a research report

Week 12: (Writing of manuscript initiated)

-Preparation of manuscript (Full paper or Short communication) for publication

Fellow #19, Zambia, Female/ NOFO: USDA-FAS-10777-0700-10.-18-0049

“To research integrated pest management for Fall Armyworm and to find out which IPM management option(s) is most effective for the control of fall armyworm in Zambia.”

1. Goal

Research goals: (i) Find out which IPM management option(s) is most effective for the control of Fall armyworm in Zambia.

2. Specific Objective(s)

- (a) To know at which stage the Fall armyworm can best be control
- (b) Find out which cultural method is the most effective to control the Fall armyworm,
- (c) To find out which botanical product is the most effective against the control of Fall armyworm

3. Background Information

Zambia experienced an outbreak of the fall armyworms (FAW) (*Spodoptera frugiperda*) in November and early December 2016, which affected fields in over 100 districts in almost all the provinces of Zambia. Although maize fields were mostly affected, FAW can affect other crops such as sorghum, millet, wheat, cotton and soybeans. While Africa has a native species of armyworm (*Spodoptera exempta*) which eats mainly the leaves of maize plants, FAW is more devastating and more destructive because it eats not only the vegetative parts of the plants but also the reproductive parts by eating the cob itself. To date, the main crop affected in all invaded countries is maize. However, the FAW is polyphagous pest attacking more than 80 plant species and prefers to feed on graminaceous family in particular the maize crop (Cruz et al., 1999), other important food crops are at risk, particularly rice, wheat, sorghum and sugarcane. FAW is capable of long flights of up-to 2000 km per year with a large reproductive capacity and is difficult to detect. Given the importance of this crop, the damage to its production certainly threatens food security. The FAW can cause up to 70 percent crop loss, or total loss in some cases if unmanaged (CABI, 2017).

In response to the outbreak, the Zambian government through the Disaster Management and Mitigation Unit (DMMU) distributed pesticides across the country in December 2016 to combat the spreading infestation of FAW. Approximately 124,000 hectares (306,000 acres) of the crops were destroyed. A number of different pesticides were tried such as Cypermethrin and Lambda cyhalothrin (Karate). Even though pesticides are one of the important farming inputs, but depending on how they are used can yield either positive/negative results. Correct, safe and effective use of pesticides can help to improve yields through timely/effective controlling of pests. However, wrong or incorrect use can produce negative effects to humans, animals, other organisms, including the environment either directly or indirectly. According to FAO, (2016) and WHO, (2016) most of these pesticides that are used to control pests are actually highly hazardous pesticides (HHP). There is a higher risk especially to children, also pesticides are very persistent in the environment or in organisms, due to their in-built chemical properties. Additionally, there is limited use of Personal Protective Equipment (PPE) during mixing and spraying of pesticides as most workers do it with bare hands. Also the use of PPE is not desirable, due to the heat, which make spray men very uncomfortable and they opt to do without it. PPEs are unavailable especially in rural areas coupled with the lack of money to buy.

Some challenges experienced during 2016/2017 farming season were: wrong identification of FAW thought to be stalkborer by farmers and extension workers, synthetic insecticides supplied to farmers were not enough and farmers resorted to use of products such as washing paste (boom) and urea fertilizers. Other farmers could not spray into the whorl of maize plant with insecticide to kill the pest due to lack of knowhow on spray techniques and the pest feeding behavior; under dilution of insecticides in order to increase the quantity of the diluted pesticide so that they could spray the whole field. Some farmers reported that insecticides did not just work especially on advanced larval developmental stage. Because of indiscriminate and desperate use of all sorts of pesticides by farmers, there could be danger of pest resistance and killing of important natural enemies. It is therefore imperative that a research be undertaken to find out different management options that are less toxic but effective for the control of fall armyworm using IPM options. Literature indicates that so far no single method or product has been found to completely eradicate the FAW.

4. Describe what you hope to accomplish during your fellowship. How do your research interests and scientific background relate to the goals of your proposal? How will working with a mentor in the U.S. help you to achieve your research goals?

Through the fellowship I hope to accomplish the following: strengthen my individual capacity to deal with the pest (Fall armyworm), identify and promote safe and scientifically proven IPM approaches / options to farmers and other stakeholders, and provide support to my institution through the use of IPM to deal with FAW. IPM was a core course during my masters' program- Integrated Crop Management. I am interested in supporting pest control options that do not solely rely on chemical control, but uses a combination of options such as those promoted by IPM like various botanicals and cultural methods to control pests. Working with a mentor in the U.S. will help me learn more and be able to develop guidelines for an economic use of the most effective IPM methods. Fall armyworm has brought disaster on the farming community in Zambia especially for the smallholder farmers who entirely depend on farming for their livelihood; therefore I am determined research in order to find lasting solutions to mitigate this problem of fall armyworm.

5. How will a Borlaug Fellowship contribute to enhanced agricultural productivity, economic development, and/or food security in your country?

Zambia continues to face challenges with invasive pests that have negatively affected agricultural productivity and market access of most agricultural/horticultural produce and products, e.g the Asian fruit fly (*Bactrocera dorsalis*) has caused a lot of post-harvest losses in horticulture and blocks market access. The fall armyworm is a new pest in Zambia and it has caused a lot of crop losses especially in Maize fields. Because maize is a food security crop for Zambia, the outbreak of the fall armyworm brought a lot of panic to the government and the farmers. The panic resulted in indiscriminate or uncontrolled use of pesticides to control the pest. Through the fellowship am hoping I will be able to research and learn to find lasting IPM solutions to control this pest. The IPM options should be cost effective, environmentally sound and socially acceptable.

Provide a weekly list of activities that links to your proposal's goals and objectives. Note that part of the first week is generally used for university and laboratory orientations and staff introductions.

THEME ACTIVITIES (including materials) TIMELINE

Armyworm Biology Research into FAW biology, ecology and population dynamics, WK 1, 2, 3 in order to have a basis for improved recommendations to minimize pesticide use.

Cultural Control methods (I) Research-based recommendations on how planting WK 4, 5, 6, 7 date affects risk of crop damage (II) Test the effectiveness of applying sand (mixed with lime or ash), sawdust or soil in the whorl for providing protection or control.

Botanicals (i)-Neem (*Azadirachta indica*) seed cake and leaf extracts botanical tests from WK 8-12

(ii) Chilli (hot pepper)

(iii) Tephrosia

Fellow #20, Zambia, Male/ NOFO: USDA-FAS-10777-0700-10.-18-0050

“The trial to evaluate the efficacy of bio-pesticides in the control of the Fall Armyworm in Maize seeks to provide cost effective methods for small-holder farmers.”

1. Goal

The goal of my research is to help generate a cost effective method for the control of the Fall Armyworm in Maize.

2. Specific Objective(s)

The specific objective of the research is to evaluate the efficacy of three bio-pesticides for the control of the Fall Armyworm.

3. Background Information

The Fall Armyworm (*Spodoptera frugiperda*) ravages maize among the many other crops that it damages. The pest affected many maize fields in Southern Africa in the 2016/2017 season. While a number of chemical solutions were proposed no single chemical seemed effective on its own and some practitioners seemed to suggest a cocktail of these as the most effective. Small-scale farmers are marginally poor in Zambia and could ill-afford further expense on an already unprofitable maize enterprise characterized by season price fluctuations. It would seem productive therefore to consider a variety of plant bio-pesticides in the control of the Fall Armyworm.

3.1 Justification

Maize is Zambia’s staple food. In spite of its relative importance the crop is constrained by a number of factors that limit its profitability. Largely the crop’s production is sustained by its importance to the nation’s food security. It is important to find solutions to increasing its marginal returns by including locally available resources in its production package. Integrated Pest Management seems to be one plausible way for achieving this.

3.2 Problem Statement

The fall Armyworm has been known to cause Deleterious on maize crops leading to significant yield losses. Farmers in Zambia are already constrained in terms of how much resources are available to them in order to produce this crop of relatively low marginal returns. Small-scale farmers in Zambia have been reputed to use local resources for pest control in certain crops. Information could not be traced on the potency of selected bio-pesticides on the control of the fall Armyworm.

4. Describe what you hope to accomplish during your fellowship. How do your research interests and scientific background relate to the goals of your proposal? How will working with a mentor in the U.S. help you to achieve your research goals?

As Agronomist under the Farming Systems and Social Sciences Division of the Zambia Agricultural research Institute (ZARI) I am actively involved on the generation of viable cost effective agricultural technologies. This Proposal gives me an opportunity to continue to contribute in this regard. Working

with a US mentor helps me to have a new dimension to Agriculture and to the Research Process. It is an opportunity to learn other trending methods and tools in the research function.

5. How will a Borlaug Fellowship contribute to enhanced agricultural productivity, economic development, and/or food security in your country?

The Fall Armyworm is a relatively new pest in Zambia that is anticipated to colonize the country's agricultural landscape for a while to come. Through the Norman Borlaug Fellowship some workable solutions could be generated to aid the production of Maize, Zambia's staple a process heavily dependent on the resource-poor small-scale farmers.

Provide a weekly list of activities that links to your proposal's goals and objectives. Note that part of the first week is generally used for university and laboratory orientations and staff introductions.

August 2018

First Week - Trial establishment

Second Week - Observations

Third Week - Observations

Week Four - Pest Introduction

September 2018

First Week - Observations

Second Week - Observations

Third Week - First Sprays

- Survival count

Fourth Week - Observations

October 2018

First Week - Second Sprays

- Survival count

Second Week - Observations

Third Week - Third Spray

- Survival count

Fourth Week - Crop Harvest

- Data Processing

- Report writing