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) Food Safety
(B) Biotechnology

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.-18-0029 – Fellow 1, Algeria
USDA-FAS-10777-0700-10.-18-0030 – Fellow 2, Algeria
USDA-FAS-10777-0700-10.-18-0038 – Fellow 8, Kenya
USDA-FAS-10777-0700-10.-18-0040 – Fellow 10, Malawi
USDA-FAS-10777-0700-10.-18-0041 – Fellow 11, Morocco
USDA-FAS-10777-0700-10.-18-0043 – Fellow 13, Rwanda
USDA-FAS-10777-0700-10.-18-0046 – Fellow 16, Tanzania
USDA-FAS-10777-0700-10.-18-0047 – Fellow 17, Senegal

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: 8

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
1	Algeria	Female	12	Develop my skills in phenotypic evaluation and the association mapping and molecular marker-assisted selection for resistance to disease.
2	Algeria	Female	12	The beneficial legumes/rhizobia symbiosis in intercropping cereal/legumes systems.
8	Kenya	Male	12	Establishing a high throughput platform for qualitative and quantitative analysis of GM derived food products in Kenya.
10	Malawi	Male	12	Screening plants/or plant derived products for possible traces of genetically engineered elements. The overall goal is to detect, identify and quantify genetically engineered products in Malawi.
11	Morocco	Female	12	Using new generation sequencing technologies and bioinformatics methods to explore date palm genome and genetic diversity.
13	Rwanda	Male	12	Investigating international standards on the testing of meat and dairy products and understand necessary requirements and pre-requisites to adopt and apply them in Rwanda.
16	Tanzania	Male	12	Learn the international standards for testing animal sourced foods and propose methods for implementing them in Tanzania.
17	Senegal	Female	12	Analysis of chemical contaminants for local and imported rice

Individual Proposals and Action Plans

Fellow #1, Algeria, Female/ NOFO: USDA-FAS-10777-0700-10.-18-0029

"Develop my skills in phenotypic evaluation and the association mapping and molecular marker-assisted selection for resistance to disease."

1. Goal

Currently I want to complete the evaluation of diversity of Algerian olive cultivars, in finding and characterizing the plant germplasm resistant to the vascular pathogen Verticillium wilt (VWO).

2. Specific Objectives

-Finding new sources of genetic resistance by the characterization and evaluation of morphological and molecular Algerian olive cultivar.

-Assess wild olives and related subspecies as a new source of resistances to Verticillium wilt

-Identify systemic defense responses induced/ repressed by a transcriptomic analysis.

-Staff training researchers and engineers in new molecular biology techniques.

-Preserve and save the local plant genetic patrimony and use it for sustainable rural development.

-Contribution to the establishment of a national database of genetic resources.

3. Background Information

For modern agriculture and to ensure food security it is important to improve the crops productions by using new technologies. Genes for desirable traits are embedded in biodiversity and as such crop genetic diversity has a critical role to play in increasing and sustaining production levels and nutritional diversity throughout the full range of different agro-ecological conditions .Olive is one of the first domesticated and cultivated tree species and has historical, social and economic relevance. However, its future as a strategic commodity in Mediterranean agriculture is threatened by diverse biotic and abiotic menaces.

Algeria is one of the olive growing countries. Olive tree occupies the 1st place, it covers one third of the trees dedicated to fruit growing area. Recently, Algerian Government supported a program of olive tree growing with the objectives to improve olive growing and olive oil production in different regions of the country and grants were given to agricultures. In our previous work, twenty-six important Algerian Olive cultivars were studied using preselected nuclear microsatellite markers, in an attempt to explore the genetic relationship between them, and comprehend how genetic variability is partitioned between the Algerian germplasm collections (Abdessemed and al, 2015). The cultivars investigated here represent distinctive olive genotypes at the molecular level.

Currently a program is ongoing to complete the evaluation of diversity of Algerian olive cultivars, in finding and characterizing the plant germplasm resistant to disease, the screening procedure is of primary importance. One of the major constraints for olive cultivation is Verticillium wilt, a vascular disease caused by the soil-borne fungus Verticillium Dahliae Kleb. This disease has been detected in almost all

regions where olive is cultivated, causing serious concern to growers, nursery companies and the olive-oil industry. The disease was described for the first time in Italy, and since then, the list of olive growing regions where VWO has been reported is continuously enlarged. The fungus has also been detected in Algeria where it has reached epidemic proportions. An epidemiological survey found that VWO of olive occurred in almost all olive-growing regions, affecting up to 90% of the orchards that were examined, with a mean disease incidence [DI] of 12% . At the moment, there are no available control measures which are sufficiently effective when applied singly. The implementation of an integrate disease management strategy is therefore recommended, combine measures such as the use of tolerant cultivars, pathogen free propagation material, appropriate cultural practices, and/or application of biological control agents are necessary. Obviously, the use of olive verities tolerant/ resistant to VWO would be the most efficient and environmentally- friendly approach to control the disease (Arias-Calderon et al., 2015; Carmen Gomez-Lama et al., 2015). The aim of our research effort is to find an effective source of VWO resistance in different Algerian local olive genotypes (cultivated, wild and laperrine olive) which represent a potential gene pool for desired character. The first step is the collect of fungus isolates and studies their genetic and pathogenic variability. Characterization will allow understanding the genetic diversity and phylogeny of the pathogen, the pathogenicity tests will allow classifying the isolates into different severity classes. Secondly, we will focus on the identification of olive verities tolerant/ resistant to VWO and identify the genes of resistance involved in plant defense against the pathogen.

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’m interested in studying gene function and genetics mechanisms at the molecular level by enhancing my knowledge to use molecular biology techniques especially: genome sequencing and cloning, discovery of molecular markers (single nucleotide polymorphisms), and association mapping for resistance to disease. Also, the extraction and process RNA effectively (mRNA) from plant tissue and generation of “suppression substractive hybridization “cDNA Libraries. In addition learn about the techniques in greenhouse, including isolation, culturing, identification and maintenance of pathogen cultures; inoculation with pathogens; phenotypic disease ratings. Finally, teach who to manage data and bioinformatics analysis.

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

Algeria has a real agricultural potential that could offer important development prospects towards it's a priority of the Algerian authorities, to reduce its food dependence, and diversify its economy of "oil rent". The government has launched a national program for agricultural development, in order to contribute to the diversification of the Algerian economy. This "Agricultural and Rural Renewal Policy" benefits from important means, but the margins of progress remain considerable. It’s in this context that our project proposal on “Evaluation and identification of olive resistant to Verticillium wilt: fishing in the Algerian local olive genotypes” is ongoing in order to improve domestic production in quality and quantity.

This training will be a great opportunity for me to demonstrate my abilities and acquire new skills and will allow our institution to capitalize on previous skills gained. It will provide new knowledge which is

needed in the field of Crop Improvement and Genetics Research. I believe that this training will significantly contribute to the CRBt relentless initiatives and efforts to raise awareness about the importance of use of genetic resources.

It will permit a better exploitation of Algerian genetic resources plants by breeders and reinforced a rights royalty collection. Our vision is to make the CRBt a national resource who will offer guidance and support of the national community in terms of development of Algerian agriculture.

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.

The plant material as well as the fungal plant pathogen does not necessarily olive specie and the Verticillium Dahliae Kleb, the most important is the methodology as well as the techniques to be followed in order to reach the main objective which is the identification and the finding of new sources of genetic resistance.

For it, the research activities that I would do during my internship are:

1st week: university and laboratory orientations and staff introductions (as mentioned above).

2nd week: Training on methods of plant pathogen isolation and identification in field.

3rd week: Plant pathogen identification and quantification, including regular PCR assays, real-time PCR assays, and DNA sequencing/sequence analyses.

4th week: Studies of the pathogenicity tests to allow classifying the isolates into different severity classes.

5th week: Inoculation procedure and growth conditions in greenhouse environments.

6th week: Study of the inheritance of the pathogen and selection of the most outstanding genotypes displaying high levels of disease resistance.

7th week: Introduction to the method used for the transcriptomic analysis to identify systemic defense responses of the tolerant cultivar and determine the expression pattern of selected defense gene.

8th week: Extraction and process ARN effectively (mRNA).

9th week: Generation of “suppression subtractive hybridization “cDNA Libraries.

10th week: Cloning and sequencing.

11th week: The bioinformatics analysis of ESTs.

12th week: Data validation and time-course gene expression profiles.

Fellow #2, Algeria, Female/ NOFO: USDA-FAS-10777-0700-10.-18-0030
"The beneficial legumes/rhizobia symbiosis in intercropping cereal/legumes systems."

1. Goal

The aims of my present research is to contribute to intensify, by an ecological way, the productivity of agricultural systems involving cereals and legumes in Mediterranean areas, in the context of reducing the use of fertilizers (nitrogen and phosphorus) and development in salinized soils. The strategy is to generate knowledge and results which can be used for the selection and breeding of crops and symbiotic microorganisms, as well as for the development of ad hoc cultural practices. For this we propose an integrative approach involving a wide range of disciplines in biology, physiology and ecophysiology, agronomy and economics and social sciences.

2. Specific Objectives

Scientific innovations of the project are part of the post-green revolution. They consist of:

(i) optimizing the selection of plant interactions with beneficial soil microorganisms, both symbiotic and endophytic,

(ii) bacterial inoculations based on diagnostics of local conditions, both agricultural and environmental.

The ultimate objective is to optimize ecological services in interactions with soil organisms on the basis of microbial inoculations as ecological fertilizers.

3. Background Information

My work research consists first on prospecting through the bean fields to sample the root nodules. These nodules are conducted to the laboratory to extract the bacteria from the nodules and test them in sterile soils to see if they can give root nodules. Then, by DNA analysis techniques, we determine the genetic diversity of these strains, and based on this, we select the strains candidate for the next research step. Following this, field trials are established, intercropping trials between maize and beans. The bean is inoculated with the strains selected previously. Statistical analyzes are finally carried out to find out whether the yields of bean and maize are significantly better or not with the inoculated strains.

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 would like to meet USDA researchers with similar work research. To share our research knowledge and results, and go on visit in the fields to see the technologies used. This visit may also lead to conventions and / or cooperation projects.

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

Sharing knowledge, especially biotechnology tools about field legume inoculation and cereal/legumes intercropping, a lot can be done on how to alleviate poor soils and arid climate to a better crop varieties productivity.

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.

1st Week: arrival, introducing to the staff, organization of the visit

2nd to 5th week: research activities in laboratory on microbiological techniques of rhizobia strains isolation, molecular techniques on nif and nod genes amplification, quantification genetic diversity.

6th to 8th week: research activities on preparation and conservation of rhizobial inoculum.

9th-12th: field inoculation and following-up of the trial

Fellow #8, Kenya, Male/ NOFO: USDA-FAS-10777-0700-10.-18-0038
"Establishing a high throughput platform for qualitative and quantitative analysis of GM derived food products in Kenya."

1. Goal

The goal of my research is to develop an effective and efficient platform for qualitative and quantitative analysis of GM derived food products at Kenya Bureau of Standards molecular biology lab

2. Specific Objective(s)

-To optimize efficient DNA extraction protocols for processed food products

-To optimize an efficient PCR protocol for qualitative analysis of GM derived food products

-To build competence in RT-PCR and optimize an efficient protocol for quantitative analysis of GM - derived food products

-To build competence in RT-PCR data analysis

-To build competence in primer designs for simplex and multiplex PCR analysis

3. Background Information

Genetically modified food products are derived from organisms who's DNA has been altered or modified with DNA from another organism through a process known as genetic engineering. Genetic engineering of organisms enables them to perform different roles differently than they would have performed in a natural setup e.g. food crops being able to tolerate diseases without application of chemicals. The issue of GM food products oscillates between two extreme views on one hand are the proponents of GM food products who view this technology as a solution to many problems facing Kenya especially in the area of food security. On the other hand is the anti- GM food products group whose view is to stop the technology citing human health concerns and environmental wholesomeness. Some legislation, consider GM as contamination, resulting in a considerable demand for detecting, identifying and quantifying the presence of DNA or GM protein, at the farm, the processor and the retailer level. Established in July 1974 Kenya Bureau of Standards (KEBS) is a statutory body established under the Standards Act (CAP 496) of the laws of Kenya. Through the National Standards Council KEBS is mandated to develop and enforce standards for all processed products in the Kenyan market including GM derived food products. Through KEBS Testing Services Department conformity of processed products is routinely monitored in the laboratories to assess adheres to set standards. The KEBS molecular biology lab is responsible for analysis of all GM derived food products to assess their conformity to KS 2225: 2012 (Kenya Standard — genetically modified organisms and derived products —Labeling of food and feed). According to KS 2225:2012 GM derived food products shall not contain more than 1% of the GM material and if the 1% limit is not achieved such a product shall be labeled as to having GM derived Material. With the GM platform rapidly growing in Kenya, KEBS has a mandate to create customer confidence by establishing a competent analytical platform for GMO's conformity to standards and set threshold which is a critical part in the composition analysis of the Gm products. A competent analytical platform will not only implant customer confidence in the Kenyan population but will contribute immensely to the growth of the

GM platform in Kenya. The proposed research seeks to develop a competent analytical platform that can detect GM martial in processed food products and that can quantify the amount of GM materials in the products.

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 build competence in the areas of molecular biology more importantly the RT-PCR and copy number analysis. During the fellowship I would like to have hands on experience in bioinformatics, sequence mining and primer design. I would also want to optimize low-cost DNA extraction protocols for processed food products. Optimize simplex and multiplex PCR protocols. My research interests and scientific background relate to the goals of my proposal in that having been actively involved in the VRCA (Virus Resistant Cassava for Africa) project as a Ph. D student where I helped develop transgenic cassava, my interest is to contribute in steps that will help in the commercialization of GM products in Kenya. These can only be achieved if the government institution that are mandated by law to validate and okay the GM products e.g. KEBS build competent analytical capacity to analyze GM products. USA has made tremendous steps over the years in the field of GM product development and hence the USA based scientists have vast experience working with GM products. Working with a mentor in the U.S will help me align my objectives to achieve my intended goals, I will also be able to gain hands on technical skills from my mentor. I will also have a person to look up to for guidance and direction, besides having a person that I will be accountable to.

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

I am seeking the fellowship to enhance the capacity for bio-safety testing of Genetically Engineered (GE) products. Kenya's economy is heavily dependent on agriculture with nearly three quarters of Kenyans making their living from farming. Majority of the Kenyan farmers are peasant farmers mainly practicing subsistence farming. Over the years climate change and emergence of new diseases has resulted to a food insecure Kenyan population. The Government has incorporated new strategies in trying to solve the food shortage problem; one of these strategies is GM technology. Kenya has a well elaborate legal framework on GM products. The fellowship will contribute towards the advancement of the GM platform in Kenya and greatly aid in trade/ commercialization of GM food products. Contribution towards the advancement of the GM platform in Kenya will help improve agricultural productivity if the GM strategies are employed hence a food secure Kenya which will result to economic gain.

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 - Activity -University and laboratory orientations and staff introductions, meeting with my mentor –outcome-Settling down

Week 2 - Activity -Profile the processed food products that I will be working with (a reflection of the products in Kenya, Source for product dependent or independent protocols, Collect the reagents and

chemicals will be working with, meeting with my mentor –outcome- Working samples, Working protocols, Working reagents and consumables

Week 3 and 4 - Activity -DNA extraction from all the samples to be used in the research activities and optimizing protocols, Reporting/presentation, meeting with my mentor –outcome- Intact DNA profiles, working DNA extraction protocols

Week 5 and 6- Activity- Introduction to Bioinformatics, Primer design, Probe design and Reporting/presentation, meeting with my mentor - outcome- Hands on experience on bioinformatics, Set of primers to work with during the study, Set of probes to work with during the study

Week 7 and 8 -Activity- PCR set up and optimization, Multiplex PCR set up and optimization, Reporting/presentation, meeting with my mentor - outcome- Working PCR protocols, Qualitative detection

Week 9 and 10 -Activity- RT-PCR set up and optimization, meeting with my mentor - outcome- Working RT-PCR protocols, Real time qualitative detection, quantitative analysis

Week 11- Activity- RT-PCR data analysis, meeting with my mentor - outcome- Quantitative detection, Copy number enumeration

Week 12- Activity- Final reporting/presentation, meeting with my mentor - outcome- evaluation

Fellow #10, Malawi, Male/ NOFO: USDA-FAS-10777-0700-10.-18-0040
"Screening plants/or plant derived products for possible traces of genetically engineered elements. The overall goal is to detect, identify and quantify genetically engineered products in Malawi."

1. Goal

The goal of my research is to detect, identify and quantify genetically engineered products in Malawi.

2. Specific Objective(s)

a) to identify plants that contain or consists of genetically engineered organisms (GMOs-eg maize varieties),

b) to identify products that contain GMO or produced through/from GMOs (e.g starch, oil, food/feed),

c) to compare GMO traces in Malawi products with threshold values from other international markets (e.g EU, USA).

3. Background Information

The European Food Safety Authority defines genetically modified organisms (GMOs) as organisms in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination. GMOs are produced through the use of modern biotechnology, where modern biotechnology according to United Nations (UN) Cartagena Protocol on Biosafety is defined as the application of (a) in vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (rDNA) and direct injection of nucleic acid into cells or organelles, or (b) fusion of cells beyond the taxonomic family, that overcome natural physiological reproductive or recombination barriers and are not techniques used in traditional breeding and selection. Since 1994 when the first commercial GM crops were produced, many countries have adopted biotechnology and it has had a very positive impact on farm income derived mainly from a combination of enhanced productivity and efficiency gains.

Throughout the history of GMOs there have been concerns regarding the safety of these GMOs on human health and environment. As such, most countries including the US, China and countries who are members of the Codex Alimentarius Commission, an international food standards program within the World Health Organization and the Food and Agricultural Organization of the United Nations have developed biosafety guidelines regarding the safety of food produced from GMOs. Malawi has not fully adopted GMOs despite being a party to the Convention on Biological Diversity and ratified the Cartagena Protocol on Biosafety in 2009. With increasing population, more pressure is being put on land resources to produce more for the ever increasing population. Coupled with climate related changes (drought, pests and diseases), Malawi is becoming food insecure by each year. Malawi is now looking into alternatives in order to produce more, and one of the mechanisms is adoption of GMOs which seem to paint a brighter future for the hungry nation. However, there are numerous purported health and environmental concerns associated with GMOs from the public domain. To arrest some of these fears and ensure safe adoption of GMOs, Malawi put in place a legal and policy framework regarding biotechnology. These include; The Biosafety Act of 2002, The Biosafety (Genetically Modified Organisms) Regulations in 2007 and The National Biotechnology and Biosafety Policy of 2008. The overall goal of these legal frameworks is to attain sustainable socio-economic development through research, acquisition and use of traditional and

modern biotechnology. Specifically, to build and strengthen national capacity in biotechnology research, development and application; to promote the utilization of biotechnology products and processes as tools for national development; to provide a regulatory and institutional framework for safe utilization and sustainable biotechnology development and application; and to promote ethical standards in biotechnology research and development. With this in place, there has been several research activities related to GMOs in Malawi. These include; Field trials on BT Cotton to traditional cotton growing areas by Bunda College (currently there is an application for general release in Malawi), application for confined field trials (CFT) for pigeon pea, cowpea and banana. In no distant future, therefore, genetically engineered products on Malawi markets will be available.

On the world market, GMOs are widespread, their species and trait diversity rising each year (James, 2011). As of 2010, Soya bean was the principal biotech crop with 81% of all soya beans grown being GM, followed by GM maize, cotton, and canola (James, 2011). The most dominant trait in all these crops is herbicide tolerance, followed by stacked herbicide resistance and insect-resistance traits and finally those GMs with only insect resistance. In Malawi, there are no official GMO products on the market. But being a predominantly importing country and due to cross border trades, GMOs (or traces of GMOs) would easily be found on the local markets. This could be confounded by the fact that there are no biosafety testing procedures of GMO in Malawi. To date no study has been documented on detection, identification and quantification of GMOs in Malawi. Hence the need for an empirical study on Malawian products (plants-maize, soybean, cotton; plant derived products-starch, oil, food/feed).

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?

The anticipated accomplishment from the fellowship is to gain a technical expertise and understanding on how to reliably test for GMOs in order to make education decisions about the safety and potential dangers of using GMOs. Therefore, working with US mentors would assist me to understand better how GMOs are made and acquire skills that I can utilize when back home. The training would also help to establish and cement working relationship/collaboration for future projects.

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

The training will help to build and strengthen my capacity in biotechnology research, development and application so as to promote the utilization of biotechnology products and processes as tools for socio-economic development of the country. The training will also help to acquire skills to effectively monitor, control and verify labelling claims on GMO or non GMO products. This will facilitate Malawi to competitively participate on international trade as the status of Malawian products will be distinctively known to be consisting of GMO or GMO free.

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.

The goal of my research is to detect, identify and quantify genetically engineered products in Malawi. To do this I need to be equipped with skills on biosafety testing of genetically engineered products.

1. WEEK 1
a. Planned activities
• Orientation to university campus, laboratories and staff

b. Resources/materials required
• University personnel

c. Expected outcomes
• Familiar with the university
• Familiar with laboratory rules and regulations
• Introduced to staff members

2. WEEK 2, 3 & 4
a. Planned activities
i. Overview of molecular biology of Genetically Modified Organisms
-Cloning strategy
-Characteristic of expression vectors
-Characteristic of inserted genes with details of sequences
-Characteristic of promoters
-Transformation/cloning methods of target organism
-Genetic analysis including copy number of inserts, stability, level of expression of transgenes, biochemistry of expressed gene products
ii. General principles of confined field trials

b. Resources/materials required
• University/Lab personnel
• Experimental field

c. Expected outcomes
• Acquired better understanding of how GMOs are made and their typical characteristics
• Linked academic theory to practice
• Developed strong mentoring relationships
• Better understanding of field layouts for confined field trials

3. WEEK 5
a. Planned activities
• Detection, identification and quantification of GMOs using PCR
i. Sampling of the GM material
ii. Sample preparation
iii. Reagent Preparation and homogenization

4. WEEK 6
a. Planned activities
• Detection, identification and quantification of GMOs using PCR
i. DNA Extraction from the samples
ii. Checking DNA quality

5. WEEK 7 & 8
a. Planned activities

• Detection, identification and quantification of GMOs using PCR
i. Setting up PCR reactions
ii. Optimization of the reactions

6. WEEK 9
a. Planned activities
• Detection, identification and quantification of GMOs using PCR
i. Agarose Gel Preparation

7. WEEK 10
a. Planned activities
• Detection, identification and quantification of GMOs using PCR
i. Electrophoresis of PCR Products

8. WEEK 11
a. Planned activities
• Detection, identification and quantification of GMOs using PCR
i. Analysis of PCR products

b. Resources/materials required for week 5 to 11
• Brushes for cleaning grinders
• Compressed air blower for cleaning
• Vacuum cleaner
• Ultrasound bath (e.g. useful for cleaning sieves)
• Spoons, spatulas mills, grinders, blending devices
• Oligonucleotide Primers
• Taq polymerase enzymes
• Deoxy-nucleotide triphosphates
• Enzyme buffers
• Magnesium solutions
• Sterile water
• Kits and related reagents
• Thermal cycler for PCR and nucleic acid analysers (spectrophotometers, enzyme immunoassay microtiter plate readers)

c. Expected outcomes for week 5 to 11
• Skills gained on how to detect, identify and quantify genetically engineered products using different sample types
• Familiar with threshold values of GMOs for different international markets
• Familiar with GMO labelling standards

9. WEEK 12
a. Planned activities
• Wrap up and report writing

b. Resources/materials required
• Computer, printer, stationery

c. Expected outcomes
• Written report submitted

Fellow #11, Morocco, Female/ NOFO: USDA-FAS-10777-0700-10.-18-0041

"Using new generation sequencing technologies and bioinformatics methods to explore date palm genome and genetic diversity."

1. Goal

The goal of my research is to learn new generation DNA sequencing technologies and their applications in studying plant genomics and genetic diversity.

2. Specific Objective(s)

The specific objectives of my training are (i) to acquire in-depth insight into modern techniques of exploring plant genomes, (ii) to get a good command of using new generation sequencing in studying plant genomes, and (iii) to learn practical aspects of processing, analyzing and interpreting sequencing data using bioinformatics approaches.

3. Background Information

In date palm, a perennial and dioecious plant species, new genotype selection using classical crossing methods is prohibitive, tedious and extremely time-consuming. For example, breeding programs aiming at creating new cultivars with specific desired traits require a series of crosses and backcrosses throughout many years. In addition, the resulting seeds need 5-10 extra years to reach fruiting stage for their commercial values to be assessed. Let alone the need for large fields and experimental stations and the amount of work and meticulous long term follow up and screening that the hybrids require to select for desired characteristics.

As a more efficient alternative, the study of date palm at the molecular level offers a great opportunity to predict plant phenotypic characteristics based on studying genetic information in the laboratory and greenhouse. Specifically, investigating date palm genome with new approaches of molecular biology and new generation sequencing technology will allow fast screening of large numbers of seedlings and select candidate individual plants with targeted encoding genetic information in their genomes. This information will foster breeding programs and save time and effort in the process of genetic selection.

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?

During the training I am hoping to get to enhance my capacity in designing and performing experiments in the field of plant genomics. Additionally, I would like to improve my skills in processing and analyzing sequencing data using bioinformatics and appropriate statistical methods. Another desired outcome of the training is to learn how to make biological meanings out of statistical figures to provide date palm breeders with scientific sound recommendations that will improve genetic selection programs. A long term goal is to build scientific connections with people having shared scientific visions for future research collaboration.

The Borlaug fellowship is a unique and much desired opportunity to work with renowned scientists from the USA and learn from their expertise in the field of my study. Working with a mentor from the US will

not only be confined to the period of the training, but will eventually extend to long term collaboration. This will provide continuous guidance and mentorship that will help me achieve my research goals.

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

My training will endow me with knowledge and new skills that I will share with members of my research team. Accelerating breeding programs using new scientific approaches will allow rapid introgression of genes of interest into the genomes of commercial date palm varieties. Overall, my training will provide basic knowledge as well as substantial practically valuable information that will allow me to carry out cutting-edge research with the aim of understanding the genetic underpinnings that govern agronomic beneficial traits in date palm. Findings from research to be conducted following my training will produce scientific and technological knowledge to enhance date palm productivity, secure food security in date palm growing areas, and support development of date palm industry in Morocco.

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.

W1: Laboratory orientations and staff introductions
Outcome: validation of the training program

W2-4: Reviewing literature and taking courses on next generation sequencing techniques, and bioinformatics analysis tools.
Outcome: Acquire basic knowledge of approaches used in generating and analyzing molecular data.

W5-7: working on a small project including practical aspects of studying genetic diversity: sample collection and preparation, library preparation, troubleshooting...
Outcome: gain insight into effective methods of conducting experiments and generating high quality data.

W8-12: Analyzing and interpreting data from my small project. This is a crucial section of the training that will allow me to get acquainted with various analysis techniques that use bioinformatics approaches to mine plant genomes, perform comparative transcriptomics.
Outcome: Learn modern techniques for analyzing and making biological meanings of data from sequencing technologies.

Fellow #13, Rwanda, Male/ NOFO: USDA-FAS-10777-0700-10.-18-0043

"The research aim is getting the latest knowledge and skills on international standards on the testing of meat and dairy products and understanding necessary requirements and pre-requisites to adopt and apply them in Rwanda."

1. Goal

The goal of my research is to get latest knowledge and skills on international standards on the testing of meat and dairy products and understand necessary requirements and pre-requisites to adopt and apply them in Rwanda.

2. Specific Objective(s)

i) Review the latest international standards on dairy and meat testing

ii) To understand necessary prerequisites and requirements to adopt and apply these standard in a Rwanda context

iii) To get knowledge on necessary policing and legislation actions necessary to accompany these changes

iv) To share experience with USA on the evolution of food safety sector and monitoring system of the implementation of the international standards on dairy and meat products

3. Background Information

Rwanda is located in Eastern Africa Country and its population is estimated at 11.89 million (NISR, 2017) and 83 % live in rural areas (NISR,2012) , its livelihood being directly relative to activities of farming and animal husbandry. Although the economic rapid development has been seen this last decade with an average of economic growth rate of 7% between 2000 and 2017, more than 30% 0f its economy depend on agriculture sector. The animal husbandry is a very ancient economic activity in Rwanda and it has some have direct relation with social and political importance in the country's history. The statistics show that the livestock has grown from 1 million to 1.35millions cattle and for that milk production has been growing from 142,511 tons to 700,000 in 2017 while the meat production has grown from 49,851 tons to 131,000 tons in the same period (RAB, 2017). The government in collaboration with the private sector has initiated the campaign to improve the quality and the safety of animal products focusing mainly on milk and meat. The policy has changed to allow these expected changes and consequent staffing has been done by putting in place 1 general direction (RALIS) at ministry level in 2012 level and 1 direction of veterinary inspection (DVI) at implementation level in 2015. The changes expected in quality and safety have stated with putting in place regulations to guide dairy and meat sector. However, the necessary skills and knowledge necessary for these changes are still needed at different levels from farmer to consumers, while an increase of animal production should go together with the quality and safety of those products. Indeed these products are very rich in nutrients necessary to human being but also very susceptible to spoliation, degradation and intoxication due to microorganisms, if adequate measures are not taken and implemented in order to guaranty their safety and insure their quality for their competiveness on the market and the benefits of Rwanda farmers.

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?

During this fellowship I hope to be able to discover and understand the international standards for the safety and quality of milk and meat products and the required pre-requisites from different stakeholders (Public sector, private sector, citizens) to adopt or adapt them in the context Rwanda.

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

The Borlaug Fellowship will enable me to fully understand the international standards for testing of meat and dairy products and as a director of veterinary inspection at the implementation level and part of the policy making team, the acquired skills and knowledge will be transferred to the staff of the direction and will help to adjust our actions. I also believe that they will be a great asset during different policy review opportunities.

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:
-Get familiar with the program goals, the university organization, laboratory orientation and staff introduction
-Review my research proposal with my US mentor, and allocate the budget to different planned activities.

Week 2-3:
Study U.S.A experience in milk and meat production systems, quality system, and safety system

Week 3-4:
Tour visit of livestock farms (Cattle, Beef, Poultry, Pig, Small ruminants), visit of animal products quality system agency/institution, visit animal products safety agency/institution

Week 5-6:
Learn about different international standards applicable to the testing of dairy and meat safety and acquire laboratory skills where possible.

Week 7-8:
-Learn about policy and legislation related to livestock and animal products sector, socio-economic interrelation with implementation of the international standards for testing of dairy and meat products, transfer of new knowledge and skills to staff and propose it to policy making team.
-Visit of big plant for distribution of dairy and meat and get knowledge of their organization and functioning on food safety.

Week 9-10:
Review, and understand necessary requirements and pre-requisites to adopt and apply these international standards for the testing of dairy and meat products in Rwanda.

Week 11-12:
-To share experience with USA on the evolution of food safety sector since ancient times up today and the monitoring system of the implementation of the international standards on dairy and meat products
-To visit the agriculture/animal husbandry museum in order to better understand the evolution of the food safety sector with the times and visit the Food Safety and Inspection Service (FSIS) agency.

Fellow #16, Tanzania, Male/ NOFO: USDA-FAS-10777-0700-10.-18-0046

"The objective of the present proposal is to learn about the international standards for testing Animal Sourced Foods (ASFs) and propose methods for implementing them in Tanzania."

1. Goal

Building capacity of Sokoine University of Agriculture to test animal sourced foods with a goal of safeguarding health of consumers.

2. Specific Objective(s)

The goal of my research is to acquire knowledge and hands on skills for testing animal sourced food (ASF) products using international standards and propose methods for implementing them in Tanzania Specific objectives;

(i) to review available or develop new methods and approaches for assessing ASF value chains in relation to nutrition and health;

(ii) to use the selected methods to assess food quality and safety in value chains with high potential for transformation; and,

(iii) to review and practice skills for implementing international standards for food quality and food safety assessments in Tanzania.

3. Background Information

Animal products provide important sources of energy as well as micro and macro nutrients. Over 80% of protein-rich food is primarily derived from meat and milk particularly of livestock. For example milk provides fat, protein, and essential micro-nutrients, such as iron, zinc, and vitamin A, making it a desired food that is especially sought after in developing countries including Tanzania (FAO, 2013). Consumption of milk and milk products in African countries will continue to increase from their current levels (Tschirley et al. 2014). Like milk, meat and meat products play a great role in nutrition and contribute a considerable amount of animal protein, fat, phosphorus, iron and various vitamins in human diets (Ukut et al., 2010). There is evidence that production of these products in Tanzania is increasing (MALF, 2016). However, ASF products like beef and milk are highly vulnerable to microbial invasion and food poisoning due to their nutritive value (Soyiri et al., 2008). In one recent paper it was shown that, milk in Tanzania is infected with a large number of bacteria which cause poor microbial quality, some are pathogenic (Msalya, 2017). In the same report, it was shown that, quality of milk is affected by presence of antimicrobials and addition of water or flour (adulteration). In other studies, it has been suggested that, meat and meat products intended for consumption contain high levels of microbes (Ntanga et al., 2014) and are of poor nutritional quality (Nonga et al., 2015). Most of ASF products are sold in informal markets where conventional regulation and inspection methods often fail and standards are weak or nonexistent leading to potential burden of food borne diseases and quality loss (Häesler et al. 2014). In addition, there is inadequate surveillance and implementation of legislation governing food safety and consumer health. For this and other reasons products contamination and quality loss is common. It is aimed in this study to devise the methods for testing milk and meat products and suggest sustainable strategies for implementation in order to address the problem of unsafe food and quality loss.

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?

Planned activities: Firstly; to review methods for collected food samples for testing at international standard levels, followed by collection of samples in the production, collection or processing points of meat and dairy value chains in the United States of America (USA) and Tanzania.

Secondly; methods used in the testing of ASFs will be reviews and listed in a designed sheet in excel. Selected methods will be tested using samples collected in USA and in Tanzania. Methods confirmed to inspect and test ASFs to international standard levels will be tested and implemented in the laboratories at Sokoine University of Agriculture (SUA) in Tanzania. Confirmed methods will be documented and recommended for use by different laboratories and agencies.

Thirdly; analysis of data and evaluate nutritional quality and microbiological status according to international standards.

Fourthly; preparation of manuals for use by local experts in Tanzania. Total time will be 18 weeks summarized into various activities shown in ix Table 1.

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

Contribution of Borlaug Fellowship: To enhance food safety and food security by imparting skills for testing meat and dairy products thereby ensuring food safety and increasing faith of consumers and bringing in more eaters of these products.

References:

Häesler et al. (2014) Rapid assessment of nutrition and health risks in informal dairy value chains in Tanzania. London: Royal Veterinary College 1 – 56pp.

Tschirley et al. (2014) “The rise of a middle class in East and Southern Africa: implications for food system transformation,” Working Paper 119, World Institute for Development Economics Research

(WIDER), Helsinki, Finland, http://www.mafs-africa.org/publications.

FAO (2013) Milk and dairy products in human nutrition. Food and agriculture organization of the United Nations. Rome, Italy.

Msalya (2017) Contamination levels and identification of bacteria in milk sampled from three regions of Tanzania, evidence from literature and laboratory analyses. Veterinary Medicine International 2017:9096149. pp 1 – 10 doi:10.1155/2017/9096149.

Nonga et al. (2015) Survey of physicochemical characteristics and microbial contamination in selected food locally vended in Morogoro Municipality, Tanzania. BMC Res Notes 8:727 DOI 10.1186/s13104-015- 1716-5.

Soriyi et al. (2008) A Pilot Microbial Assessment Of Beef Sold In The Ashaiman Market, A Suburb Of Accra,

Ghana. African Journal of Food, Agriculture, Nutrition, and Development 8:91 – 103.

Ministry of Agriculture, Livestock and Fisheries (MALF) 2016, Budget Speech for 2016/2017, Tanzania. https://tanzania.go.tz/.

Ntanga et al. (2014) Assessment of beef microbial contamination at abattoir and retail meat shops in

Morogoro Municipality, Tanzania, Tanzania Veterinary Journal 29: 53 – 61.

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.

SN Activity Proposed duration
1 Literature review and selection of methods for testing meat and dairy products 2 weeks
2 Preparation of laboratory reagents for testing the samples and decision of study areas 1 week
3 Sampling of target products and preliminary evaluations 2 weeks
4 Prepare samples for testing using international testing methods 1 week
5 Orientation and learning international testing methods in USDA laboratories 3 weeks
6 Sampling of milk and meat products in USDA decided localities 1 week
7 Carry out laboratory tests of the samples 2 weeks
8 Data analyses for laboratory tests 1 week
9 Draft manuals for testing standards of meat and dairy products 1 week
10 confirming the tests in and release of standards manual 4 weeks
6 weeks (ground work in Tanzania); 8 weeks (studying and testing products following international standards); 4 weeks (draft of manual)

Activities 1 and 2, half of activity 3 as well as 2 weeks of activity 10 will be accomplished in Tanzania some of which will involve the US mentor.

Fellow #17, Senegal, Female/ NOFO: USDA-FAS-10777-0700-10.-18-0047

"My proposed research topic is the comparison of levels of contamination and exposure of the Senegalese chemical contaminants population (Arsenic, pesticides and aflatoxins) when consuming local rice and imported rice."

1. Goal

The goal of my research is to compare the levels of contamination and exposure of the Senegalese population to chemical contaminants (arsenic, pesticide residues and aflatoxins) when consuming local rice and imported rice.

2. Specific Objective(s)

-to take stock of the consumption, import and production of rice in Senegal

-to assess the levels of contamination in arsenic, pesticide residues and aflatoxins

-To compare the level of exposure of the population of Senegal in the consumption of local rice and imported rice.

3. Background Information

This topic will assess the risks associated with contaminants in the food chain in Senegal. The results obtained will make it possible to know the levels of arsenic, pesticides and aflatoxins in local rice and imported rice. These results will also enable the state to have a basis for making decisions in the area of self-cultivation of rice which is a priority of the Emerging Senegal Plan.

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?

This research project will allow me to have baseline data on the rice problem in Senegal. The mentor in the USA will allow me to validate certain methods of analysis with other equipment in order to confirm my results and to ensure the reliability of the results.

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

This project falls within the framework of the Emerging Senegal Plan through the Program of Relaunch and Acceleration of the Cadence of Agriculture in Senegal (PRACAS). This component stipulates self-sufficiency in rice by irrigated and rain-fed rice cultivation. It will ensure the monitoring of the sanitary quality of rice in Senegal.

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 2: Bibliographical review with the mentor, finalize the thesis plan and start writing the article

Week 3: Grinding rice samples from Senegal preparation of samples for analysis, review of the analytical method for the analysis of Arsenic, pesticides and aflatoxin.
Week 4: Preparation of Calibration Standard and Injection Solutions
Week 5: sample extraction
Week 6: sample extraction
Week 7: sample extraction and reading from GCMS or LCMS, ICPMS.
Week 8: reading samples
Week 9: calculation and validation of results
Week 10: calculation and validation of results
Week 11: finalize the draft report
Week 12: finalize the draft report and draft article