

2018 RIFA Project Catalog

Applications due February 28th

The Research and Innovation Fellowship for Agriculture (RIFA) offers early-career professionals enrolled in agricultural and development-oriented graduate programs at all University of California campuses the opportunity to plan, engage and implement two to six-month-long international projects in developing countries.

RIFA Fellows collaborate with a host institution in the country they are working to develop robust projects that address global challenges in agriculture and food systems. Host organizations define the available opportunities and a fellow's collaborative work contributes integrally to the success and sustainability of ongoing projects and programs. Faculty mentors at the University of California also play an integral role, serving as resources and helping guide Fellows in their projects.

RIFA application resources:

RIFA application - Find a RIFA Mentor - RIFA Timeline - RIFA Application Checklist
(See the RIFA webpage for PDFs)

Project titles linked to full project listings – click title to read detailed project description.

**Funding allocations are based on average round-trip airfares between host locations and major CA airports.*

Additional funds added for ground transportation. If travel costs are demonstrated as higher than listed, additional funding can be made available to fellow. All fellows receive \$1,000/month unless match funds are provided by the host.

Vaccinations, pre-travel health visits and insurance will be covered up to \$500.00

Project Title	Country	Host Organization	Duration (desired, between 2-6 mo)	Keywords	Funding Details (*see explanation for calculations)
Central America					
Geospatial Analysis of Wild Cacao Trees	Belize	BFREE	2	mapping, agroforestry, data collection	\$1,150 + \$1000/month
Women's Empowerment through Horticultural Production in Honduras	Honduras	Escuela Agricola Panamerica (Zamorano University)	3	gender, horticulture, technology, communication	\$1,400 + \$1000/month <i>*final month stipend of \$1000 provided by host as cost match</i>
Agrodiversity for sustainable agriculture in Yucatan	Mexico	Universidad Autónoma de Yucatán	flexible	agrodiversity, data collection, database	\$1,100 + 1000 month
Various projects (8), see listing for details	Mexico	CIMMYT	varies	wheat, data analysis, modeling, field trials	\$1,100 + \$1000/month
Innovation Center on Inputs for Bioenergetics and Co-products	Mexico	INIFAP	6	Breeding, genetics, GIS, lab skills	\$1,100 + \$1000/month

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Production of second-generation (2G) bioethanol from agroindustry waste	Mexico	Tecnológico Nacional de México	flexible	bioethanol, renewable feedstocks	\$1,100 + \$1000/month
Agroecology and Food Security in Rural Nicaragua	Nicaragua	CANTERA	6	agroecology, climate change adaptation, feasibility studies	\$1,150 + \$1000/month
South America					
Building on the Success of the Marketplace (M-BoSs) Monitoring and Evaluation	Brazil (<i>and likely Africa</i>)	Agricultural Innovation MKTPlace (Embrapa)	6	project monitoring and evaluation, goat breeding	\$2100 + \$1000/month
Rhizosphere-Induced Nitrogen Fixation in Brazilian Pasture compared to Primary Forest	Brazil	Universidade de Sao Paulo	3	forage crops, soil microbes, C & N cycling	\$1,800 + \$1000/month
Exploring Climate Smart Agriculture as a Form of Community Development	Ecuador	Fundación Sol & Montaña	flexible	coffee, climate smart, economic & social sustainability	\$1,400 + \$1000/month
Biomass and Nutrient Partitioning and Nutrient Recycling in Cacao	Ecuador	Hacienda La Chola / Mars, Inc.	6	crop residues, fertilizer, nutrient, cacao	\$1,550 + \$900/month <i>all meals at field station covered by host</i>
Agriculture-nutrition linkages: Improving food and security nutrition in the potato-based highlands systems in the Andes	Peru <i>and Ecuador</i>	International Potato Center (CIP)	flexible	potato, nutrition, interventions, data analysis	\$1,550 + \$1000/month
Early Awareness and Participatory Education for flood disaster risks in the Southern Cone of Latin America	Uruguay	UTEC	6	Latin America, disaster management, education	\$2,300 + \$1000/month
East Africa					
Appropriate Technology & Practice Assessment for Moringa Production and Processing	Kenya	World Agroforestry Centre-ICRAF	6	field trials, solar dryer, communication	\$2,200 + \$1000/month
Toward Sustainable Food Systems Profiles for Decision-makers in Kenya and Vietnam	Kenya	CIAT	flexible	food systems, analysis, data collection	\$2,200 + \$1000/month
Strengthening Capacity in Tanzania to Implement Agriculture Climate Resilience Actions	Tanzania	World Agroforestry Center (ICRAF)	flexible	climate-smart ag, impact evaluation	\$2,300 + \$1000/month
Drip Irrigation Design and Biogas System Establishment	Uganda	Kulika Uganda	3	design, building, irrigation, biodigester	\$2400 + \$700/month <i>lodging covered by host</i>

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Development and Assessment of irrigation technologies for smallholders farmers in Uganda.	Uganda	TEWDI Uganda	3	communication, trainings, data analysis	\$2400 + \$1000/month
Improving Cowpea for Yield Potential and Stress Resilience	Uganda	Makerere University Kampala	flexible	cowpea, breeding, genetics	\$2400 + \$1000/month
Digital Platforms for African smallholder farmers to access 'bundled services'	Uganda, Tanzania, Laos	Olam International Ltd.	flexible	coffee, farmer services, technology adoption	\$2400 + \$1000/month
North Africa					
Valorization of medicinal plants and rangelands rehabilitation in Eastern Morocco	Morocco	Morocco Ministry of Agriculture, Water and Forests	flexible	value chain, edible herbs, rangelands	\$2,200 + \$1000/month
South Africa					
South African Avocado, Cherry, Almond, Date (medjool) and Tomato Mini-studies	South Africa, Namibia	ZZ2	flexible	postharvest practices, ag practices, crop evaluation	\$2500 + \$1000/month
West Africa					
"Balu Tin Marino" Improved nutrition through food fortification in the Gambia	Gambia, Senegal	United Purpose	4	nutrition, survey, crop adoption	\$2,250 + \$1000/month
Participatory evaluation of extra early, early and medium maturing MAGIC cowpea lines	Ghana	CSIR- Savanna Agricultural Research Institute	4	Ghana, cowpea, field trials, farmer interviews, analysis	\$2500 + \$1000/month
Researching and documenting orange fleshed sweet potato (OFSP) yield results.	Ghana	Global Communities	2	scaling up, sustainability, messaging	\$2500 + \$1000/month
Understanding Cost of Operations for Cotton Farmers in Ivory Coast	Ivory Coast	SECO-OLAM	3	cotton, farmer interviews, cost effectiveness	\$2,600 + \$1000/month
Warehousing Management and Storage Techniques for the Millet Business Services Project	Senegal	NCBA CLUSA Millet Business Services Project	3	crop storage, warehouse management, millet	\$2,350 + \$1000/month
Central Asia					
Pathways to Innovation in Central Asia: Building regional capacities for agri-enviromental research	Tajikistan	University of Central Asia	flexible	capacity building, academic, projects	\$2,700 + \$1000/month <i>*great team opportunity! First fellow funded by RIFA, second by host.</i>
East Asia					

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<u>Coordination Mechanism of Ecological Effect and Resource Utilization in the Middle and Lower Reaches of the Yangtze River</u>	China	Zhejiang University	3	field and laboratory sampling, crop rotation	\$1,800 + \$1000/month
<u>The impact of re-flood on active microbes responsible for nitrous oxide emission in Chinese paddy soils</u>	China	Zhejiang University	flexible	microbes, SIP microcosms	\$1,800 + \$1000/month
South Asia					
<u>Agricultural Landscape Assessment in West Bengal, India</u>	India	Grameen Foundation	3	agricultural landscape assessment, impact evaluation, qualitative research	\$1,800 + \$1000/month
Southeast Asia					
<u>Food, Agriculture and Social Entrepreneurship (FASE) Curriculum & ToT</u>	Cambodia	Green Shoots Foundation/CIDO	3	value chain, vegetables, innovation	\$2,200 + \$1000/month
<u>Innovations to Build and Scale Safe Vegetable Value Chains in Cambodia-Hard and Soft Technologies</u>	Cambodia	Royal University of Agriculture, Phnom Penh	flexible	safety, vegetable production, technical and social innovations	\$2,200 + \$1000/month
<u>Innovations to Build and Scale Safe Vegetable Value Chains in Cambodia-Value Chain Analysis</u>	Cambodia	Royal University of Agriculture, Phnom Penh	flexible	value chain, vegetable production, inputs	\$2,200 + \$1000/month
<u>Social-Ecological Contributions of Organic Agriculture to Sustainable Climate Resiliency Among Smallholder Farmers</u>	The Philippines	ASI - University of Philippines, Los Banos	flexible	climate resiliency, farming, policy change	\$1,800 + \$1000/month

Project: Geospatial Analysis of Wild Cacao Trees

Host: Belize Foundation for Research and Environmental Education (BFREE)

Location: Belize

Project Summary: Fellows will assist in a mapping project for a rare and genetically unique variety of cacao whose material would be used to implement a cacao agroforestry program by a conservation organization in southern Belize. Fellows will work with onsite staff to geo-reference the cacao trees and collect preliminary data on habitat and site characteristics.

Project Description:

The Belize Foundation for Research and Environmental Education (BFREE) operates a biological field station and 1,153 acre private reserve located in southern Belize at the foothills of the Maya Mountains. Over 20 years ago, while exploring the property, BFREE staff identified cacao trees growing wild on the reserve. In 2015, seeds collected from these wild trees were designated heirloom fine flavor by the Heirloom Cacao Preservation organization. Genetic testing from the USDA/FAS determined this variety was 100% pure criollo, one of the few pure wild criollos known, likely cultivated by the Aztec culture in South America and, over time, brought to southern Belize and cultivated by the ancient Maya thousands of years ago.

This variety of cacao appears to require environmental conditions that incentivize tropical forest conservation. A high percentage of shade and a structurally diverse forested environment provide natural ecological barriers to disease and cross-pollination, and are likely the conditions necessary for productivity; ultimately, correlating a high value agricultural crop to a high quality rainforest habitat.

As a result of this discovery, BFREE has begun a project to preserve and propagate this rare and wild ancient heirloom fine flavor cacao. The first step in this process is to understand the spatial distribution and habitat requirements of this variety which appear to be different from other varieties of cacao.

Fellows will have the opportunity to participate in mapping the distribution of the wild trees on the BFREE property. Fellows will accompany staff into gridded forest plots throughout the 1,153 acre property, conduct surveys for the presence of wild cacao trees and when trees are found they will use GPS units to geo-reference and tag each individual tree, collect data on vegetation and canopy characteristics, distance to nearest water source, depth of the water, standing water in the plot, categorize soil type, collect and analyze soil samples at multiple sites, collect tissue samples and note the phenological stage of the plant (flowering, leafing, number of fruits, etc). Photographs will be taken to document each tree as well.

When not in the field, Fellows will assist with data entry, database management and basic GIS mapping. The Fellows will compile the results in a report as the final project product.

For more information about BFREE, visit www.bfreebz.org

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Work Environment:

The Fellow(s) will engage in fieldwork and office work at the BFREE field station in the Toledo District of southern Belize.

Desired Skills of Fellow(s):

Compass skills, mapping skills, competent with Arc GIS, use of GPS units, soil sampling and analysis experience preferred, comfortable working outdoors in tropical environments, ability to get along well with others.

Funding Notes:

In support of Fellows' participation in the mapping project, BFREE is willing to offset some of the living costs in order to help ensure that student's living costs stay below the \$1000.00 monthly stipend. Also, BFREE has a GPS unit available for the project. However, it is recommended that, if possible, students come equipped with their own. Our station uses Garmin Map 64SC.

Language: English

Desired Duration In-Country: 2 months, between June-August 2018 would be best, but host is flexible.

Main Point of Contact: Heather Barrett, Deputy Director, hbarrett@bfreebz.org, US: 352-231-2772

Principal Field Based Collaborator: Elmer Tzalam, Operations Manager and Cacao Farm Manager

University of California Faculty/Staff Counterpart (Mentor): Nikki Grey Rutamu, Associate Director, Humphrey Fellowship Program, Global Affairs, and Training Coordinator, International Programs Office, College of Agriculture and Environmental Sciences, ngreyrutamu@ucdavis.edu

Project: Women's Empowerment through Horticultural Production in Honduras

Host: Escuela Agricola Panamerica (Zamorano University)

Location: Honduras

Project Summary: This project, funded by the Horticulture Innovation Lab, is investigating the potential of horticulture to empower women and improve household nutrition and income. Depending on the background of the fellow, they would contribute to integration of gender in business and marketing training for producer organizations, identify gender-sensitive sustainable intensification technologies for horticulture and/or develop documentation and communication pieces for the Horticulture Innovation Lab Regional Center at Zamorano.

Project Description:

Our project has several options for engagement of a RIFA Fellow, depending on the applicant's background and interests. We are starting the fourth year of a five-year project that seeks to understand how horticultural production can empower women and improve household well-being in Western Honduras. Most producers in this area are small-scale subsistence farmers using minimal inputs or technologies.

We have developed a gender-sensitive Farmer Field School curriculum which will be deployed in the department of Intibuca in the spring of 2018. This curriculum integrates gender awareness and sensitization throughout the 16-week curriculum through role playing, discussions and reflection. We intend to integrate these gender modules into training for producer groups (both mixed-gender and women's groups) in financial management, marketing, negotiations, etc. A fellow could take a lead on this initiative.

A second project is to identify gender-sensitive sustainable intensification technologies for horticultural producers in the region. Given their limited land holdings, producers in this region need access to and an understanding of technologies and practices that can sustainably increase production at a low cost.

A third project would be to work with the Horticulture Innovation Lab Regional Center at Zamorano to document and communicate their activities in outreach and training, especially in work related to small scale horticultural producers and gender-sensitive training.

We are open to exploring other options with an interested candidate.

Work Environment:

The Fellow(s) will work primarily at the Zamorano University campus, near Tegucigalpa. There will likely be field visits to producer groups in the western highlands.

Desired Skills of Fellow(s):

Critical thinking, writing, ability to synthesize knowledge and work independently. Familiarity with gender issues in agricultural development is preferred but not required.

Funding Notes: In country travel expenses (e.g. to sites in western Honduras) will be provided.

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Language: Spanish, limited working proficiency

Desired Duration In-Country: 3 months, time of stay flexible.

Main Point of Contact: Janelle Larson, JBL6@psu.edu, 610 396 6183

Principal Field Based Collaborator: Arie Sanders, sanders@zamorano.edu

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Agrodiversity for sustainable agriculture in Yucatan

Host: Universidad Autónoma de Yucatán

Location: Mexico

Project Summary: We are developing a database on agrodiversity of the Yucatan given emphasis to traditional agroecosystems. Students involved will gather information in rural communities about crops and practices. We want to establish a baseline of information in a user-friendly central database for soil and water resources; biota diversity; and socioeconomic status as these factors relate to food security.

Project Description:

At a time when the world's population is increasing rapidly while the climate is changing and resources are becoming limited, it is essential to think of novel strategies to meet the global demand for food and raw materials. Agrobiodiversity is the subset of biological diversity with relevance to food and agriculture, selected naturally and through human intervention over the millennia. It includes a variety and variability of living beings at different levels (genetic, species, and ecosystem levels) which are indispensable to maintain the key functions of the agroecosystem.

Mayan home gardens are the most intensively utilized agroecosystem by the campesinos in the Yucatan Peninsula, Mexico. Home gardens involve different agricultural techniques. They are rich in wild and domesticated plant species and the structure is defined by multipurpose perennial species. Ethno-historical documents suggest that the Maya people made use of at least 39 fruit species since the Pre-Columbian era. Some of these species were native to the region whereas others were introduced in an earlier period from other areas of The Americas.

Many of the numerous fruit species that were used in the past as food are presently not cultivated. Apparently, this is due to the limited market demand for these fruits, the changes in eating habits and the loss of knowledge regarding meal-preparation techniques in which these fruits are included as ingredients. Besides, the biological importance in terms of conservation and storage of useful germplasm, the rescue of such techniques and species could help to improve the nutritional status and the economy of rural people.

We propose the establishment of training programs for locals regarding cultivation, transformation, commercialization, and consumption of indigenous fruits. Through the development of sustainable food networks and a diversified fruit chain in the region, it will be possible to revalue these indigenous fruit species. This strategy is also expected to contribute to improve social and economic sustainability in the rural areas of Yucatan.

Work Environment:

Fellows will have an introduction to the project and the region, this will be in Merida. They will be mostly in one the municipalities where we are working: Tzucacab, Peto, Tahdziu, Mayapan, Cantamayec, Chacsinkin, Tixmehuac and Tipikal. If necessary, the fellow can do lab and office work at UADY Campus of Biological and Agricultural Sciences.

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Desired Skills of Fellow(s):

Knowledge of some combination of agroecological practices: composting, association and rotation of vegetables, preparation and use of biopesticides. Insect pest management. pruning of fruit trees, and seed production skills and experience with participatory research are also desirable.

Funding Notes: We will make arrangements for the fellow's housing and transportation in the rural communities where we work. All materials for office, lab and field work are covered by the project.

Language: Spanish, elementary.

Desired Duration In-Country: Flexible, as long as possible, no specific time period.

Main Point of Contact: Juan J. Jiménez-Osornio, Professor, Campus de Ciencias Biológicas y Agropecuarias, josornio@correo.uady.mx

Principal Field Based Collaborator: Juan J. Jiménez-Osornio

University of California Faculty/Staff Counterpart (Mentor): Michael Allen, Distinguished Professor, Departments of Plant Pathology and Microbiology, Biology; Director, Center for Conservation Biology, mallen@ucr.edu

Project: International Maize and Wheat Improvement Center Projects

Host: CIMMYT

Location: Mexico

Project Description:

1. Analysis of genetic variability for wheat grain fructans and/or arabinoxylans

Summary: Fructans are functional food ingredients that selectively promote the growth of beneficial bifidobacteria in the human gut, making the digestive system work more effectively, thereby increasing the absorption of more beneficial nutrients, particularly calcium and iron. The fellow will be in charge of developing, testing and validating different high-throughput protocols to analyze wheat grain fructans and arabinoxylans and to screen for their concentration in different sets of wheat samples, in order to have an idea of the genetic variability for this trait in CIMMYT germplasm.

Project Description:

Fructans and arabinoxylans are functional food ingredients that deserve attention for their potential health benefits. They selectively promote the growth of beneficial bifidobacteria in the human gut, making the digestive system work more effectively, thereby increasing the absorption of more beneficial nutrients, particularly calcium and iron. Iron availability and absorption are particularly important, given that billions of people are iron deficient. Significant genotypic variation has been described for these bioactive components, with grain fructans content ranging from 0.7 to 2.9% of grain dry weight. There is no evidence of strong genotype-by-environment interaction, and therefore breeding approaches could be carried out to increase fructans content. For this purpose, the first step is to analyze the genetic variability in current CIMMYT lines to have an idea about the available genetic variability. This step also involves developing/validating a high-throughput methodology to quickly quantify grain fructans and arabinoxylans at a low cost, which is necessary when analyzing large numbers of lines developed by the breeding program.

The fellow will be in charge of developing, testing and validating different high-throughput protocols to analyze wheat grain fructans and arabinoxylans and to screen for their concentration in different sets of wheat samples, in order to have an idea of the genetic variability for this trait in CIMMYT germplasm. Those sets will include different wheat lines grown in different environments to analyze environmental and GxE effects on fructans and arabinoxylans concentration. The student will be responsible for analyzing the results and publishing them in an SCI journal.

Work Environment:

The student will work at CIMMYT's Headquarters in Texcoco, which is located 40 km outside Mexico City. The workplace is in the CIMMYT Bioscience lab.

Desired Skills of Fellow(s):

Ability to work with chemical/biochemical methodologies in the laboratory.

Funding Notes: Office costs & Internet access, lab costs and airport transfer is provided by CIMMYT.

Language: English

Desired Duration In-Country: 6 months

Number of Fellows: 1

Main Point of Contact: Carlos Guzman; C.Guzman@cgiar.org, Tel. +52 55 5804 2004

Principal Field Based Collaborator: Carlos Guzman

University of California Faculty/Staff Counterpart (Mentor): Student must find.

2. Stochastic stimulation for support decision in plant breeding research

Summary: When addressing complex questions about crop yield variables, breeders face a set of intricate subjects. Stochastic simulation can play an important role by delivering a cheap and quick answer when evaluation is not feasible due to the time and/or resources it requires. Parallel to the ongoing work on this theme at CIMMYT, the fellow is expected to join the development efforts of the project, ie, assist in its implementation, testing, debugging, documentation and maintenance with the aim of improving and extending the current version of the software.

Project Description:

Plant breeding has been fundamental for improving and adapting crops to human needs and benefits. Those achievements were obtained through selection that increases the net genetic merit of target traits, which are typically quantitative traits. However, while crop yields have increased over the past decades, current estimates show that the pace of progress is not going to be enough to satisfy the projected population demand or to overcome additional challenges, such as global climate change. When addressing these complex questions, breeders face a set of intricate subjects. These issues may be analyzed under quantitative genetic assumptions; some are easily evaluated but others are not. In this sense, stochastic simulation can play an important role by delivering a cheap and quick answer when evaluation is not feasible due to the time and/or resources it requires. Stochastic simulation has already been successfully applied here at CIMMYT. Although several options for quantitative genetic simulation are currently available, one that merges features such as high performance, cross platform, flexibility, friendly interface and free/open source is still being developed by the BSU/GRP team.

Parallel to the ongoing work on this theme here at CIMMYT, the fellow is expected to join the development efforts of that project, i.e, assist in its implementation, testing, debugging, documentation and maintenance with the aim of improving and extending the current version of the software. Specifically, the fellow will work on classic and well-founded genetic designs (e.g., Mathers, diallel and North Carolina types I and II) that involve using whole-genome data. He/she will also be trained to use the upcoming achievements in his/her own simulation project under the guidance of his/her supervisor and in agreement with his/her thesis advisor. The

project will also support the thesis activities; plan and script the simulation trials using our high performance computing facilities; summarize the outcomes and communicate the results.

Work Environment:

The fellow will work at CIMMYT's Headquarters in Texcoco, which is located 40 km outside Mexico City. The workplace is in the office area of the BSU (Biometrics and Statistics Unit).

Desired Skills of Fellow(s):

Ability in programming languages R and C++ desirable.

Funding Notes: Office costs & Internet access, lab costs and airport transfer is provided by CIMMYT.

Language: English fine

Desired Duration In-Country: 6 months

Number of Fellows: 1

Main Point of Contact: Fernando Toledo; F.TOLEDO@cgiar.org, Tel. +52 55 5804 2004

Principal Field Based Collaborator: Fernando Toledo

University of California Faculty/Staff Counterpart (Mentor): Student must find.

3. Heat Shock Tolerance Mechanisms in Wheat

Summary: The present study aims to identify physiological mechanisms associated with heat shock tolerance in a range of environments (drought, irrigation and heat) and the ability of different wheat genotypes to recover from brief 'heat shock' events. The fellow will work with the wheat genotypes in control and treated plots to assess the physiological effects of wheat genotypes before, during and after heat shock.

Project Description:

The negative effects of heat shocks (short periods of 1–4 consecutive days during which maximum temperature increases 2–4°C) on wheat yields during the grain-filling period are expected to become more common as a consequence of climate change. Heat shock can reduce grain weight and, sometimes, grain number, if it occurs before or soon after flowering, causing serious damage to wheat quality. Modeling studies by Asseng et al. (2011) suggested a yield reduction of ~0.2 t/ha for each such day, because of an assumed dramatic acceleration of leaf senescence in proportion to the number of such shocks. These effects should be influenced by the level of soil water and the previous acclimation of the wheat plants. The present study aims to identify physiological mechanisms associated with heat shock tolerance in a range of environments (drought, irrigation and heat) and the ability of different wheat genotypes to recover from brief 'heat shock' events.

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The fellow will conduct research at CIMMYT's experiment station in the Yaqui Valley (Northwest Mexico, Ciudad Obregon) during a period of 5 months (from February to June). The fellow will spend an additional month (July) at CIMMYT headquarters (in Texcoco) working with the data and statistical analysis for the publication.

During the period in Cd. Obregon, the fellow will work with the same genotypes under drought, irrigated and heat (late sowing) conditions. Two different heat shocks will be induced at heading stage and ten days after anthesis using specially designed tents in all three environments. Physiological characterization before, during and after heat shock will be conducted in the control and treated plots.

Work Environment:

The fellow will conduct research at CIMMYT's experiment station in the Yaqui Valley (Northwest Mexico, Ciudad Obregon) during a period of 5 months (from February to June). After that he/she will spend an additional month (July) at CIMMYT's headquarters (in Texcoco) working with the data and statistical analysis for the publication.

Desired Skills of Fellow(s):

The fellow should be able to work in the field under high temperature conditions (up to 40°C) and have basic knowledge of statistical analysis.

Funding Notes: Office costs & Internet access, field costs, local air travel to Ciudad Obregon and back and airport transfer is provided by CIMMYT.

Language: Spanish, basic knowledge.

Desired Duration In-Country: 6 months, desired. The fellow should be available for field work during a period of 5 months (from February to June). The fellow will spend an additional month (July) at CIMMYT's headquarters (in Texcoco) working with the data and statistical analysis for the publication.

Number of Fellows: 1

Main Point of Contact: Gemma Molero; g.molero@cgiar.org, Tel. +52 55 5804 2004

Principal Field Based Collaborator: Gemma Molero

University of California Faculty/Staff Counterpart (Mentor): Student must find.

4. The Role of Stomatal Conductance and Leaf Porosity for Maximizing RUE of Wheat

Summary: It is predicted that future increases in yield potential will rely largely on improved biomass production boosted by higher radiation use efficiency (RUE). The fellow will work with genotypes that have contrasting canopy architecture under irrigated and heat (late sowing) conditions in order to learn more about stomatal conductance and density in different canopy strata, as a strategy for maximizing photosynthetic capacity and RUE.

Project Description:

It is predicted that future increases in yield potential will rely largely on improved biomass production boosted by higher radiation use efficiency (RUE). Major improvement in photosynthetic capacity and/or efficiency will be required to maximize RUE. One strategy for increasing photosynthetic capacity is to increase canopy photosynthesis, including photosynthesis in leaves situated at different strata of the canopy. However, relatively little is known about genetic diversity for the photosynthetic rate of leaves below the flag leaf and their contribution to final biomass, probably due to the amount of time needed to make these measurements.

A useful proxy for measuring photosynthesis is to measure stomatal conductance using a porometer. In previous studies, a positive correlation between yield and stomatal conductance in the flag leaf was observed. To date, information regarding stomatal conductance and stomatal density at the different canopy strata and their regulation in response to environment in wheat is scarce. Given their importance, a clear opportunity exists to genetically improve crops for stomatal behavior through increased understanding of their distribution along the canopy, their response to environment, and through exploitation of genetic diversity.

Stomatal conductance and leaf porosity will be studied along the canopy strata with the goal of identifying genetic variation associated with radiation use efficiency in different environments (irrigated and heat) where increasing RUE is a target for increasing yield in wheat.

The fellow will conduct research at CIMMYT's experiment station in the Yaqui Valley (Northwest Mexico, Ciudad Obregon) during a period of 5 months (from February to June). The fellow will spend an additional month (July) at CIMMYT headquarters (in Texcoco) working with the data and performing statistical analysis for publication.

During the period in Cd. Obregon, the fellow will work with genotypes that have contrasting canopy architecture under irrigated and heat (late sowing) conditions. Stomatal conductance and leaf porosity will be measured at booting initiation and during grain-filling at different canopy strata (flag leaf, leaf 2, leaf 3 and leaf 4). These measurements will be included in growth and RUE analysis.

Work Environment:

The fellow will conduct research at CIMMYT's experiment station in the Yaqui Valley (Northwest Mexico, Ciudad Obregon) during a period of 5 months (from February to June). After that he/she will spend an

additional month (July) at CIMMYT headquarters (in Texcoco) working with the data and statistical analysis for the publication.

Desired Skills of Fellow(s):

The fellow should be able to work in the field under high temperature conditions (up to 40°C) and have basic knowledge of statistical analysis.

Funding Notes: Office costs & Internet access, field costs, local air travel to Ciudad Obregon and back and airport transfer is provided by CIMMYT.

Language: Spanish, basic knowledge

Desired Duration In-Country: 6 months desired. The fellow should be available for field work during a period of 5 months (from February to June). He/she will spend an additional month (July) at CIMMYT's headquarters (in Texcoco) working with the data and statistical analysis for the publication.

Number of Fellows: 1

Main Point of Contact: Gemma Molero; g.molero@cgiar.org, Tel. +52 55 5804 2004

Principal Field Based Collaborator: Gemma Molero

University of California Faculty/Staff Counterpart (Mentor): Student must find.

5. Developing an R-library for spatial analysis of experiments

Summary: Analytical models that model the spatial variability considering the grid location of plots in the field have improved the precision of estimating the treatment mean, which produces greater genetic gains in plant breeding than when this spatial adjustment is not performed. Free software for spatial analysis of experiments will provide breeders with more precise genetic values at minimum cost. The fellow will perform a review of existing R libraries for the analysis of experiments to identify the most suitable library, which will then be modified to include the modeling of the error by a spatial model.

Project Description:

Incomplete block designs and alpha-lattice field designs have helped increase the precision of estimating genetic values of breeding individuals. However, blocks or incomplete blocks do not capture all the plot-to-plot variability in a field experiment; therefore, appropriate modeling of the error term in field trials is indeed necessary. Analytical models that model the spatial variability considering the grid location of plots in the field have improved the precision of estimating the treatment mean, which produces greater genetic gains in plant breeding than when this spatial adjustment is not performed. A limited number of expensive commercial software (SAS, ASReml, Genstat) and specifically one of the most used spatial models, the separable

autoregressive in the direction of the rows and the columns, can model this spatial variability. However, no free software is available for this analysis. Some efforts have been made in R but the results are not reliable. Free software for spatial analysis of experiments will provide breeders with more precise genetic values at minimum cost.

The main objective of this proposal is to develop a free R-library for the spatial analysis of experiments. A review of existing R libraries for the analysis of experiments should be performed to identify the most suitable library, which will then be modified to include the modeling of the error by a spatial model. If no suitable library is found, a new R package including spatial analysis of field trials must be developed. Other activities included in the project are to produce technical documents for scientists and plan training activities to disseminate the new library.

Work Environment:

The fellow will work at CIMMYT's Headquarters in Texcoco, which is located 40 km outside Mexico City. The workplace is in the office area of the BSU (Biometrics and Statistics Unit).

Desired Skills of Fellow(s): Linear mixed models and computing programming in R.

Funding Notes: Office costs & Internet access and airport transfer is provided by CIMMYT.

Language: English

Desired Duration In-Country: 6 months

Number of Fellows: 1

Main Point of Contact: Gregorio Alvarado; G.Alvarado@cgiar.org, Tel. +52 55 5804 2004

Principal Field Based Collaborator: Gregorio Alvarado

University of California Faculty/Staff Counterpart (Mentor): Student must find.

6. Optimization of experimental design strategies in multi-phase studies

Summary: Traits that are measured in the laboratory are expensive and it is not possible to have data for all the experimental units that are in the field. The main objective of this research is to design and compare different sampling strategies based on the cost and precision of the produced data. The fellow will perform a literature review and the analyses needed to complete the research and will be responsible for writing the first drafts of the documents to be published.

Project Description:

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Traits that are measured in the laboratory are expensive and it is not possible to have data for all the experimental units that are in the field. Schemes for sampling the experiments have been proposed to obtain data from all the treatments together with an approximate estimation of the experimental error. Although this type of sampling reduces the overall cost of the experiment, it also reduces the precision of the estimation of some effects. The main objective of this research is to design and compare different sampling strategies based on the cost and precision of the produced data. Specific objectives are to: (1) determine the advantages and disadvantages of this type of sampling; (2) identify factors that affect the optimality of the sampling and measure their effect; (3) suggest randomization strategies for the lab phase and evaluate alternative design options for optimizing efficiency; and (4) write a scientific article and a technical document useful for scientists.

The fellow is expected to complete the work and, at the end of the visit, to have an article for publication and also a technical document for scientists. The student will perform a literature review and the analyses needed to complete the research. He/she will also be responsible for writing the first drafts of the documents to be published. In addition to activities directly related to the proposed research, the student would participate in other CIMMYT activities such as meetings, discussions with other scientists, and visits to research stations..

Work Environment:

The student will work at CIMMYT's Headquarters in Texcoco, which is located 40 km outside Mexico City. The workplace is in the office area of the BSU (Biometrics and Statistics Unit).

Desired Skills of Fellow(s): An understanding of experimental design concepts, use of analytical software (R, SAS, Genstat). M.Sc. or Ph.D. preferred.

Funding Notes: Office costs & Internet access and airport transfer is provided by CIMMYT. All other costs including health insurance should be absorbed by the student through his scholarship.

Language: English fine

Desired Duration In-Country: 6 Months, desired.

Number of Fellows: 1

Main Point of Contact: Juan Burgueño; J.Burgueno@cgiar.org, Tel. +52 55 5804 2004

Principal Field Based Collaborator: Juan Burgueño

University of California Faculty/Staff Counterpart (Mentor): Student must find.

7. Spatial variability of high-throughput phenotypic data in field experiments

Summary: High-throughput precision phenotyping (HPP) is rapidly becoming popular in plant breeding for its ability to facilitate measurement of data points from a broad spectrum of light reflectance wavelengths. When the obtained data points correlate well with a phenotypic trait of interest (e.g., grain yield), this allows using this technology to evaluate several plant phenotypes of agronomical importance. The fellow will be responsible for collecting and analyzing data using this method and writing a publication based on the results.

Project Description:

High-throughput precision phenotyping (HPP) is rapidly becoming popular in plant breeding for its ability to facilitate measurement of data points from a broad spectrum of light reflectance wavelengths. When the obtained data points correlate well with a phenotypic trait of interest (e.g., grain yield), this allows using this technology to evaluate several plant phenotypes of agronomical importance. For example, HPP can predict grain yield weeks before harvesting date, thus reducing harvesting costs and making it possible to make decisions for the next sowing season. However, it is not clear how spatial variability affects the relationship between HPP data and the traits of interest. It is known that soil characteristics can create a spurious relationship between different variables including HPP data. Spatial or soil variability can be handled by the experimental design and by the statistical model used to analyze the data, thereby improving the use of high-throughput phenotypic data.

The overall aim of this project is to understand and develop statistical models to analyze spatial variability of HPP data and their relationship with traits of interest, i.e., grain yield, flowering date. Specific objectives: (1) to test different spatial models and their ability to model HPP data; (2) to analyze the relationship between the HPP data, the spatial model and the experimental design; and (3) to publish scientific papers and technical documents to disseminate research results. The student will be responsible for collecting and curating the data, analyzing them and writing the documents. The student will work closely with BSU colleagues and give lectures to CIMMYT staff and partners.

Work Environment:

The student will work at CIMMYT's Headquarters in Texcoco, which is located 40 km outside Mexico City. The workplace is in the office area of the BSU (Biometrics and Statistics Unit).

Desired Skills of Fellow(s): Experimental design, linear mixed models.

Funding Notes: Office costs & Internet access and airport transfer is provided by CIMMYT. All other costs including health insurance should be absorbed by the student through his scholarship.

Language: English fine

Desired Duration In-Country: 6 months, desired

Number of Fellows: 1

Main Point of Contact: Juan Burgueño; J.Burgueno@cgiar.org, Tel. +52 55 5804 2004

Principal Field Based Collaborator: Juan Burgueño

University of California Faculty/Staff Counterpart (Mentor): Student must find

8. A Bayesian genomic prediction model combining pedigree and incomplete genotyped individuals

Summary: This project aims to develop a novel approach that uses Bayesian statistics to combine genotypic data with those with pedigree and phenotypic data and therefore use all available data. The overall aim of this project is to develop a theoretical model that includes pedigree and missing genotyping data in a unified approach, and test it with real data available from international multi-environment wheat breeding nursery trials.

Project Description:

Quantitative trait variation may display a complex genetic architecture, which is the underlying basis of a phenotype, with few genes with large effects and several genes with small effects. The genes can show additive, dominance or/and epistatic effects and different types of interaction with the environment. Advances in plant genomics –and, more recently, in DNA sequencing of many species– coupled with the availability of statistical and biometric methods for analyzing genetic and phenotypic data with friendly software, have made it feasible to map and dissect complex quantitative trait variation. Genomic selection (GS) and prediction based on genome-wide single nucleotide polymorphism genotyping, pedigree and phenotypic data are very powerful tools for capturing small genetic effects dispersed over the genome; this allows predicting an individual's phenotype. New methods and tools are continuously being developed to integrate GS into genetics research.

One of the key issues with GS is the fact that there are usually many more individuals that have been phenotyped and have pedigree data than individuals with marker data. When attempting to make predictions, only lines with marker, pedigree and phenotypic data can be used, thus leaving out lines with pedigree and phenotypic data that have missing marker data. This project aims to develop a novel approach that uses Bayesian statistics to combine genotypic data with pedigree and phenotypic data and therefore use all available data. This project will lead to developing new algorithms and software for GS based on advanced statistical methods that will cause a paradigm shift in this field.

The phenotypic variation of a plant population measured across locations, seasons or years can be attributed to its genetics, the environment where it grows, and genotype \times environment interaction. Biometric models are used to explain traits with continuous variation because algebraic equations facilitate the understanding of quantitative genetics, which is the study of complex traits affected by the action of multi-genes. Quantitative genetic models include genes having major or small effects and the non-genetic factors affecting a complex trait. Genomic prediction (GS) uses genome-wide single nucleotide polymorphisms, pedigree and phenotypic data, and is a very powerful tool to capture small genetic effects dispersed over the genome, which allows predicting an individual's phenotype. New methods and tools are continuously being developed to integrate GS

into genetics research. One of the key issues with GS is the missing values in the genotyped data, which makes it difficult to develop GS models with different numbers of lines with pedigree, marker, and phenotypic data.

The overall aim of this project is to develop a theoretical model that includes pedigree and missing genotyping data in a unified approach, and test it with real data available from international multi-environment wheat breeding nursery trials. The specific objectives are: (1) to mix the A matrix obtained from the pedigree with the G matrix obtained from the markers into one unified H matrix. The Bayesian approach used to compute matrix H will be compared with other models used as references in GP; and (2) the prediction accuracy of our H matrix will be compared with the prediction accuracy of other methods used to compute matrix H.

Work Environment:

The fellow will conduct research at CIMMYT's experiment station in the Yaqui Valley (Northwest Mexico, Ciudad Obregon) during a period of 5 months (from February to June). After that he/she will spend an additional month (July) at CIMMYT headquarters (in Texcoco) working with the data and statistical analysis for the publication.

Desired Skills of Fellow(s): Bayesian analysis and computer programming in R.

Funding Notes: Office costs & Internet access, field costs, local air travel to Ciudad Obregon and back and airport transfer is provided by CIMMYT. All other costs including health insurance should be absorbed by the student through his scholarship.

Language: Spanish, basic

Desired Duration In-Country: 6 months, desired. The fellow should be available for field work during a period of 5 months (from February to June). He/she will spend an additional month (July) at CIMMYT's headquarters (in Texcoco) working with the data and statistical analysis for the publication.

Number of Fellows: 1

Main Point of Contact: José Crossa; j.crossa@cgiar.org, Tel. +52 55 5804 2004

Principal Field Based Collaborator: José Crossa

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Innovation Center on Inputs for Bioenergetics and Co-products

Host: National Institute for Forestry, Agricultural and Livestock Research (INIFAP)

Location: Mexico

Project Summary: A new Innovation Center in Mexico focused in developing innovative technologies on bioenergetics and co-products, some of the topics included are the following: a) primary production in five crops, Agave, Jatropha, sugar cane, castor bean and sorghum; b) Research in laboratory and field trials related to innovative technologies (breeding, efficient field technologies, etc.); c) certificated laboratories which are located in several Experimental Stations in Mexico. The fellows will contribute mainly in three topics: genetic breeding program on the five crops; potential production areas in Mexico for five crops (expertise in GIS program management); knowledge in microorganism management, production and use (we are going to establish a new laboratory).

Project Description:

1. In order to improve the yield on the five crops included in this project, we expect that the fellow will be involved in formulating a breeding program based on: a) genetic diversity available in Mexico (natives, introduced and advanced lines on each crop) and which could be introduced; b) usual and advanced breeding methodologies: molecular markers, etc.; c) training on breeding by using new methodologies.
2. Map potential regions for five crops in Mexico by using GIS or other software programs: Agave, Jatropha, sugar cane, castor bean and sorghum. There will a team researcher to write production manuals as a complement of the maps.
3. Research the use of microorganisms in crop production to improve soil fertility. It is very important to build this research area for the new laboratory.

Work Environment:

1. Breeding program. Field and lab work: Morelos State (Zacatepec city) and Guanajuato State (Celaya city).
2. Knowledge in microorganism (for crop production). Field and lab work: Morelos State (Zacatepec city)
3. Potential production areas in Mexico (GIS). Lab work: Chiapas State (Tuxtla Gutierrez city).

Desired Skills of Fellow(s):

1. Knowledge or experience with breeding programs.
2. Knowledge in microorganism (for crop production)
3. Potential production areas in Mexico (GIS)

Funding Notes: None.

Language: English

Desired Duration In-Country: 6 months, July – December 2018.

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Main Point of Contact: Dr. Edwin Javier Barrios Gómez, barrios.edwin@inifap.gob.mx,
Phone: 01 55 3871 8700 ext. 86612

Principal Field Based Collaborator:

1. Breeding program: Dr. Edwin Javier Barrios Gómez, barrios.edwin@inifap.gob.mx
2. Potential production areas in Mexico: PhD. Efraín Cruz Cruz, cruz.efrain@inifap.gob.mx
- 3 Knowledge in microorganism: Dr. Nestor Espinosa Paz, Espinosa.nestor@inifap.gob.mx

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Production of second-generation (2G) bioethanol from agroindustry waste and enzymes obtained from autochthonous microorganisms.

Host: Tecnológico Nacional de México (TecNM) / Instituto Tecnológico de Veracruz (ITVER)
National Mexico National Technology / Veracruz Institute of Technology

Location: Mexico

Project Summary: A Establish an integral and sustainable model of bioethanol production 2G and enzymes, as an element of diversification of the agro industrial sector, based on a scheme of transformation of the lignocellulosic material into fermentable sugars..

Project Description:

A wide range of agricultural / agro industrial residues are available in Mexico to develop the technology for bioethanol production. It is very important to develop well-integrated new process technologies that will more efficiently convert renewable feedstocks to bioethanol. Agricultural / agro industrial residues include crops and residues and forest residues.

This project is based on good understanding of fundamental principles of conversion processes involving chemical and enzymatic reactions as well as understanding of special properties of the feedstocks and products and the ethanol fermentation and distillation. In these sense the energy efficiency, process economy, process variable sensitivity, and environmental impact will have to be evaluated for the conversion process technologies to be developed as integrated systems. Systems analysis will be an important component of scaling-up and optimization of integrated processes. Also the co-products from the bioethanol process to be converted to a wide range of value-added products are included.

In this sense, we consider that the link between the researchers of this project and the researchers from the Bioenergy Research Center of the University of California would be an excellent complement that would allow us to share experiences and technological developments in both institutions due that both have a lot of time working in the same process.

Work Environment:

Cities or regions of work are Veracruz, Veracruz; (TecNM-ITVER, INIFAP) Guasave, Sinaloa (CIIDIR, INP); Reynosa, Tamaulipas (INIFAP), Orizaba, Veracruz (TecNM-ITO).

The fellows will be in fieldwork and lab work. We have an ethanol pilot plant equipment with bioreactors of 80,450,1500 L, distillatory columns, mill cane, autoclaves, evaporators, and a bioengineering laboratory equipment with bioreactors 3, 5,14L, incubators, centrifuges, analysis with HPLC, analysis NIRS, etc.

Desired Skills of Fellow(s):

The students could have a combination of any of the following knowledge/skills: microbial systems optimization, biomass production system, process and system engineering, instrumentation and control, and resource management environmental quality, agricultural systems.

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Funding Notes: None

Language: Spanish, conversational.

Desired Duration In-Country: 6 months, July – December 2018.

Desired Number of Fellows: 3

Main Point of Contact: Dra. María Guadalupe Aguilar Uscanga, gaguilar@itver.edu.mx, 2299345701 ext. 211

Principal Field Based Collaborator:

Dra. María Guadalupe Aguilar Uscanga (ITVER): gaguilar@itver.edu.mx

Dra. Claudia Castro Martinez (CIIDIR, IPN): claudiacm30@hotmail.com

Dr. Sergio Uribe Gómez (INIFAP): uribe.sergio@inifap.gob.mx

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Agroecology and Food Security in Rural Nicaragua

Host: CANTERA – Center for Communication and Popular Education

Location: Nicaragua

Project Summary: CANTERA's Rural Center for Technology Exchange is an experimental farm center which demonstrates agroecological technologies for adaptation to climate change and overall sustainability in the tropical dry corridor of Nicaragua. We are looking for fellows to research and document the effectiveness of experimental technologies on the farm, suggest or implement improvements in the use of these technologies, and/or investigate feasibility of subsistence farmers using researched technology in their communities.

Project Description:

CANTERA's Rural Center for Technology Exchange is an experimental farm center which demonstrates agroecological technologies for adaptation to climate change and overall sustainability in the tropical dry corridor of Nicaragua. The Farm Center provides alternative techniques to improve overall production and food security for rural subsistence farmers.

Having experienced three years of drought in Nicaragua (2014-2016), the Farm Center is experimenting with alternative food sources for livestock and people; implementing techniques to improve soil health; and developing honey bee nutrition.

We hope that through a partnership with RIFA, fellows can research and document:

1. Effectiveness of the technology (choose from list below)
2. Suggest or implement improvements for given technology
3. Investigate feasibility of subsistence farmers using researched technology in their communities

RIFA Fellows would study one or two of the following techniques over a period of 4-6 months:

- Moringa (*Moringa oleifera*) as an alternative food source for livestock and people
- Opuntia cactus (*Opuntia ficusindica*) as an alternative food source for livestock and people
- The elaboration, application, and effectiveness of mycorrhizae
- The use of beneficial soil bacteria to improve soil quality and overall production
- The application of biofertilizers, such as Bokashi compost to improve soil quality and overall production
- The development and improvement of honeybee nutrition

Work Environment:

For the most part, fellows will engage in field work. At the Farm Center, they will experiment with the implementation and improvement of technologies (listed in the Project Description). Fellows will be located principally in the Municipality of Mateare, where the Farm Center is located, but will also have the opportunity to travel to communities in the Departments of Managua and Rivas. There they will have the opportunity to introduce these technologies in a culturally-sensitive way and oversee the outcomes. Foreseeable office work would include documenting and analyzing research findings.

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Desired Skills of Fellow(s):

Research experience, data analysis, cultural competency and sensitivity, flexibility, critical thinking and problem solving, independence, self-motivated, respectful.

Funding Notes: We highly recommend that Fellows apply for additional grant funding. Our organization can apply for grants to support Fellow but cannot promise funding.

Language: Spanish, professional working proficiency.

Desired Duration In-Country: 6 months, anytime except Dec-Jan.

Main Point of Contact: Rose Costello Enos, Communications Coordinator for the Development Office, Rcostellonic13@gmail.com

Andy Choi, International Relations and Exchange Coordinator, Immersion@friendsofcantera.org

Principal Field Based Collaborator: Luis Valles

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Building on the Successes of the Marketplace (M-BoSs) Monitoring and Evaluation

Host: Agricultural Innovation MKTPlace (lead organization), Embrapa

Location: Brazil

Project Summary: The Agricultural Innovation MKTPlace works to benefit smallholder producers by enabling innovation through collaborative partnerships between Africa, LAC, and Brazil. The program has now entered its phase two initiative, M-BOSS, which builds on the successes of projects that had the potential to be scaled up after phase one. The fellow will work within the organization's structure to carry out monitoring and evaluation on several of the six \$700K projects, looking closely at the project focused on goat breeding.

Project Description:

The Agricultural Innovation MKTPlace works to coordinate South to South cooperation for more successful development beyond theory, it is an international open partnership aiming at benefiting smallholder producers in Africa, Latin America, and the Caribbean by promoting policy dialogue and knowledge sharing among researchers and institutions in this regions. The MKTPlace also looks to competitively fund collaborative research for development projects between African (and later LAC) institutions and Brazilian organizations, beginning with Embrapa. By 2016 the MKTPlace had funded 82 projects, today the MKTPlace is entering phase two of its organization which looks to scale up six of these projects through a new joint initiative, the M-BoSs (Building on the Successes of the Marketplace) which has already mobilized over 9 million USD. M-BoSs looks to improve results of MKTPlace projects, significantly increase their range, and benefit a greater number of people, M-BoSs looks to increase the scope of results from research projects turning them into products and services and delivering them to end users or the market.

M-BoSs incorporates six projects with a three year time line and a \$700,000 USD budget over 21 African institutions in eight countries in collaboration with seven Embrapa research centers. These projects ran from nitrogen fixation, to goat and honeybee breeding, to millet foods and integrated crop-livestock systems. The aim of the M-BoSs program is to contribute to the development and sustainability of production systems of key food chains in Africa by strengthening collaboration between African and Brazilian institutions. One of the main components of the M-BoSs projects is monitoring and evaluation which begins as soon as the project is implemented by the projects governance which is composed of members of Embrapa, the beneficiary African institution, and the administrative handler indicated for the project. Monitoring and evaluation focuses on impact assessment in both the quantitative, such as increases in income and the qualitative, targeted at the project's specific end.

The fellow will contribute to achieving the goals of the M-BoSs project by working on the monitoring and evaluation process of the six phase projects, specifically emphasizing work in the monitoring and evaluation of the "Out scaling of community-based breeding programs: attractive and innovative approach to improving the lives of smallholders in low input systems" project. This project works in conjunction with the International Center for Agricultural Research in the Dry Areas in Ethiopia and Embrapa Goats and Sheep. The fellow will work on monitoring and evaluation by conducting visits at Embrapa centers during which project leaders present their results, then based on a review of the project as well as reports, interviews, and analysis of the project implementation the fellow will suggest modifications and support to alleviate any difficulties

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encountered by the researchers. The fellow will then create a report covering the levels of activity implementation, the constraints faced by research partners, and lessons that can be learned and shared with M-BoSs and its partners. Through this process the fellow will also learn about the structure of this type of organization as well as how this platform works.

Work Environment:

The fellow will engage in fieldwork, lab work and office work throughout the monitoring and evaluation process. The fellow will work at the Agricultural Innovation MKTPlace and M-BoSs headquarters in Brasília. Work will also occur at other Embrapa offices such as the Goats and Sheep center in Sobral, Ceará, Brazil and possibly at partner organizations in Africa.

Desired Skills of Fellow(s):

The fellow will have to be able to communicate effectively with others in an environment they are unfamiliar in as well as being able to adjust quickly to new situations. Ideally the fellow will have a background in internationally focused development for agriculture as well as some experience or course work in project development and evaluation.

Funding Notes: The MKTPlace program has long-term funding from external sources, in addition to internal Embrapa support. This will be the first RIFA Fellow to participate in the program, and if it turns out that value is added a position could be created for future Fellows with Program funds. The MKTPlace will cover expenses related to travel within Brazil and if necessary to Africa that are related to the objectives of the program. Fellows staying for the full 6 month period will need to cover their own leave costs.

Language: Portuguese, limited working proficiency.

Desired Duration In-Country: 6 months, June – December preferred.

Main Point of Contact: Dr. Francisco Reifschneider, francisco.reifschneider@embrapa.br, +556134484410

Principal Field Based Collaborator: Dr. Francisco Reifschneider

University of California Faculty/Staff Counterpart (Mentor): Dr. Roberto Sainz, UC Davis, Animal Sciences, Professor, rdsainz@ucdavis.edu

Project: Rhizosphere-Induced Nitrogen Fixation in Brazilian Pasture compared to Primary Forest

Host: Universidade de Sao Paulo, Centenario Na Energia e Agricultura
(University of Sao Paulo, Center of Energy and Agriculture [CENA])

Location: Brazil

Project Summary: The purpose of this project is to determine the impact of perennial forage crop grasses on tropical soil microbial communities, and thus soil biogeochemical processes. Cumulatively, a forest area approximately the size of Texas has been replaced by pasture in the Brazilian Legal Amazon. It is crucial to determine impacts on C and N cycling.

Project Description:

The fellow will travel to the state of Rondonia, Brazil to collect soils from extant pastures along a conversion age gradient, ranging from 13 to 116 years of age. Soils will then be utilized for a greenhouse experiment using seed of *Brachiaria brizantha*, the sole forage crop used in these systems. The following treatments will be set up: 1) *B. brizantha*/no grazing 2) *B. brizantha*/high grazing 3) *B. brizantha*/low grazing 4) control bare pot. Grazing will be simulated through shoot biomass removal approximately equal to $\pm 50\%$ of estimated field condition grazing. Pot replicates for each treatment will also be fit with a mesh barrier which allows the passage of Arbuscular mycorrhizal fungi but not plant roots. This will allow us to determine the effect of root+fungi and just fungi.

Trials will be run for 2 months, with destructive harvesting occurring at 2.5 weeks, 5 weeks, and 8 weeks after planting to determine plant growth stage effect on microbial community. Specifically, we are interested in rhizosphere and mycosphere microbial communities, particularly those organisms which fix nitrogen (non-symbiotically). Soil samples will be collected and preserved for RNA extraction, as well as carbon analysis to determine the type of exudates available to the microbial community. Soils collected from field trials will be analysed to the best of our extent in Brazil, but some analyses will be completed after transferring soils to CA.

Work Environment:

The project will involve a combination of field and greenhouse work. Field work will be necessary for collecting soil to use in greenhouse experiments. Soil will be collected near the city of Ariquemes in Rondonia, Brazil. Greenhouse experiments will take place in Piracicaba in Sao Paulo, Brazil. Some laboratory work will be done in preparation for greenhouse experiments, as well as processing samples after greenhouse experiments conclude.

Desired Skills of Fellow(s):

The fellow should be a hard worker with attention to detail. Knowledge and technical skills in performing greenhouse trials are important. Additional skills in soil microbiology, including analysis of both fungi and bacteria, is also useful.

Funding Notes: Research expenses will be covered through a joint grant between UC Davis and USP (University of Sao Paulo) entities. Special visa is required for handling soil in Brazil. Costs associated with

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obtaining the visa total approximately \$500.00.

Language: Portuguese, limited working proficiency

Desired Duration In-Country: 3 months, fall 2018

Main Point of Contact: Rachel Danielson, redanielson@ucdavis.edu; 925-998-8788

Principal Field Based Collaborator: Siu Mui Tsai

University of California Faculty/Staff Counterpart (Mentor): Jorge Rodrigues, Associate Professor, UC Davis, jmrodrigues@ucdavis.edu

Project: Exploring Climate Smart Agriculture as a Form of Community Development

Host: Fundación Sol & Montaña (Sun Mountain Foundation) (Lead); Sun Mountain International

Location: Ecuador

Project Summary: The fellow can research: the comparative economic and social sustainability study of coffee farming versus cattle raising; the comparative economic and social sustainability study of sustainable coffee farming versus traditional coffee farming; or ways to encourage and implement climate smart agricultural practices amongst vulnerable communities.

Project Description:

Sun Mountain organization is dedicated to the social and economic development of vulnerable communities by helping them implement environmentally friendly practices that can improve their social and economic status. To this end, we are in the process of establishing a research and learning center in the Tulipe/Pacto/Mashpi region of Ecuador that will work closely with American and Ecuadorian universities in working with and educating the local communities. Amongst the local communities, our organization is in contact with women's groups, agricultural cooperatives, coffee associations, schools, ecotourism groups, small business owners, coffee farmers, both sustainable and traditional, cattle farmers, immigrant farm laborers, etc. within rural metropolitan Quito.

There are ~75,000 families that grow coffee in Ecuador, most using poor environmental management practices and low quality production techniques. Many other farm families base their farming systems on the production and sale of beef cattle. There is both the need and opportunity in Ecuador to significantly reduce land degradation, increase climate smart agricultural practices, protect and conserve biodiversity, and recoup forests and ecosystems that have been degraded by cattle production and poor farming practices.

Project 1. This project aims to assess the economic and social benefits to individuals and communities of coffee farming in comparison with cattle raising. Fellows would need to research predicted harms and benefits of both practices and analyze if these align with reality through interviews with local farmers of both coffee and cattle and the surrounding communities, and analyze why or why it is not aligning with predicted benefits. Fellows will also need to analyze the relationship between benefits and/or potential benefits and what the local people want and/or need.

Project 2. This project aims to assess the economic and social benefits to individuals and communities of sustainable coffee farming in comparison with traditional coffee farming. Fellows would need to research predicted harms and benefits of both practices and analyze if these align with reality through interviews with local farmers of both sustainable and traditional coffee farming and the surrounding communities, and analyze why or why it is not aligning with predicted benefits. Fellows will also need to analyze the relationship between benefits and/or potential benefits and what the local people want and/or need.

Project 3. This project aims to analyze the wants and/or needs of the local community members and immigrant farm laborers and compare the goals of our organization with these desires. Through this we hope to better understand the perspectives of the community in order to better align our goals with theirs and work together to

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establish a more economically and environmentally sustainable future. This project would require developing a strategic and operational plan, and potentially develop fact sheets and social media strategies to promote the transformation of harmful farming practices to climate smart agricultural practices. To develop these plans, the student selected will need to research opportunities and leverage the skills and knowledge of local farmers, coffee associations, and other key organizations. A great deal of outreach with both local organizations and Universities in Ecuador and the US would be needed in this process. Close coordination would also be required with the UC Davis Coffee Center, and possibly other social enterprise institutions. Specialty coffee may become a pathway to reforestation efforts, new economic opportunities, increasing biodiversity and strengthening ties between US and Ecuadorian University students and citizens.

Work Environment:

Field work and office work would be done within a large span of the Metropolitan District of Quito (some in the rural cloud forest towns and some in urban Quito).

Desired Skills of Fellow(s):

Projects 1-2: Skills in interviewing, research, and possibly statistics and/or experimental design; an understanding of economics might also be helpful.

Project 3: Skills in interviewing, research, and possibly social media and design.

Funding Notes: Our organization has low cost arrangements with places to stay throughout the project area.

Language: Spanish, professional working proficiency.

Desired Duration In-Country: Flexible

Main Point of Contact: Scott Solberg- ssolberg@smtn.org, (+593) 2 2922 625

Principal Field Based Collaborator: Scott Solberg

University of California Faculty/Staff Counterpart (Mentor):

Dr. David Kyle, Associate Professor in the Department of Sociology at UC Davis, djkyle@ucdavis.edu

Dr. James Grieshop, Department of Sociology at UC Davis

Project: Biomass and nutrient partitioning and nutrient recycling in cacao

Host: Hacienda La Chola / Mars, Inc. (Lead); Alia2, S.A.

Location: Ecuador

Project Summary: This project aims to quantify the partitioning of biomass and nutrients in cacao. In addition, because cacao trees typically produce excessive vegetative material, which requires regular pruning, and because cocoa pods also have a large husk, which is often left in the field, crop residues likely comprise a significant, though as yet unquantified source of nutrients for cocoa. This project proposes to quantify the contribution of these crop residues to nutrient uptake by cocoa trees in order to improve fertilizer recommendations for high yielding cocoa.

Project Description:

To meet the rising market demands for cocoa, there is an urgent need to increase cocoa yields. Although yields of 5-6 metric tons/ha are possible, most cocoa farms yield only 300 to 600 kg/ha. Major production constraints include use of poor yielding varieties; pests and diseases; and water and nutrient limitations. A recent literature review identified major knowledge gaps in the understanding of cocoa nutrient dynamics (van Vliet & Giller 2017). The proposed research aims to fill some of these knowledge gaps so that we can establish improved fertilizer recommendations. Our primary objective is to quantify the amounts and distribution of biomass and nutrients in cocoa trees. Because cocoa also tends to produce excessive vegetative material, which requires regular pruning, we also aim to quantify the amounts of nutrients that are recycled in the crop system through leaf litter, pruned leaves and branches, and pod husks.

Specific questions to be addressed are:

1. How much biomass is partitioned to the different cacao components, namely, leaves, branches, pods, beans, and roots?
2. What are the nutrient concentrations in each of these tissues?
3. How much does nutrient concentration change with age of the tissues, especially leaves?
4. What is the nutrient composition in leaf litter, pruned vegetative material, and pod husks?
5. What is the rate of decomposition for crop residues and what is the contribution of residue decomposition to overall nutrient uptake by cocoa?

Biomass distribution and allometric observations:

We will quantify biomass partitioning through destructive sampling of whole trees. We will sample trees of different ages, including seedlings, 2 to 3 year old trees, 5 to 6 year old trees, 10 to 11 year old trees, and 15 to 20 year old trees. Within each age group we will sample 3 trees and measure the fresh weight of different components:

- a. Branches, divided into primary (pod bearing), secondary, and tertiary or higher order branches.
- b. Leaves from each branch category and further subdivided by flush along the branch.
- c. Pods, including total pods, pod husk, beans, and placenta.
- d. Roots will be washed from 30 cm x 15 m soil samples in transects within the row and perpendicular to the row from 0 to 1.5 m from the tree base and to a depth of 90 cm.

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We will also measure the lengths and basal circumferences of all branches in each category as well as length and width of 25 leaves for each age category. Subsamples of all components will be dried, weighed, and then processed for nutrient analysis.

Residue collection and observation:

Leaf litter will be collected in nets under each of 3 trees of the same age as those used for destructive sampling. We will collect pruned material during one mechanical hedging operation and one hand pruning for tree shaping as well as collecting pod husks during harvest. Residues will be weighed and subsamples dried and processed for nutrient analysis. Nutrient analyses will all be conducted at the laboratory of Alia2 in Guayaquil.

Work Environment:

Hacienda La Chola is an operating 650 ha cacao farm in Ecuador that leads the world in the application of modern farming methods to cacao production. The work will primarily be on the farm, but would also include some lab work. Hacienda La Chola, is just west of Safando, about 45 km SW of Guayaquil, a popular jumping off point for visitors to the Galapagos, and 30 km NW of Playas, a popular beach destination. Lab work would be done at Alia2, in Guayaquil, which is Ecuador's largest city with a population of about 4 million people.

Desired Skills of Fellow(s):

- Basic understanding of crop nutrition and organic matter decomposition.
- Interest in conducting field and laboratory research in agriculture.
- Familiarity with Microsoft office products, particularly Excel and Word.
- Though not essential, some understanding of statistics and statistical software would be a plus.

Funding Notes:

- Mars La Chola will provide meals in the La Chola cafeteria (3 meals a day), all expenses for nutrient and organic matter analyses to be conducted in the laboratory and labor and equipment as needed for fieldwork. If needed, Mars can cover costs associated with a student's leave of absence.
- Alia2 will provide access to analytical laboratory for students, and Dr. Egbert Spaans of Alia2 will offer local scientific support through regular visits.

Language: Spanish, elementary proficiency (mostly for activities outside of the farm and laboratory)

Desired Duration In-Country: 6 months. Flexible, but the rainy season is Jan-March and it would be great if the fellow could overlap with this time period.

Main Point of Contact: Keith Ingram, Senior Agronomist and Manager of Global Cacao Agronomy Research, keith.ingram@effem.com, +1-352-278-8524

Principal Field Based Collaborator: Freddy Amores, freddy.amores@effem.com, +593 0 98 874 6070

University of California Faculty/Staff Counterpart (Mentor): David Mackill, djmackill@ucdavis.edu, UC Davis, Department of Plant Sciences, Plant Breeder and Geneticist

Project: Agriculture-nutrition linkages: Improving food and security nutrition in the potato-based highlands systems in the Andes

Host: The International Potato Center (CIP)

Location: Peru (main focus) and Ecuador

Project Summary: The International Potato Center (CIP) has done a number of surveys in the context of projects aimed at improving food and nutrition security through agriculture interventions in potato based systems. These datasets need to be further analyzed to better understand the potential benefits and nutritional outcomes of these interventions. The objective is to look at new ways of analyzing the existing data with potential use of other publicly available data. We are looking for students with experience and/or interest in at least one of the following areas: nutrition, agriculture, economics, spatial statistics, GIS, modeling.

Project Description:

Malnutrition, particularly anemia, continues to be a chronic problem in rural areas of the Andean region of Peru. 43% of children under the age of 5 and 21% of women of childbearing age suffer iron (Fe) and zinc (Zn) deficiency in the highlands of Peru (ENDES, 2016). CIP has implemented several interventions in the Andean region under food-based approaches to improve nutritional outcomes, as a promising option to contribute to food and nutrition security of rural highland populations. Innovations such as new improved potato varieties with higher yields, biofortified potato varieties with higher Fe and Zn content, and increasing dietary diversity have been promoted and adopted by rural households. There are several datasets from these projects that need to be analyzed to better understand the potential benefits and nutritional outcomes of these interventions.

The data that we seek to further analyze includes: a) production (including socio-economic data) and nutrition data sets collected in Andean communities of Peru and Ecuador in 2012, and b) data sets from a 2013 adoption study of potato varieties implemented in Peru and representative at the national level. These data could be combined and analyzed, for example, under a framework of a targeting analysis for potato interventions based on the local importance of the crop and a composite indicator of livelihood (Thiele et al. 2010). Geo-spatial analysis will facilitate the analysis of the spatial overlap of potato production systems with poverty, production and nutrition constraints, and other variables such as soil properties. This analysis may allow CIP to identify priority areas for investment in potato research and innovation to contribute to reducing hunger and poverty.

Publicly available data in Peru allows CIP to use and link the datasets from these interventions with public data sets such as ENAHO (Encuesta Nacional de Hogares – National Household Survey 2013-2014) and the IV Agricultural Census data (2012).

Work Environment:

The Fellow will be based at CIP headquarters in Lima and will contribute to the data set analysis that will be combined with some field visit in areas in the Andes where the data were collected to meet partners and confirm information. Visits to CIP's office in Quito, Ecuador and meetings with CIP's staff and partners will also be considered.

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Desired Skills of Fellow(s):

We are looking for students with experience and/or interest in at least one of the following areas: nutrition, agriculture, economics, spatial statistics, GIS and modeling.

Funding Notes: CIP will cover all project costs.

Language: Spanish, limited working proficiency.

Desired Duration In-Country: Flexible, as long as possible.

Main Point of Contact: André Devaux, Latin American and the Caribbean (LAC) Regional Director, a.devaux@cgiar.org, main phone: 00 593 2 3006 443 and 00 32 487422761

Principal Field Based Collaborator: Guy Hareau (g.hareau@cgiar.org) and Willy Pradel (w.pradel@cgiar.org)

University of California Faculty/Staff Counterpart (Mentor): Robert Hijmans. Professor, Department of Environmental Science and Policy, rhijmans@ucdavis.edu

Project: STEP - Early Awareness and Participatory Education, facing floods disaster risks in local communities of national reference in the southern cone of Latin America.

Host: Universidad Tecnológica de Uruguay (UTEC)

Location: Uruguay, Argentina, Brazil

Project Summary: To promote the reduction of flood disaster risk through participatory education programs and implementation of early warning systems in local communities of national reference in the southern cone of Latin America.

Project Description:

The academic sector and scientific research networks are a key factor in risk situations of disasters, including emerging risks, research and support in decision-making. This project seeks to contribute to public awareness, creating a culture of prevention and education about disaster risk, advocating for resilient communities and inclusive management for the whole society to reinforce the synergies between participating communities. The participation of a RIFA fellow reinforces the participatory process, adapting the models to the needs of the users, as well as promotes the use of equipment and tools for early warning, extending the channels of dissemination on the risk of floods in the region. There is a weak regional articulation to promote the exchange and dissemination of information and data, not confidential information on disaster risk, public awareness campaigns, and regional cooperation in early warning and detection systems. The United States has vast experience in disaster risk reduction, so it is a shared learning between governments and relevant actors.

Work Environment:

The project is coordinated from the ITR-CS of UTEC in the city of Durazno, Uruguay. It has all the necessary means to develop daily activities: offices, meeting and multipurpose rooms, conferences, and communications (Internet, telephone, etc.). The city of Durazno, is a town of 30,000 inhabitants, in the center of the country, with access to all services, transportation, etc. The team will work together with 2 other universities and 3 local governments in the region.

Desired Skills of Fellow(s):

- Training in natural sciences, agronomy, environment, water management, risks and emergencies.
- Communication skills and teamwork.
- A willingness to learn and become proactively involved in the project.

Funding Notes:

Living costs are very affordable in the city of Durazno (Uruguay). UTEC has the possibility of temporary accommodation when students first arrive that have beds, bathrooms, hot water and study. UTEC can also help the fellow find accommodation, transportation and basic needs.

Language: Spanish or Portuguese, basic

Desired Duration In-Country: 6 months (between June- December 2018)

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Main Point of Contact: Elianne Elbaum, M.A., Head of International Relations, elianne.elbaum@utec.edu.uy, 00598 94111870

Principal Field Based Collaborator: Dr. Marcelo Mautone, marcelo.mautone@utec.edu.uy, 00598 91361333

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Appropriate Technology & Practice Assessment for Moringa Production and Processing in Kenya

Host: UC Davis, Department of Nutrition, World Agroforestry Centre-ICRAF, Colorado State University

Location: Kenya

Project Summary: Food security in Africa remains a complex problem, including limited access to nutritious and safe foods. Moringa (*Moringa oleifera*) is a perennial, fast-growing, drought-tolerant, green leafy vegetable, with high nutritional and health value. Dr. Waterman and Austin Peterson, a recent IAD grad and former RIFA recipient, are currently working on a baseline land use system analysis of moringa production that is demonstrating high economic potential for Kenyan smallholders. This project aims to improve quality and access of moringa through best practice training, implementation of innovative processing technologies, and development of adaptive aggregation networks along the supply chain.

Project Description:

Within the larger project, the fellow(s) will focus on three primary target areas:

1. **Intensive Bed Yield Assessment** - Intensive moringa production - a system in which moringa is grown at a density of 350,000 - 1,000,000 trees per ha - has demonstrated high yield efficiency and improved income margins for smallholder farmers in other parts of the world. However, to date, many Kenyan farmers are unfamiliar with the practice and no studies have been conducted on intensive bed performance under local conditions. The fellow would run several test plots under local conditions to assess optimal intensive bed practice and to collect yield data that will be used to improve ongoing economic assessments of smallholder moringa production. With implementation, initial establishment time, and harvesting on a 30 day cycle, the fellow will be able to collect data for 4-5 harvests.
2. **Assessment of Processing Technology** - Moringa powder is one of the primary forms of moringa consumption and distribution on local and international markets. To process moringa powder that meets health and safety standards, the fresh leaves must be washed and then dried. Currently many farmers dry their leaves in suboptimal conditions resulting in an inferior product. Several low-cost drying technologies exist, including the UC Davis Hort and Innovation lab chimney dryer and locally adapted greenhouse dryers. However, neither have been specifically developed for processing moringa under local conditions, resulting in suboptimal drying times and product quality. The fellow would build and test several iterations of solar dryers to identify the optimal dryer for moringa powder at the small and medium scale of production.
3. **Information Dissemination** - As part of our ongoing commitment to moringa producing communities in Kenya, the fellow will partner with local aggregators to disseminate the results of testing directly to producer communities. In addition to the publication of the researcher's specific findings, they will also contribute to the publication of our land use system analysis looking at larger structural changes to the moringa value chain and aggregation network. These results will be used to inform agricultural and commercial partners, from smallholder farmers to local, regional, and international buyers, along with policy makers, on moringa's use in addressing food security and income generation in East Africa.

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Work Environment:

The fellow will engage in field work in the Machakos and Meru regions of Kenya with commercial growers and researchers. They will also engage in some office work analyzing data and meeting with Kenyan counterparts at the World Agroforestry Centre.

Desired Skills of Fellow(s):

Agricultural statistics, agronomic research, RCBD experimental design, data analysis, cultivation experience, post-harvest processing experience, and carpentry skills. Previous experience in practicing small-scale agricultural production in Africa or moringa intensive bed production a strong plus.

Funding Notes: No additional costs would be needed from the fellow. Supplies for construction material, moringa seeds, and tools will be funded through Dr. Waterman's Fogarty K01 grant. Lodging, meals, and transportation will come from the RIFA Fellow's monthly stipend, but will be more than adequate.

Language: English, Swahili not required but a plus.

Desired Duration In-Country: 6 months, May – October 2018

Main Point of Contact: Carrie Waterman, PhD, cwaterman@ucdavis.edu, +254 0708790, Skype: carriewaterman

http://nutrition.ucdavis.edu/people/faculty/waterman_carrie.html

Principal Field Based Collaborator: Carrie Waterman

University of California Faculty/Staff Counterpart (Mentor): Carrie Waterman

Project: Toward Sustainable Food Systems Profiles for Decision-makers in Kenya and Vietnam

Host: International Center for Tropical Agriculture (CIAT)

Location: Kenya

Project Summary: Our three year project occurring in Kenya and Vietnam works in collaboration with many governmental and other institutions to identify what key sources of information are needed to make pro-sustainable food system decisions, assess the availability of these data, and understand how they can be analyzed and packaged so as to be useful to decision-makers at local, regional, and national scales. In this second year of the project, fellow(s) will work with the CIAT team and the project partner University of Michigan to assess available data and to use the results of interviews with decision-makers to compile and analyze these data on nutrition, environment, and food systems. Fellows will be part of a team working on publishing these results and on contributing to more informed decision making.

Project Description:

The world's nations have collectively agreed to meet ambitious Sustainable Development Goals (SDGs) within the coming 5-15 years, including eliminating hunger, increasing human health and well-being, creating economic growth, adapting to climate change, and producing and consuming the world's natural resources sustainably. Meeting these goals, which are outlined in 169 targets measured by 230 indicators, requires that decision-makers are able to understand the interactions between food production, consumption, and trade, human health, and environmental sustainability, at their relevant scales. Adequate, accurate, integrated and understandable data and analyses in the hands of the appropriate decision-makers at national and sub-national scales are thus urgently needed to create good policy and action toward these goals, as well as to measure progress along the way.

But available national and global level data on these sectors is mostly only accessible in disparate and unconnected sources, making such information effectively unavailable in digestible formats. Moreover, such data is often considered to lack the sufficient resolution and culturally specific contexts so as to be relevant to national and especially sub-national level decision-making. On the other hand, upscaling high quality community and household-level information so as to be relevant for decision-making at larger scales implies major resource mobilization hurdles, which may be practically impossible within the short SDG time-frame.

We bring together available food and agriculture, human health, environment, and social information, with the aim of producing policy-relevant data and analysis packages of high value for national-, sub-national, and local-level decision-making toward the SDGs. In collaboration with information generating organizations and decision makers, we identify key leverage points where sound data can help to make decisions that have multiple food system benefits. We analyze the available data with the aim of creating such information packages, and test their usefulness with key decision-makers.

We are in the early-middle stages of this ambitious three-year project, which is led by the University of Michigan and by CIAT, and enacted in two regions each of Kenya and Vietnam. In the previous year, four RIFA fellows were deployed in Hanoi, significantly advancing the first stages of the project. This year we hope

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to deploy up to three fellows in Nairobi, to perform similar research as that completed in Vietnam, and also to move the project forward with regard to data analysis and packaging. RIFA fellows will play key roles in compiling and testing the data, and become part of a larger project with an ambitious agenda to publish the results for the research community, and to contribute to positive impact in both countries.

Work Environment:

Project will be a mixture of desk based data compilation and analysis based out of the CIAT Nairobi office, and potentially some field based interaction/data collection at community and district levels in Nairobi and Kisumu.

Desired Skills of Fellow(s):

Specialization in one or more aspects of sustainable food systems (e.g., soil scientist, agronomist, biodiversity conservation, genetic resources, agricultural economist, value chain specialist, life cycle assessment, food policy, nutritionist, food sovereignty and equity, or other) with broad interest in integrating other aspects toward a holistic account of food systems. Ability to analyze large datasets and experience with social and participatory data gathering methods are also beneficial.

Funding Notes: We can provide full office support (space, office costs, internet, visa processing, etc.). We also offer consistent oversight on this project from CIAT and the University of Michigan. We can also help to find low cost accommodation in Nairobi for UC researchers.

Language: English

Desired Duration In-Country: The timing of our project fits well with the 2018 summer (and/or fall) period for UC students. We can accommodate periods from as little as 2.5 months to up to 6, but a stint of 3-4 months should work well.

Number of Fellows: 3

Main Point of Contact: Colin Khoury, Crop Diversity Specialist, c.khoury@cgiar.org +1 970 237 9571

Principal Field Based Collaborator: Christine Chege, Post-Doctoral Fellow in Nutrition, c.chege@cgiar.org

University of California Faculty/Staff Counterpart (Mentor): Robert Hijmans, rhijmans@ucdavis.edu, UC Davis Associate Professor, Ecology, Geography, Horticulture and Agronomy Graduate Groups

Project: Strengthening Capacity in Tanzania to Implement Agriculture Climate Resilience Actions

Host: World Agroforestry Centre (ICRAF)

Location: Tanzania

Project Summary: This project aims to determine the potential benefits and tradeoffs of stakeholder-selected climate smart agriculture (CSA) practices in four locations (agroecologies) in Tanzania. That is, we will analyze farm management alternatives in terms of their impact on agriculture productivity, resilience, and mitigation benefits. The fellow's research should contribute to these analyses and may vary depending on fellows interests and skills.

Project Description:

Agriculture in Tanzania supports the livelihoods of more than 70% of the population but is mainly rainfed and thus severely affected by impacts of climate change. Tanzania has developed several programs and plans to address the impact of climate change and reduce vulnerability. These strategies include the recent Agriculture Climate Resilience Plan and Climate Smart Agriculture Framework Program, which underpin specific interventions in the agriculture sub-sector and aim to improve productivity, enhance resilience, and contribute to climate change mitigation. However, these reports highlight the currently lacking evidence base -- needed to inform policy decisions -- of effectiveness of climate smart agriculture (CSA) practices, in terms of productivity, resilience, and mitigation objectives, in Tanzania's distinct regional climates and predominate crop and livestock production systems.

This project aims to determine the potential benefits and tradeoffs of CSA practices in four locations characteristic of regional climates and production systems. In each location, approximately three management practices will be selected via a scoping study by stakeholders (farmers, policy-makers, and scientists) to be the focus of the investigation. An experiment will then be established using a core-satellite approach (i.e. mother-baby), in which a fully replicated core site will compare all practices to a standard farmer practice (control) and satellite sites in farmers' fields will compare standard practice to the candidate CSA practices most of interest to the farmer. Sites include Tabora (cassava and maize), Zanzibar (poultry), and to-be-determined sites in Central and Western Tanzania and the southern Highlands (e.g. Dodoma and Mbeya Regions) (likely maize). Practices will be compared in terms of indicators of the three pillars of CSA: productivity (e.g. yield, biomass, labor, income), adaptation/resilience (e.g. soil moisture dynamics, rainwater and nutrient use efficiency, economic and social resilience as reflected in net present value, cost-benefit and profit margin analyses), and mitigation (e.g. soil carbon, soil quality, greenhouse gas emissions, fuel consumption). Research at Tabora and Dodoma site is ongoing, and experiments at the remaining three sites will be established late 2018/early 2019, following participatory selection in early 2018. The intended project duration at each location is three years.

We envisage that the Fellow will strengthen/deepen assessment of selected CSA practices at one of the four locations. We encourage the Fellow to co-create research questions with us that are of interest to them and that align with overall project objectives (i.e. productivity, resilience, and/or mitigation). This is flexible, but could include, for example, in-depth monitoring of indicators in a specific CSA pillar or prediction of impacts of practices beyond the three-year project time frame, etc.

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ICRAF and collaborating Ministry of Agriculture, Livestock, and Fisheries (Tanzania) and Ministry of Agriculture, Natural Resources, Livestock, and Fisheries (Zanzibar) researchers will be responsible for experiment establishment, maintenance, and data collection for selected indicators in the overall project, over which the Fellow will layer their research. It is expected that the Fellow lead the analysis and write-up of results in a working paper if not in a peer-reviewed article.

Work Environment:

Selection of city/region will depend on which of four main project sites is of interest to the Fellow as well as recommendation of ICRAF. Work environment will vary by Fellow's research design, but will likely prioritize fieldwork while in country. Office space will be arranged by ICRAF. Access to limited lab space or analysis may be available upon request following discussion with Fellow (e.g. soil analysis). Fellow may be able to travel to ICRAF's state of the art soil spectroscopy laboratory in Nairobi.

Desired Skills of Fellow(s):

Research experience in soil science, plant science, agronomy, agroecology, hydrology, or similar, particularly with emphasis on climate change adaptation and/or mitigation

Research experience in maize or cassava

Research experience on-farm or research station

Ability to collaboratively but independently conduct research

Upper division and graduate coursework in soil science, plant science, agronomy, agroecology, hydrology, or similar

Graduate coursework in statistics

Potential to co-author peer-reviewed scientific publication

Potential to co-author associated summary report, fact sheet, and/or policy brief, depending on research findings

Funding Notes: Funding for the Fellow's research project (research supplies, equipment) will be provided by ICRAF, though application by Fellow for supplementary small grants to graduate students at their home institution is welcomed.

Language: English

Desired Duration In-Country: 3 Months Flexible, but December is the holiday period in Kenya and most expat staff are traveling through late summer (~August). These lulls should be taken into account when planning the project period.

Main Point of Contact: Todd Rosenstock, PhD; Climate Change and Environmental Scientist,
t.rosenstock@cgiar.org, +243 826 372 223

Principal Field Based Collaborator: Anthony Kimaro, PhD; Scientist (Soils and Agroforestry), Tanzania Country Representative, ICRAF

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University of California Faculty/Staff Counterpart (Mentor): Amelie Gaudin, Assistant Professor, Plant Sciences, UC Davis, agaudin@ucdavis.edu

Project: Design and Installation of a low cost drip Irrigation system for growing vegetables in demonstration gardens and establishment of biogas system

Host: Kulika Uganda

Location: Uganda

Project Summary: Kulika Uganda owns a training Centre about 37KM out of Kampala city where farmer groups, schools, churches and individuals are trained on ecological agriculture particularly vegetable growing.. The role of the fellows will be to design and implement low cost drip irrigation systems that can be used to grow vegetables throughout the year. Kulika Uganda also wants to use waste generated from the on-site piggery to generate biogas for lighting and cooking.

Project Description:

We are proposing two projects that fellows can choose from:

Project 1 – Objectives:

1. To design and install a low-cost irrigation system for growing vegetables at the training center's demonstration garden
2. To train staff on how to operate and maintain the irrigation system
3. To perform a cost benefit analysis for using the irrigation system vs. rain-fed agriculture

Currently, the demonstration garden is divided into 16 small plots with average size of (24x18) meters on which different varieties and species of vegetables are grown such as: kale, spinach, beetroot, cabbage, eggplant, passionfruit, cucumber, lettuce, coatmeal (a local herb) and onions.

The fellows will be expected to do a site survey upon arrival at the Kulika Training Centre to ascertain the soil type, site history and available sources of water for sustainable irrigation use. The fellows will closely work with training center staff who will assist them in executing this project. Having a functional irrigation system at the demonstration garden will enable the center to grow and sell organic vegetables throughout the year.

Project 2 – Objectives:

1. Design and operationalize a small biogas plant.
2. Train staff on how to effectively use and maintain the system.
3. Develop an operation manual.

The digester will be primarily fed with pig waste and also the vegetable remains from the farm, and serve as a more sustainable way to manage the waste. The biogas plant will also be used as a training tool during events/trainings at the center.

Work Environment:

The fellows will be based at Kulika Training Centre office in Central Uganda, Wakiso district, which is 37km along the Kampala - Hoima road. We estimate that the fellows will spend 60% of their time in the field and 40% in office calculating, designing and writing project progress reports. Occasionally, the fellows will also

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travel to visit some of Kulika key farmer trainers (KFTs) in their homes and advise them on irrigation aspects on their farms. Some of these KFTs are out of Wakiso district.

The fellows will be accommodated in our accommodation rooms that are within the training Centre premises with very good security in place. The training center is about 5 km from the nearest busy town (about 20 minute drive) where the fellows can access medical services and supermarkets. Public transportation is easily accessible from the training center, as it is 15 m away from the main Kampala - Hoima road.

Desired Skills of Fellow(s):

- Irrigation system design
- General crop agronomy
- Soil and water conservation
- Rain water harvesting and storage will be an added advantage
- Renewable energy skills, specifically biogas

Funding Notes: Kulika Uganda will provide the fellows' accommodation in-kind. The accommodation rooms are at 50,000UGX/person/night. For two fellows for 6 months, the organization can contribute UGX 18,000,000, approximately 5,143. USD.

Language: English

Desired Duration In-Country: 3 months (between June – December 2018)

Main Point of Contact: Ms. Magdalene Amujal, Executive Director, magdalene@kulika.org, +256 755517892

Principal Field Based Collaborator: Mr. Amen Emmanuel, Training Centre Manager, amen@kulika.org, +256 702636080

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Development and Assessment of small scale irrigation technologies for smallholder farmers

Host: TEWDI Uganda (Teso Women Development Initiatives) - Lead organization

Department of LAWR, University of California, Davis

Amelioration of Agricultural Risk (AMARI- NGO)

Busitema University

National Research Agricultural Organization (NARO)

Location: Uganda

Project Summary: This RIFA project will provide support for a local Uganda NGO focused on women's empowerment, in collaboration with Busitema University students and UC Davis staff, to help create outputs, engage in and organize outreach activities, and lead communication efforts for Ugandan and global audiences. We engage in participatory research and development with smallholder farmers to improve irrigation systems in Uganda which fit the local context and address gender issues. Work will include synthesizing data (biophysical and social science) describing trade-offs of adopting different irrigation technologies and governance structures in small, farmer managed irrigation. The RIFA students (2) will engage in finalizing output materials and creating communication, incorporating feedback, and using local opportunities (e.g. training sessions) and international platforms (e.g. web based) to disseminate information about the project and its outputs.

Project Description:

Our project "Innovations in Dry Season Horticulture for Women and Smallholders in East Africa -Production and marketing for income, nutrition, and climate resilience" is funded by the US AID Horticultural Innovation Lab. Our Horticulture irrigation project ("HIP") has developed, using participatory research with farmers, an approach for identifying and maintaining innovations in irrigation and soil management for vegetable production. The project focuses on women's as well as men's needs, and aims to strengthen small scale farmer enterprises targeted to local markets and family consumption. The goal is to develop irrigation projects that address local needs, gender issues and are sustainable. Irrigation technologies and associated governance structures help support implementation of climate-smart vegetable production systems.

Our objectives are to:

- Use participatory approaches to develop innovative irrigation designs and approaches for smallholder farmers, with an emphasis on gender aspects that are suited to a diversity of agroecological conditions and social organizations.
- Develop an evaluation toolkit for district and regional staff of local government, NGOs, and private organizations to support development of irrigation capacity among smallholders in Uganda.

In collaboration with farmer groups, we established six irrigation technology evaluation plots at six farmer group sites that target key challenges identified by farmers in those areas. These evaluation plots are designed by the project team in collaboration with farmers, and managed by a committee of farmers already elected at each site. We are collecting detailed data on technical and social parameters to evaluate each innovation for net benefits to farmers, and the schemes as a whole. Surveys will help identify current practices by smallholder

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farmers in managing water and growing horticultural crops, and how these practices impact human well-being. Our goal is to tap farmers' existing knowledge to actively engage them in the research and development process as "owners and creators" of knowledge rather than mere 'beneficiaries'. This approach improves the relevance and applicability of technologies developed and reduces the cost of innovation both for the farmers and the project.

HIP has developed many approaches to improve smallholder farmers' issues related to irrigation. This includes technological options, crop and soil management, women's participation in irrigation, group institutions, and others. Specific potential project outputs will take the form of technology profiles (e.g. fact sheets), guidelines for irrigation institutions, tools/methodologies for ensuring engagement and involvement of women in irrigation, spreadsheets of data, mobile-phone based evaluation apps for irrigation sites, short videos, blogs, social media engagement, radio interviews with farmers. Audiences for information include local farmers in the region, the University (for internal and external communications), local NGOs interested in irrigation and women's empowerment, extension specialists, our funders and international development organizations, and academicians working in agricultural development. Our goal is to have developed and disseminated different outputs and accompanying communications, targeting different audiences, by the end of the project in October 2018.

The RIFA fellows will lead a group effort that will draw on contributions of all partners in further developing project outputs and disseminating information about project findings within Uganda and abroad. Some of the effort will involve communicating with targeted audiences (e.g. farmers) throughout the development phase to help ensure that project outputs are both useful and desired. In 2017 two RIFA fellows spent 6 months working with the HIP project on irrigation modeling/ecosystem services and women's empowerment and raising gender awareness in university engineering curriculum. The 2018 RIFA fellows will build in part on previous RIFA student efforts and also draw on other data collected for the project.

Specific activities include:

- Familiarizing oneself with project: including discussions with partners, evaluating existing outputs and technologies, identifying gaps
- Developing draft forms of different outputs (as described above)
- Presenting draft outputs to target audiences, getting feedback and making modifications
- Holding trainings and other outreach activities with specific target audiences (farmers, other NGOs, students) in Uganda,
- Summarizing data and other results, and helping communicate major conclusions, for funders and international community
- Creating short videos in collaboration with farmers and Busitema University students describing different aspects of project

Work Environment:

The fellow(s) will be based primarily at TEWDI headquarters in the town of Soroti, in Eastern Uganda, with some time at the UC Davis Project Office in Mbale, Uganda. The project will involve some travel to our 6 project field sites located in rural settings throughout the country's Eastern region. We estimate the work will be

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about approximately 70% office-based and 30% field-work. Fieldwork will involve understanding small-scale farmers use of project approaches, and considerable time on one's feet in a rural setting interacting directly with farmers and our partners. Travel will entail long working hours far from urban centers, and fellows should be willing to work in a rural environment with minimal services. Work will include conducting interviews with farmers and other stakeholders; measuring crop, soil and water parameters on farm; and providing general support for other project team members. Our project is very collaborative in nature and offers an excellent opportunity to work directly with and learn from farmers, agricultural and irrigation extension specialists, social scientists, and other stakeholders.

Desired Skills of Fellow(s):

Some background in small holder agriculture, soils, irrigation, and/or gender issues (not expecting one person to have all these experiences)

- Experience with agricultural extension approaches and NGOs in developing countries
- Proficiency in basic computer applications
- Strong writing skills
- Strong communication skills (social media, video, blogging, etc) and desire to develop these further

Funding Notes: TEWDI Uganda will provide \$200 per student per month towards their upkeep to cater for some project supplies and local transport to the field. They will have office space and access to photocopiers, printers, etc. within the organization. The staff will also be very supportive in enabling them to settle into their new home and in conducting their responsibilities.

Language: English

Desired Duration In-Country: 3 months, July to September 2018

Main Point of Contact: Betty Ikalany, Executive Director TEWDI Uganda & HIP project supervisor, +256781096059, ikalanybetty12@gmail.com

Abraham Salomon, UC Davis Representative in Uganda & HIP project manager, +256782187655, agsalomon@ucdavis.edu

Principal Field Based Collaborator: Helen Acuku Ekolu, HIP Project manager, +256777172217, helengrace690@gmail.com

University of California Faculty/Staff Counterpart (Mentor): Kate M Scow, Professor of Soil Science and Microbial Ecology, 530-752-4632, kmscow@ucdavis.edu

Project: Improving cowpea for yield potential and stress resilience

Host: Makerere University Kampala

Location: Uganda

Project Summary: Our cowpea breeding program was initiated with support from Alliance for a Green Revolution in Africa (AGRA) with the prime focus of setting up a model regional crop improvement center, with the mandate of training and research to meet the food security need of the region. We have assembled close to 1000 collections of cowpea including the mini core and MAGIC populations obtained from the University of California, Riverside. The program has also created segregating populations that are currently being advanced for further testing and selection. The graduate fellow will play active roles in characterizing some of these populations, dissecting the genetic variations for various traits in these populations and relating such variations with molecular marker data.

Project Description:

We will design specific projects for the fellow to fit within the main cowpea breeding program activities. Especially, the fellows will be assigned some populations with particular research questions to be addressed that we think will inform the breeding decisions. There are breeding populations that need to be phenotyped for key traits, the data analyzed, results interpreted and compiled for publications. The fellow will learn from this at the same time contribute to the goal of the breeding program. There are also lab activities, including nucleic acid handling and processing, and bioinformatics that we think the fellow will play active roles in.

Work Environment:

The fellow will do both field and lab work. Makerere does cowpea testing in five different locations in the country: MUARIK (central region--main station and the fellow will reside here), Serere (eastern region--6hrs away from main station), Arua (Western region---7hrs away from the main station), Lira-Ngeta (Northern region--5hrs away from the main station), and Kotido (North east---~8hrs away).

Desired Skills of Fellow(s):

Familiarity with experimental designs and basic statistical analysis of experiments and interpretation, good genetics foundation, some knowledge of molecular markers and its application in plant breeding, familiarity with statistical softwares like R, or Genstat among others.

Funding Notes: None.

Language: English fine.

Desired Duration In-Country: Flexible, as long as possible, must be in country July-August 2018.

Main Point of Contact: Dr. Patrick O. Ongom, pongom@marccimak.org, +256780434723

Principal Field Based Collaborator: Mr. Bruno Awio, bawio@marccimak.org

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Digital platforms for African smallholder farmers to access 'bundled services'

Host: Olam International Ltd

Location: Uganda, Tanzania, Laos

Project Summary: Olam is rolling out the OFIS digital platform across its smallholder supply network to get 'bundled services' (weather info, payments, credit, tailored technical advice, etc) to farmers. That requires solving some key questions in terms of (i) translating technical info to relevant info for farmers, (ii) tailoring the services to diverse farmer needs and opportunities, and (iii) overcoming socio-technical barriers for technology adoption for smallholder suppliers.

Project Description:

The students will go through several steps - not necessarily in a singular sequence and with equal amount of time per step, since that will depend on the insights and progress and what key bottle necks need to be tackled (first):

1. Visit the field to understand the smallholder coffee farming communities, farmer diversity and economic, social and environmental drivers of smallholder coffee production.
2. Explore existing digital data on farmer communities -> identify farmer segments / typologies and how opportunities and needs for services differ amongst farmers.
3. Validate a 'stepwise investment' approach in coffee with smallholders in the field.
4. Explore to what extent service needs by smallholder segments can be channeled through the digital platform (e.g. weather services, mobile payments, micro-credit, and technical advice on pre- and post-harvest practices).
5. Help translate knowledge on needs and opportunities for 'bundled services' into message formats and contents that can be handled by the digital platform.
6. Write a report with the key observations on (i) farmer needs, (ii) opportunities for digital 'bundled services', (iii) practical examples and suggestions on how it could work, and (iv) way forward to build this further with partners.

Work Environment:

The fellow(s) will be based at our country head offices and field offices in the country that we will jointly select (depending on fellow interest and Olam priorities by early/mid 2018. From these offices, the fellow will join the field teams to understand the rural communities, their local actors, and the ability to provide 'bundled services' that are meaningful for farmers through the Olam digital platform (OFIS).

Desired Skills of Fellow(s):

- Big curiosity in what drives smallholder farmers to (dis-)invest in cash crops in the tropics.
- Excellent communication skills to engage with diverse actors.
- Ability to innovate and collaborate to explore and test digital tools.
- Minimum set of skills in data analytics and digital programming will be a major advantage.

Funding Notes: Olam should be able to cover all local costs (accommodation, travel, operational) and will provide access to data, partnerships and project resources when/where relevant.

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Language: Some knowledge of local languages in UG, TZ, LAOS is advantage but not required.

Desired Duration In-Country: Flexible, as long as possible; Sept 2018 – Feb 2019

Main Point of Contact: Piet van Asten, Agronomy Head- Coffee Plantations, Piet.vanAsten@olamnet.com, +256 752787812

Principal Field Based Collaborator:

Uganda - Piet van Asten

Tanzania - Jeremy Dufour

Laos - Karsten Ziebell

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Valorization of medicinal plants and rangelands rehabilitation in Eastern Morocco

Host: Ministry of Agriculture, Water and Forests in Morocco. The fellow will be hosted by the Regional Directorate of Water, Forests and Combating Desertification in Eastern Region, Oujda, Morocco (DREFLCD de l'Oriental)

Location: Morocco

Project Summary: The project will focus on the valorization of local medicinal-pastoral plants in Eastern Morocco, especially *Artemisia herba alba*, in order to create incomes for women in that region and decrease the pressure on the natural resources threatened by desertification and the effect of climate change.

Project Description:

The project has two main aspects:

- Environmental objective: rehabilitation of rangelands, biodiversity conservation.

The fellow will help the institution to work on the technical issues of the rangelands rehabilitation (collecting, processing and storage of seeds, germination, seedling on the nursery, transplantation in the field)

- Socio-economical objective: woman empowerment, create incomes, promote the breeding label in the region (help the institution to establish a reference status of the project in order to evaluate the impact after the implementation)

Work Environment:

The fellow will be involved in fieldwork, lab work and office work between different cities in the Eastern region (Oujda, Ain Beni Mathar, Bouarfa). The fellow may have to travel to Ifran as well (University of Al Akhawayn).

Desired Skills of Fellow(s): The fellow could have a background in: ecology, rangelands/pastoral plants, plants multiplication (nursery production), agro-economy.

Funding Notes: None

Language: French or Arabic, limited working proficiency.

Desired Duration In-Country: Flexible

Main Point of Contact: Laila Annouri, Technical Center of Desertification Monitoring, laianouri@ucdavis.edu, laila.annouri@gmail.com

Principal Field Based Collaborator: Laila Annouri

University of California Faculty/Staff Counterpart (Mentor): Student must find.

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Project: South African avocado, cherry, almond, date (medjool) and tomato mini-studies

Host: ZZ2

Location: South Africa and Namibia

Project Summary: The fellow will likely travel between different areas in South Africa and Namibia in order to work on four specific crops and their respective challenges or opportunities that our group is undertaking.

Project Description:

ZZ2 is one of the largest commercial farming groups in Southern Africa and was founded in 1904 by the Van Zyl family. The group produces, packs and markets tomatoes, avocados, mangoes, onions, apples, pears, stone fruit, cherries, almonds, dates and mangoes. ZZ2 is the largest avocado producer in Southern Africa and provides 40% of South Africa's tomato market. Core to the agricultural practices is the embodiment of nature conservation and environmental health to ensure biodiversity preservation. The group employs close to 10,000 people.

At present the ZZ2 group would like to undertake an evaluation of various avocado varieties. The group would furthermore like to investigate the effect of Dormex on cherries in a unique harvesting window and the potential for almonds in various micro-climates of South Africa's Mediterranean climate. In addition, the group would like to understand issues regarding medjool dates drying out in certain intensive summer periods. There is additionally the need to evaluate the performance of various tomato system.

Work Environment:

Predominately field and office work. The locations would be in Mooketsi, Rustenburg and Riebeeck West in South Africa, and Haakiesdoorn Farm (Karasburg) in Namibia.

Desired Skills of Fellow(s):

Expertise or an interest in avocados and dates with a further interest in Dormex for low chill cherries and almonds.

Funding Notes: None

Language: English

Desired Duration In-Country: Flexible

Main Point of Contact: Thomas Mehl, thomas.mehl@zz2.co.za

Principal Field Based Collaborator: BJ Van Zyl

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: "Balu Tin Marino" Improved nutrition through food fortification in the Gambia

Host: United Purpose (formerly Concern Universal)

Location: The Gambia, Senegal

Project Summary: Balu Tin Marino is a four year food fortification project of United Purpose (formerly Concern Universal) in The Gambia funded in large part by the European Commission. The fellow will build upon the baseline survey (2017) and conduct a midterm adoption survey. This will help to assess how new crop varieties are being adopted, and guide future project development.

Project Description:

One of Concerns primary areas of work is in developing sustainable food systems. Concern would like to invite a Fellow to collaborate on a project focused on reinforcing food security and nutrition in The Gambia, launched in 2017 with funding from the European Commission. The project is focused on reducing micronutrient deficiencies of women and children through sustainable and integrated approaches to food fortification. The main objective of the project is to provide improved health and nutrition, by introducing and/or promoting: 1) biofortified orange-fleshed sweet potato, 2) biofortified high iron and zinc Pearl Millet (PM), and 3) African leafy vegetables. This will be complemented by advocacy efforts with government institutions to engage in formulating policy for bio and conventionally fortified foods and an enabling environment for private sector engagement. Working in five rural regions of Gambia including direct targeting of Local Government Authorities (LGAs), United Purpose will help the declining nutrition situation. The selected crops are already grown and suitable in the target regions, providing opportunities to integrate agriculture with nutrition, increase production and create commercial opportunities for farmers.

Concern welcomes a fellow from December 2018 - March 2019 in order to conduct a midterm adoption survey to better understand how new crop groups are being received by beneficiaries. This will build on the baseline survey done in 2017, and will inform the development and scaling of the project. It will also inform methods and approaches for tracking behavior changes further along in the four-year track of the project.

Work Environment:

The fellow will be based out of the Gambia office in Serekunda, with the option of collaborating with the Senegal office located in the capital city of Dakar. Field work will be conducted in the Gambia in the Central River Region (North & South); Upper River Region; West Coast Region; North Bank Region; Lower River Region. Transportation will be provided by Concern Universal vehicles. Safety and security is a priority for United Purpose staff and collaborators. United Purpose has been active in the Gambia since 1992, and Serekunda is a hub for a number of international organizations and non-profits.

Desired Skills of Fellow(s):

Concern seeks a fellow with expertise and experience in agricultural development projects in sub-Saharan Africa, and strong skills in qualitative research methods. Experience in designing, conducting qualitative surveys is desired. This position will require the fellow to engage in extended field work in rural areas. Concern seeks to work with a fellow who has a familiarity with the region and an understanding of the on-the-ground realities of this type of work. Previous experience working with small-scale farmer's groups and women's

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enterprise is a plus, as well as experience working with and/or supervising field survey enumerators. Concern would like to work with a graduate student who has the potential to contribute to the development of this project over the course of its four-year track. In the case that the work of the fellow leads to a paper, Concern Universal requests that the relevant staff members (those who work directly with or supervise the fellow) are offered co-authorship. Excellent English skills and good physical health are needed.

Funding Notes: In-kind contributions include: field transportation, office space and office supplies, research assistants (upon approval).

Language: French, professional working proficiency.

Desired Duration In-Country: 4 Months (December 2018 – March 2019)

Main Point of Contact: Tony Jansen, Country Director, Tony.jansen@concern-universal.org, +220 439 6071 /+220 4397 648

Principal Field Based Collaborator: Tony Jansen

University of California Faculty/Staff Counterpart (Mentor): Madeleine Fairbairn, University of California, Santa Cruz, Assistant Professor, mfairbai@ucsc.edu

Project: Participatory evaluation of extra early, early and medium maturing MAGIC cowpea lines under both sole and maize/cowpea intercrop

Host: CSIR- Savanna Agricultural Research Institute (CSIR-SARI)

Location: Ghana

Project Summary: The MAGIC cowpea population is being evaluated at CSIR-Savanna Agricultural Research Institute (CSIR-SARI) in Ghana for the performance of extra early, early and medium maturing lines under both sole cropping and maize/cowpea intercrop among other traits. This is a climate smart activity that will select for extra early and early lines that could escape terminal drought and use for multiple cropping and selection of dual purpose medium maturing lines to meet crop/livestock intensification system. The fellows will be engaged in the field establishment of the trials, agronomic data collection, participatory variety selection, data collection on what informed the farmers' selection. The fellows will also be involved in data compilation, analysis and report writing.

Project Description:

The Multi-parent Advanced Generation Inter-cross (MAGIC) cowpea population was developed by University of California Riverside through the crossing of 8 different cowpea genotypes known to carry different resistant traits in Sub-Saharan Africa. The MAGIC population is being evaluated across West African under the Innovation Lab for Climate Resilient Cowpea project. These lines are being assessed for their agronomic and yield performance, resistance or tolerance to drought, heat, Macrophomina disease etc. The preliminary assessment of the agronomic performance of the lines has classified the lines into extra early, early, medium and late maturing lines. The current study aim is evaluating the extra early, early and the medium maturing line under two agro-ecological zones (Sudan and Guinea Savanna) under both sole cropping and maize/cowpea intercrop. This is part of efforts to generate data to support the release of the promising lines as varieties to the cowpea farmers in Ghana and for West Africa as a whole.

The selection of the promising extra early, early and medium individual lines will be done with the active involvement of farmers, consumers and traders. The selection under maize/cowpea intercrop is to identify cowpea lines that could withstand shade under the maize canopy and mature between 45, 35 and 25 days respectively before the maize is harvested. The farmers can therefore break the long hunger gap with the cowpea and also serve as a source of cheap protein in the diet of the farmers. The price of cowpea at the time is also very good and through that the farmers could generate income to improve their livelihood.

The fellows will be involved in the project implementation as follows:

- Planning to identify research materials needed, to discuss the experimental design, agree on data points to be collected, identify resources available and those to be procured for the project implementation.
- The fellows will be actively involved in supervising the farm laborers to select quality seed of the MAGIC lines to be used in the field trials.
- They will also join the field technician to layout the experiment on the field and assign label according to the treatment randomization. During field establishment the fellows will join the field technicians in distributing the seed packages based on the labels and supervise the farm laborers in planting, refilling and later thin to maintain the required plant stand.

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-Data collection: The fellows will be actively involved in the data collection and they will be assisted by the field technicians. They will team up with the field technicians in regular scouting and recommending prompt action to the field laborers to control weeds, insects and diseases. At harvest and postharvest handling, the fellows and the technicians will supervise and record yield data. Data compilation, analysis and reporting will be done by the fellows, field technicians and the scientists of the project. Weekly meetings will be used to discuss progress of project implementation, identify challenges and find ways to address them. The fellows will use these meetings to give at least four seminar presentations on:

1. Field establishment
2. Trial maintenance
3. Data collected
4. Final report

Work Environment:

The students will be engaged in:

- Field work to establish field trials, trial management, data collection, participatory variety selection this will be carried out in Manga and Nyakpala stations of CSIR-SARI
- Office work, including data compilation, analysis and report writing at Manga station of CSIR-SARI

Desired Skills of Fellow(s):

The student should be agriculture students in the area of plant breeding or agronomy.

Funding Notes: The Innovation Lab for Climate resilient Cowpea project will absorb all the research cost involve in the establishment of trials, trial maintenance, participatory variety selection and data collection.

Language: English

Desired Duration In-Country: 4 months, beginning in June - July 2018

Main Point of Contact: Dr, Francis Kusi, CSIR-SARI, onkufra@yahoo.co.uk, +233 244788076 or +233 261776765

Principal Field Based Collaborator: Dr. Francis Kusi

University of California Faculty/Staff Counterpart (Mentor): Dr. Timothy Close, Department of Botany & Plant Sciences, UC Riverside, timothy.close@ucr.edu

Project: Researching and documenting orange fleshed sweet potato (OFSP) yield results

Host: Global Communities Ghana Resiliency in Northern Ghana (RING)

Location: Ghana, Northern region, Tamale

Project Summary: Global Communities Ghana Resiliency in Northern Ghana (RING) program works to improve agriculture and livelihoods through nutrition-sensitive agriculture interventions that have great potential for sustainability beyond the life of RING. Work with orange fleshed sweet potato (OFSP) is one such intervention that proved successful in yield results and scaling up. These results need to be thoroughly captured and documented so that appropriate integrated messaging can be developed to be used strategically across sectors (Nutrition, WASH, Gender and social protection) and provided to district implementation teams which will be delivering them, particularly on complementary feeding, critical times of handwashing, and other key nutrition-specific messages to drive the desired behavior change.

Project Description:

To meet its program target, Global Communities RING will multiply approximately 23 million vines in FY18 (or 7,500 vines per Village Savings and Loan Association [VSLA] to cover half an acre). Considering potential vine loss, this will cover more than 1,700 acres to produce potentially 5,100 metric tons of OFSP tubers (an average 3 MT per acre) primarily for home consumption and surplus sales to generate income. This is one of RING's nutrition-sensitive agriculture interventions that have great potential for sustainability beyond the life of RING. The project will continue to strategically use the activity to integrate messaging across sectors (Nutrition, WASH, Gender and social protection), particularly during the cooking demonstrations. Nutrition, sanitation, hygiene, and gender-sensitive messages will be delivered by district implementation teams, particularly on complementary feeding, critical times of handwashing, and other key nutrition-specific messages to drive the desired behavior change.

A specialist from HQ will go to Ghana in January 2018 to work on two themes which will ground the work of the RIFA Fellow:

- (1) Sustainability of OFSP vines production and supply, including meetings with a variety of actors to analyze the current model we have set up for the multiplication of high quality OFSP vines and understand the various options that farmers have for sourcing vines. Documentation of the challenges with production and scale up, as well as looking into various other ways in which RING can establish the input via market mechanisms will lead to ensuring that Ghana RING leaves behind a system that is sustainable beyond the life of the program where vines are available and affordable on the market for all who want to access them; and
- (2) Best practices for scale up. Ghana RING has been successful in scaling up a variety of interventions that started small in the first year. GC's specialist will review and evaluate the process by which this scale-up happened over the course of the program to document lessons learned and best practices for any and all implementers who are struggling to implement their programs at scale and to bring pilot programs to the next level.

The RIFA Fellow will follow on work of the HQ Specialist in documenting best practices in meeting the challenges with production and scale as well producing appropriate messaging products that will contribute to behavior change around this intervention. It is expected that the HQ Specialist will provide the RIFA Fellow

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with context and technical guidance before the assignment start. This will allow the RIFA Fellow to expand or limit its research around the issues that will have the most significant impact on overall program results.

Work Environment:

Work will involve a combination of field and office work to research, capture, and properly document ODSP intervention and produce appropriate messaging and promotional products. No lab work is envisioned.

Desired Skills of Fellow(s):

- Technical knowledge and experience in OFSP vines production and supply
- Excellent communication skills (oral and written)
- Some demonstrated experience in writing on technical subject (OFSP) or equivalent, e.g. term papers or essays or other types of written products
- Flexibility and adaptability to local working conditions
- Must be able to physically withstand extreme weather and regular travel on poor road networks with limited infrastructure and supplies

Funding Notes: Global Communities will be glad to offer office space in our local office in Tamale (although providing or use of computer cannot be guaranteed) as well as transportation to field sites using field office vehicle, as appropriate and in line with agreed-upon work of the RIFA Fellow. A local program manager will provide some programmatic guidance and oversight as well as basic logistics support but the RIFA Fellow is expected to work independently within the framework of agreed scope of work.

Language: English

Desired Duration In-Country: 2 months, June-July 2018

Main Point of Contact: Peter Tyliszczak, Program Manager, ptyliszczak@globalcommunities.org, 301-587-4700 ext.1915

Principal Field Based Collaborator: Wekem Raymond Avatim, Agriculture/Livelihoods Senior Coordinator, wavatim@globalcommunities.org

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Understanding Cost of Operations for Cotton Farmers in Ivory Coast

Host: SECO (Olam subsidiary)

Location: Ivory Coast

Project Summary: The objective of this project is to understand the costs of medium-sized cotton farmers (5-8 ha) in Ivory Coast and explore options to reduce farmer costs to increase income. The Fellow will interview farmers to understand drivers for cost and suggest ways and means to reduce costs.

Project Description:

The components of the project include:

- Understand activities undertaken by farmer for growing cotton and other food crops
- Prepare survey questionnaire
- Populate list of farmers to be interviewed from the existing farmers' data base
- Understand what drives their cost
- Identify big cost drivers and opportunities and means to reduce costs through innovations (e.g. mechanization)
- Validate the suggestion on ground through a pilot project (to be executed by SECO team after research)

The Fellow should be willing to travel upcountry locations and interview farmers with probing questions to go beyond the first statements made by farmers to develop an independent view on the real cost drivers and quantify them. Once the cost heads and their drivers are ascertained, the fellow will work out a plan to bring the cost down keeping in mind the on-ground realities.

Work Environment:

This will be largely a field work based out of Ferkessédougou.

(<https://en.wikipedia.org/wiki/Ferkess%C3%A9dougou>). Within Ivory Coast, Olam has offices in the capital Abidjan where the fellow will first arrive. From there, he or she can travel upcountry to our field offices and ginning facilities in Ferkessédougou. Access to office facilities will be provided, but much of the work will be in the field with the cotton producing communities in Northern Ivory Coast.

Desired Skills of Fellow(s):

- Understanding of (cotton) agronomy
- Background in agricultural development, preferably with some course work in socio-economic dimensions of agricultural systems in developing countries
- Fluency in French - at least fluent in conversation
- Analytical thinking skills
- Willingness to travel upcountry and operate in rural locations with access to basic facilities and services only.

Funding Notes: None

Language: French, professional working proficiency.

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Desired Duration In-Country: Flexible, but June to August 2018 desired.

Main Point of Contact: Nitin Mittal, Vice President, nitin@olamnet.com, +22506727301

Principal Field Based Collaborator: Dr Krishna Prasad

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Warehousing Management and Storage Techniques for the Millet Business Services Project in Senegal

Host: NCBA CLUSA Millet Business Services Project

Location: Senegal

Project Summary:

This assignment will focus on teaching storage technique and warehouse management to the organization management committees. The organizations just built new warehouses and need an assistance to manage it.

Project Description:

1. The fellow will have a briefing session with USDA/Millet Business Services Project (MBSP) staff, who were involved in the building of the warehouse for the local organizations. During the meeting MBSP staff will give the fellow all information needed and tell him/her their expectations. They will also discuss the final agenda.
2. The fellow will work with at least 3 different warehouses in different location (approximately 3-4 weeks per warehouse)
3. The fellow will assess the current state of the warehouse to see what is taking place and assess the current process and procedures being used.
4. The fellow will design training(s) on warehouse/storage techniques and warehouse management processes and procedures. The training will take place in the warehouse with about 15 people, coming from different villages.
5. The fellow will help the management committee set a debit-credit-balance sheet for records.
6. The fellow will also provide one-on-one mentorship and work with specific people on warehouse problems and issues.

Work Environment:

Fieldwork and office work. Regions: Koalack, Kaffrine, Fatick and maybe Dakar.

Desired Skills of Fellow(s):

1. Understanding of warehouse management processes and procedures.
2. Understanding of storage techniques particularly for grains (most of the storage is for Millet)
3. Ability to effectively design trainings
4. Ability to effectively give a training

Funding Notes: We can pay for airfare and potentially some portion of lodging.

Language: French, full professional working proficiency.

Desired Duration In-Country: 3 months, flexible.

Main Point of Contact: Megan Wall, mwall@ncba.coop, 202-442-2309

Principal Field Based Collaborator: Laurent Gomis, Chief of Party, and other field staff to be identified.

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University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: Pathways to Innovation in Central Asia: Building regional capacities for agricultural environmental research

Host: University of Central Asia (UCA), at the UCA Khorog Campus (Tajikistan).

Location: Tajikistan

Project Summary: Regional research capacities will be strengthened through co-development and implementation of small scale agricultural, natural resource management, and food security projects. The Fellow will actively participate in UCA's "university support" program. Fellow to be based in Khorog, Tajikistan.

Project Description:

The RIFA Fellow would be joining the UCA team implementing the project "Pathways to Innovation: Strengthening Mathematics, Science and Economic Policy Capacity in Afghanistan and Central Asia (2017-20)." While the above project targets three regional universities, including two in Afghanistan, the Fellow shall be based at UCA Khorog (Tajikistan) and focus most attention on research projects (co-)designed with partners from Khorog State University (KSU) - including fieldwork associated with the KSU projects. Depending on the specific skills and experience of the Fellow, inputs may also be requested for supporting the Afghan projects, albeit remotely (i.e., without any travel or fieldwork in Afghanistan). Overall, through the "Pathways to Innovation" project, UCA is seeking to enhance the science and research capacities of faculty from several universities, with a focus on young to mid-career faculty.

Two broad areas of support are anticipated from the RIFA Fellow. First, direct engagement with the design and/or implementation of agricultural or sustainable resource management research projects. Second, contribution to the development of a 'certificate program' in Natural Resource Management, which will be delivered by UCA to regional universities at a later stage of the IDRC-supported project.

In regard to the research projects, local faculty members have already been identified in the regional universities, and over a dozen research concepts have been received by UCA. Proposals from KSU are related to sustainable land management, nursery development, indigenous fruit trees, the use of under-recognized under-utilized plants, and promotion of mountain tourism as alternative livelihood.

While all the proposals have core focus on agronomic and rural development, highly pertinent inter-disciplinary research areas will be highlighted in their further formulation. In particular, the proposals shall be embedded within contexts or perspectives of food security, climate change and adaptation, water-energy-food interactions, and sustainable mountain development. Knowledge generated and lessons learned from this project will strengthen not only the regional universities and their faculty, but also will feed into Aga Khan Development Network (AKDN) programming in the region. (Note: UCA is an agency of the AKDN, and thus can benefit from and feed into broader AKDN initiatives).

The RIFA Fellow is expected to play an overarching support role, as part of UCA's project team, to strengthen the development, implementation, and analysis of emerging project results. Inputs will include scientific and technical elements, as well as management, communications, and editorial or writing contributions. The Fellow

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will work alongside (and/or be in regular contact with) UCA and other researchers. Emphasis shall be placed as much on 'mentorship' of regional faculty (through partnership) as on agri-environmental field research per se.

Work Environment:

The Fellow will be based in Khorog, Tajikistan. Some regional travel will occur in Gorno-Badakhshan Autonomous Oblast (province), according to emerging project requirements (i.e. field work activities). Serving as part of UCA's team implementing the IDRC-supported "Pathways to Innovations" project, the Fellow will need to come with a flexible mindset - as appropriate for this 'capacity development' intervention that seeks to build regional universities' research and analytical skills through co-design and implementation of a suite of small agricultural and sustainable development research projects. A combination of field-based work (in support of specific selected agricultural projects) and office work (including communications, concept reviews, project design, etc.) are anticipated.

Desired Skills of Fellow(s):

The Fellow should have good knowledge / experience in agriculture, food security, sustainable land management, rural development, and/or environmental sciences - and ideally also experience in the extension of such knowledge to various audiences including academic and/or community partners. Experience in the coordination and monitoring of research in multi-stakeholder contexts also would be an asset, as well as project management. In addition to fluency in English (spoken and written), ability to communicate effectively in Russian, Tajik, and/or Farsi, would also be helpful for the team. Specific agricultural and natural resource management skills in horticulture, fruit trees (orchards), nursery development, medicinal plants, agrobiodiversity, integrated pest management - all could be integrated into UCA's "Pathways to Development" project. Specific TORs to be developed later.

Funding Notes: First fellow funded by RIFA, second fellow funded by host

Language: English. Russian, Tajik and/or Farsi helpful.

Desired Duration In-Country: Flexible, as long as possible. Time in-country should include as much of the growing season as possible. But some flexibility is possible, depending on the applicants' profiles.

Main Point of Contact: Dr Marc Foggin (Acting Director, Mountain Societies Research Institute, University of Central Asia), marc.foggin@ucentralasia.org, (+996)770822456

Principal Field Based Collaborator: Dr Murodbek Laldjebaev
<http://www.ucentralasia.org/About/UcaStaff#MurodbekLaldjebaev>

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Research and Innovation Fellowship for Agriculture

Project: Coordination Mechanism of Ecological Effect and Resource Utilization of Long - term Rotations in Middle and Lower Reaches of Yangtze River

Host: College of Environment and Resource Science, Zhejiang University

Location: Hangzhou city, Zhejiang Province, P.R of China

Project Summary: This project will conduct 4 years field experiment on the rice-corn, rice--rice, rice--oil seed rape and rice--green manure crops rotation system to investigate the resource use efficiency, crop physiological and biochemical indexes, crop rhizosphere micro-ecological behavior and soil physical and chemical properties of continuous cropping and rotation cropping patterns of major grain crops and provides theoretical basis for optimizing crop rotation and rotation efficiency. The role of the fellow would be to exchange ideas and experience on the crop production technology with rotation to help accomplish the project.

Project Description:

Our experiments require occasional field measurement and sampling. Samples, such as greenhouse gases, soil samples, plant samples need to be analyzed and tested in the laboratory. The office provides computers and networks for data analysis and material writing. On the basis that the work can be completed on time, there is no hard working time requirement. Partners need to follow us for sampling and analysis when we need.

Work Environment:

The fellow will work in the field, lab and office. The fields belong to Zhejiang Academy of Agricultural Sciences and Hangzhou Academy of Agricultural Sciences. The lab and office are located in College of Environment and Resource Science, Zhejiang University in Hangzhou.

Desired Skills of Fellow(s):

We would like fellows to have strong agricultural and environmental knowledge, and experimental background. Writing skills are welcomed.

Funding Notes:

Language: English, Chinese language desirable.

Desired Duration In-Country: 3 months, June – August 2018

Main Point of Contact: Dr. Jingping Yang, jpyang@zju.edu.cn, tel: 0571-88982007,13067755647

Principal Field Based Collaborator: Name: Zhenhui Jiang, jiangzh1990@126.com

University of California Faculty/Staff Counterpart (Mentor): Student must find.

Project: The impact of re-flood on active microbes responsible for nitrous oxide emission in Chinese paddy soils

Host: Zhejiang University

Location: China

Project Summary: Rice paddy drainage and re-flooding practices usually causes a large flush of greenhouse gas (methane and nitrous oxide) emissions soon after re-flooding during rice cultivation. This project is designed to study the active microbes responsible for the greenhouse gas using SIP microcosms with ^{18}O -water mimic the re-flooding of paddy soils.

Project Description:

Rice paddy drainage and re-flooding practices usually causes a large flush of greenhouse gas (methane and nitrous oxide) emissions soon after re-flooding during rice cultivation. The active microbes in the short-term are not well understand, even though many scientists have elaborated on the microbial activity response for the greenhouse gas emissions during rice cultivation. DNA/RNA based stable isotope probing (DNA/RNA-SIP) is an approach that links organisms or groups of organisms to specific functions within natural environments. Unlike SIP approaches that employ specific substrates labeled with ^{13}C or ^{15}N , SIP with ^{18}O -water is a powerful technology to study the active microbes responsible for the greenhouse gas emission after the re-flooding of paddy soils. China accounts for one of third of the world's rice harvest with paddy field ranging across temperate, subtropical and tropical climate areas. This project is designed to study the active microbes responsible for the greenhouse gas using SIP microcosms with ^{18}O -water mimic the re-flooding of paddy soils.

Work Environment:

All work will take place in Hangzhou City in a lab and office environment.

Desired Skills of Fellow(s):

- Molecular biology techniques (DNA extraction, PCR, qPCR...)
- Bioinformatics tools (e.g. R statistics software) for interpretation of molecular biology data

Funding Notes: None

Language: English

Desired Duration In-Country: Flexible, as long as possible

Main Point of Contact: Yong Li, yongl@zju.edu.cn, +86-571-88982410

Principal Field Based Collaborator: Yong Li

University of California Faculty/Staff Counterpart (Mentor): Student must find

Project: Agricultural Landscape Assessment in West Bengal, India

Host: Grameen Foundation (lead), Freedom from Hunger India Trust, Bandhan Konnagar, Aikyatan Development Society

Location: India

Project Summary: The Grameen Foundation proposes to conduct an agricultural landscape assessment as a follow up to our Health Diaries and Anemia Projects. The RIFA Fellow would follow up with these same female clients or similar clients in the program area to further assess agricultural opportunities and challenges and the impact on food security and nutritional status.

Project Description:

Grameen Foundation recently wrapped up our Health Diaries and Anemia Prevention projects. The Health Diaries project involved surveying and interviewing 30 women in West Bengal about their income generating activities, health needs, and household expenses, whereas the Anemia Prevention project included pre and post test surveys on anemia knowledge and behaviors. As a follow up activity to both projects, we hope to conduct an agricultural landscape assessment by going back to these same female clients and rounding out their stories by collecting information about their agricultural opportunities and challenges and the impact on food security (including availability, access, and utilization) and nutritional status.

While West Bengal is considered the vegetable basket of India, our NGO partners in India have been primarily focused on integrating health and financial services/inclusion for women, with less emphasis on nutrition-sensitive agriculture and capacity building. Thus, the RIFA fellow would be responsible for assisting our Indian NGO partners by designing a survey and conducting interviews that begin to answer some of the following questions related to agriculture and food security:

- To build on current knowledge around household dietary diversity, what are the primary sources of animal source foods and fruits and vegetables (e.g. kitchen gardens, local markets, bartering, etc.)?
- As a follow up to questions on the percentage of food grown for home consumption versus sales, what are the determining factors in this decision?
- What are the most common agricultural practices and limitations (e.g. irrigation vs. rainfed) among our female clients?
- To what extent is the agriculture practiced nutrition sensitive?
- What is the seasonal availability of produce in local markets and barriers to access?
- What's the potential for ICT services in agriculture for women? How many women get info from radio or TV?
- As a follow up to the percentage of households raising small livestock in a mixed farming system, to what extent are ASFs consumed versus sold and is this in the form of milk, meat or eggs?
- Who in the household has control over livestock operations and makes decisions about what is sold and when?
- What are the livestock production practices (e.g. supplementary feed, improved shelter, breeding of indigenous village chicken varieties)? Are livestock being used to enhance crop production through fertilizer and pest control?
- As a follow up to questions about agricultural extension services, what kind of knowledge or input gaps could our partner NGOs fill in terms of delivering agricultural information and education?

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Similar to the health diaries, the agricultural landscape/livelihood assessment would be administered in person by a RIFA fellow and either FFHIT or partner staff members, with clients and other stakeholders over a 3-4 month period. During these interviews, we will explore the questions listed above. The tools developed for this assessment will be quantitative and qualitative in nature, taking a “deep dive” to understand motivations behind production and consumption decisions, including: demographics, household income sources, gender dynamics, agricultural seasonality and market fluctuations.

The RIFA fellow would also help with compiling results and data analysis from the survey responses and interview content.

Work Environment:

Based primarily in the Freedom from Hunger India Trust (FFHIT) office in New Delhi, the fellow would engage in a combination of office work and also field work in West Bengal and other select northern India states, such as Madhya Pradesh and Rajasthan, where Grameen Foundation and FFHIT locate the majority of their projects.

Desired Skills of Fellow(s):

The fellow should be comfortable living and working in a developing country setting, ideally with previous travel and research experience in India. They should have a background in agricultural development and some knowledge of nutrition and food security concepts. The fellow should also have familiarity with designing surveys and conducting structured interviews, as well as coding interviews and analyzing data.

Funding Notes: None.

Language: English

Desired Duration In-Country: 3 Months (June – August/September 2018)

Main Point of Contact: Bobbi Gray, Research Director at Grameen Foundation
bgray@grameenfoundation.org

Principal Field Based Collaborator: Saraswathi Rao, CEO of Freedom from Hunger India Trust

University of California Faculty/Staff Counterpart (Mentor): Student must find

Project: Food, Agriculture and Social Entrepreneurship (FASE) Curriculum & Trainer Skill Development

Host: Green Shoots Foundation/Community-based Integrated Development (CIDO)

Location: Oddar Meanchey Province, Cambodia

Project Summary: Green Shoots Foundation FASE initiative started in late 2012 in the NW of Cambodia. The aim is to demonstrate to youth that a rural economy can be thriving and help provide for their families. The role of the fellow will involve working with our local partner on updating skills and techniques, carrying out assessments.

Project Description:

Green Shoots Foundation's mission is to foster sustainable development by promoting holistic programs that combine economic development with food & agriculture, education or medical aid. By working with local partners, we implement holistic programs to break localized poverty cycles.

In 2012, Green Shoots Foundation launched its Food & Agriculture and Social Entrepreneurship (FASE) Initiative in Cambodia through a series of pilot projects and with the intention to invest in the skills of people for long-term development. Our vision is to “revitalize rural economies through sustainable agriculture skills and business development” and we are committed to making agriculture exciting for youth:

<https://tinyurl.com/y7p8hnwv>.

In 2014, we scaled up the pilot project to Agriculture Skills in Public Schools (ASPUS) Project with CIDO. For this we set-up, managed and trained teachers on vocational vegetable gardens in 42 government-run schools in this province.

The role of the RIFA fellow can involve carrying out third-party evaluations of these gardens and providing recommendations (and or) training for improvement in the gardens.

Whilst, ASPUS is ongoing, we are also embarking on an Agriculture Training Centre in the same location. For this, the RIFA fellows will be instrumental in:

- 1- Ensuring our trainers are equipped with the appropriate skill set, such as: soil/ water pH testing, climate change adaptation principles, etc.
- 2- Giving input on the curriculum for the agriculture training center (focusing on horticulture, integrated farming, water resource management, low-cost tech solutions).

Work Environment:

All work will take place in Odar Meanchey, a province in the northwest of the country bordering Thailand. The fieldwork will be in 42 vegetable gardens that Green Shoots has set-up with local partner, CIDO, and (potentially) an agricultural training center. For office work, the fellow will have a desk at CIDO's office. On occasion the fellow will accompany local staff to attend NGO meeting or events.

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Desired Skills of Fellow(s):

- An understanding of tropical agriculture, especially in the SE Asian context and within the realms of climate change
- Ability to work in low-resource setting (no access to labs)
- Good understanding of soil properties, techniques to improve soil quality, water resource management.
- Past experience working on Training of Trainer programs
- Ability to work independently and with teams in different countries (Green Shoots is in the UK)

Funding Notes: As we are still fundraising for the project, we could include a RIFA candidate in our grants and partially fund local costs (local transport for example). Other options: find homestays. Additional costs for the fellow would include the visa for Cambodia, which is USD 30 for one month. A volunteer in Cambodia for three months would need to renew the visa three times (this is quite easy as we are 40Km from the Thai border).

Language: Khmer (if possible), limited working proficiency

Desired Duration In-Country: 3 months (excluding July-Sept 2018)

Main Point of Contact: Muneezay Jaffery, muneezay@greenshootsfoundation.org, +44 7903224508

Principal Field Based Collaborator: Mr Ratana Oeurn, ratana.cido@gmail.com, +855 7741 2177

University of California Faculty/Staff Counterpart (Mentor): Student must find

Project: Innovations to Build and Scale Safe Vegetable Value Chains in Cambodia-Hard and Soft Technologies

Host: Royal University of Agriculture, Phnom Penh

Location: Cambodia

Project Summary: Our project aims to improve the safety and quality of vegetables in Cambodia while increasing farmer livelihoods. We are looking for Fellows who are interested in studying both technical and social innovations with potential to overcome production challenges in ways that increase the safety of vegetables. We are a multi-national team of university researchers who partner with farming communities, private sector partners, local government, NGOs and other local stakeholders to conduct participatory applied research.

Project Description:

While in-country, the Fellow(s) will be part of a team of researchers that includes multiple Cambodian university faculty, Safe Vegetable Value Chain (SVVC) project staff, multiple interns, and at least one UC Davis researcher. The Fellow(s) specific project plan and timeline may be adapted to fit the Fellows' interests.

In general, the project should be centered around technology and practice-based challenges that exist for farmers who have traditionally overused chemical fertilizers and pesticides to address their production problems. One priority area involves pest exclusion nets (nethouses) as a means to protect crops from pest damage. The SVVC project has introduced and adapted with farmers this hard technology and, as with the introduction of any new technology, challenges arise with its use in the field. The Fellow(s) role will be to help address some of these social and technical challenges, which may include:

- 1) how to address soil borne pests and diseases,
- 2) investigating and recommending appropriate Integrated Pest Management techniques or chemical free fertilizers,
- 3) identifying farmers' field practices and perceptions about nethouse technology during its testing phase that may hinder its effective use,
- 4) how to transition farmers away from the pattern of overusing chemical fertilizers and pesticides in response to problems in the field, and/or
- 5) investigating the structure, cost, and effectiveness of new or improved designs of nethouses.

Additional opportunities to contribute other soft and hard technological innovations may also be available based on the Fellow(s) interest and relevance to the SVVC project and Horticulture Innovation Lab.

In addition to the Fellow(s) project goal, the Fellow(s) will be expected to contribute to capacity building of emerging local leaders. This will include at least one presentation to students at the Royal University of Agriculture in Phnom Penh and training at least one student intern to engage in the Fellow(s) project. The Fellow(s) contribution to capacity building can also include other forms of engagement with emerging Cambodian leaders such as conducting student workshops, organizing journal clubs, advising students preparing research proposals, abstracts, presentations or scholarship/grant applications.

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The Fellow(s) will have opportunity to pre-plan their project in Davis with face-to-face mentorship from a multi-disciplinary team of UC Davis researchers who have been working with Cambodian counterparts for more than 7 years. This offers Fellow(s) the advantage of preparing a solid plan of action while still in Davis so the Fellow(s) can make the most out of their time in-country.

Work Environment:

This project is field-based in Battambang Province - field sites are approximately a 40-50 minute drive from Battambang City. Some work also occurs in offices and at field stations at the Royal University of Agriculture in Phnom Penh and the University of Battambang in Battambang City.

Desired Skills of Fellow(s):

Since the Fellow(s) will be joining an ongoing university-led multi-faceted program in Cambodia, it is possible to integrate a variety of specific skills a Fellow may have into his or her project plan and also to adapt the specific plan to fit the Fellows' educational interests. Applicants who may wish to apply his or her skills and interests in ways that extend beyond what is described in this Host Profile will be certainly be considered. Applicants should plan to discuss his or her extended interests during the interview with the Host Institution. It should be noted that project plans extending beyond direct applicability to the SVVC project and Horticulture Innovation Lab will require greater degrees of independence on the part of the Fellow.

Funding Notes: The Fellow(s) will be working as part of an ongoing project, Safe Vegetable Value Chains in Cambodia (SVVC), funded by the Horticulture Innovation Lab. Therefore, funding is available to support the RIFA Fellow with some field supplies, translation services and transportation that directly relate to the goals of SVVC project and priorities of the Horticulture Innovation Lab. Additionally, the RIFA Fellow will operate as part of a team that has local staff and interns who are dedicated to the SVVC project.

Fellow(s) are encouraged to leverage funding to secure sources that can support additional travel to field sites and field supplies/stipends/reimbursements/gifts for local people that support Fellow(s) as they conduct their projects.

Language: English

Desired Duration In-Country: Flexible, fellow should be in country June - August

Main Point of Contact: Karen LeGrand, UC Davis, International Programs Office, Principal Investigator-Safe Vegetable Value Chains in Cambodia Project, klegrand@ucdavis.edu, +1 (818) 326-9613

Principal Field Based Collaborator: Karen LeGrand, klegrand@ucdavis.edu
Borarin Buntong, borarin@yahoo.com, +855 (0)12 822 910

University of California Faculty/Staff Counterpart (Mentor): Karen LeGrand

Project: Innovations to Build and Scale Safe Vegetable Value Chains in Cambodia-Value Chain Analysis

Host: Royal University of Agriculture, Phnom Penh

Location: Cambodia

Project Summary: Our project aims to improve the safety and quality of vegetables in Cambodia while increasing farmer livelihoods. We are looking for Fellows who are interested in studying both technical and social innovations with potential to overcome production challenges in ways that increase the safety of vegetables. We are a multi-national team of university researchers who partner with farming communities, private sector partners, local government, NGOs and other local stakeholders to conduct participatory applied research.

Project Description:

While in-country, the Fellow(s) will be part of a team of researchers that includes multiple Cambodian university faculty, Safe Vegetable Value Chain (SVVC) project staff, multiple interns, and at least one UC Davis researcher. The Fellow(s) specific project plan and timeline may be adapted to fit the Fellows' interests.

In general, the project will be centered around an emerging vegetable value chain in Battambang Province where our project team works with multiple stakeholders (including farming communities, private sector partners, local government, NGOs and others) to conduct participatory applied research. One element of the project centers around a community-led collection center and packing house that is currently being constructed in a village approximately a 40 minute drive from Battambang City. One intention for this packinghouse facility is for it to serve as a hub to develop new value chain linkages that can strengthen Cambodian farmers position in the marketplace and displace some of the vegetable imports from neighboring countries (currently ~70%). We are looking for Fellows who are interested in studying:

- 1) a comparison of developing an independent safe vegetable supply chain vs. integrating a safe vegetable supply chain into the conventional supply chain,
- 2) areas where input costs can be decreased or inputs can be used more efficiently and
- 3) how the supply chain can be shortened in ways that offer mutual benefits to all actors.

Additional opportunities to contribute to developing and strengthening the value chain may also be available based on the Fellow(s) interest and relevance to the SVVC project and Horticulture Innovation Lab.

In addition to the Fellow(s) project goal, the Fellow(s) will be expected to contribute to capacity building of emerging local leaders. This will include at least one presentation to students at the Royal University of Agriculture in Phnom Penh and training at least one student intern to engage in the Fellow(s) project. The Fellow(s) contribution to capacity building can also include other forms of engagement with emerging Cambodian leaders such as conducting student workshops, organizing journal clubs, advising students preparing research proposals, abstracts, presentations or scholarship/grant applications.

The Fellow(s) will have opportunity to pre-plan their project in the U.S. with mentorship from a multi-disciplinary team of UC Davis researchers who have been working with Cambodian counterparts for more than

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7 years. This offers Fellow(s) the advantage of preparing a solid plan of action while still in the U.S. so the Fellow(s) can make the most out of their time in-country.

Work Environment:

This project is field-based in Battambang Province - field sites are approximately a 40-50 minute drive from Battambang City. Some work also occurs in offices and at field stations at the Royal University of Agriculture in Phnom Penh and the University of Battambang in Battambang City.

Desired Skills of Fellow(s):

Since the Fellow(s) will be joining an ongoing university-led multi-faceted program in Cambodia, it is possible to integrate a variety of specific skills a Fellow may have into his or her project plan and also to adapt the specific plan to fit the Fellows' educational interests. Applicants who may wish to apply his or her skills and interests in ways that extend beyond what is described in this Host Profile will be certainly be considered. Applicants should plan to discuss his or her extended interests during the interview with the Host Institution. It should be noted that project plans extending beyond direct applicability to the SVVC project and Horticulture Innovation Lab will require greater degrees of independence on the part of the Fellow.

Funding Notes: The Fellow(s) will be working as part of an ongoing project, Safe Vegetable Value Chains in Cambodia (SVVC), funded by the Horticulture Innovation Lab. Therefore, funding is available to support the RIFA Fellow with some field supplies, translation services and transportation that directly relate to the goals of SVVC project and priorities of the Horticulture Innovation Lab. Additionally, the RIFA Fellow will operate as part of a team that has local staff and interns who are dedicated to the SVVC project.

Fellow(s) are encouraged to leverage funding to secure sources that can support additional travel to field sites and field supplies/stipends/reimbursements/gifts for local people that support Fellow(s) as they conduct their projects.

Language: English

Desired Duration In-Country: Flexible, fellows must be in country June-August 2018.

Main Point of Contact: Karen LeGrand, UC Davis, International Programs Office, Principal Investigator-Safe Vegetable Value Chains in Cambodia Project, klegrand@ucdavis.edu, +1 (818) 326-9613

Principal Field Based Collaborator: Karen LeGrand, klegrand@ucdavis.edu
Borarin Buntong, borarin@yahoo.com, +855 (0)12 822 910

University of California Faculty/Staff Counterpart (Mentor): Karen LeGrand

Project: Social-Ecological Contributions of Organic Agriculture to Sustainable Climate Resiliency Among Smallholder Farmers

Host: Division of Agricultural Systems Studies, Agricultural Systems Institute (ASI), College of Agriculture and Food Science(CAFS), University of Philippines Los Baños (UPLB)

Location: The Philippines

Project Summary: The project aims to document and assess the social-ecological components of organic agricultural systems and how these can contribute to sustainable climate resiliency among smallholder farmers. Results of this study can contribute to formulation of policies contributing to the integrated development planning, implementation and monitoring of national and local programs that address climate change among our most vulnerable smallholder farmers. The RIFA fellow may conduct sub-component studies on the documentation, quantification and assessment of various social-ecological dimensions of organic agricultural systems in the Philippines that can directly or indirectly contribute towards sustainable climate resiliency of smallholder farmers.

Project Description:

Climate change and its pervasive effects, particularly on Philippine agriculture and fishery continue to pose grave threats to the livelihood of smallholder farmers and rural communities as well as to the country's food security. Thus in response to Republic Act (RA) 9729, also known as the Climate Change Act of 2009, the Department of Agriculture, through a memorandum, enjoined all its operating units to mainstream climate change in its programs, plans and budget (DA-BAR CC-RDEAP 2016-2022).

Similarly, based on the legislation of RA 10068, known as the Organic Agriculture Act of 2010, the National Organic Agriculture Program (2012-2016) aimed to “promote, propagate, further develop and implement the practice of organic agriculture in the Philippines for better farm incomes and sustainable livelihood; improved health; environmental protection, disaster risk reduction and resilience to climate change; and social justice (NOAP 2012).

Studies show that organic agricultural systems have potential for climate change mitigation and adaptation (Scialabba and Lindenlauf 2015; Khanal 2009, Dikitanan, et. al, 2017). However, studies to document and quantify the potential of organic agricultural systems for climate resiliency given the social-ecological dimensions of smallholder farms are limited. Thus, this project aims to contribute to building the science-based evidence that can also guide the formulation of policies towards organic agriculture development and sustainable climate resiliency of the Philippines. The focus of the study is on smallholder farmers since they are the backbone of agriculture in the country yet they are the most vulnerable to climate change.

Depending on the professional background of fellows, the contribution of fellows may include:

1. Identification and valuation of organic agricultural systems and their potential contribution to climate change mitigation (for example C sequestration in the soil, N₂O emissions from the soil, and others) and climate change adaptation
2. Search for appropriate indicators and methodologies for estimation of climate change mitigation and adaptation potential of organic agricultural systems.

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3. Documentation of organic farming systems design and management that contribute to building resilient food systems in face of climate change driven disasters.
4. Document coping strategies for food security and livelihoods by smallholder farmers in the face of climate risks
5. Livelihoods and food and nutrition security assessment of small-scale organic farming households in the face of climate change induced disasters.
6. Landscape and biodiversity analysis of small-scale organic farms.
7. Analysis of farming system design of small-scale organic farms.
8. Assessment of the understanding and risk management for climate change among small-scale organic farming households.

Work Environment:

The Fellow will engage in field work in selected towns in Laguna and nearby region and some laboratory work in the University facilities.

Desired Skills of Fellow(s):

The Fellow should be a self-starter; mature and with high sense of purpose and responsibility, can work with minimal supervision but is open to feedback, suggestions and guidance from others as needed; easy to get along with; can adjust to the local culture; is open to the possibility of doing collaborative research in tandem with a local UPLB undergraduate thesis student so that they both learn together and from each other; willing to present seminars and other activities to share his/her knowledge and findings from the research and other relevant topics.

Funding Notes: None

Language: Filipino, elementary proficiency

Desired Duration In-Country: Flexible, as long as possible

Main Point of Contact: Blesilda M. Calub, PhD (University Researcher, Affiliate Faculty & Program Leader, Organic Agriculture Program), bmcalub.uplb2017@gmail.com, (6349) 536-2459; 0923 2623 878

Principal Field Based Collaborator: Blesilda M. Calub

University of California Faculty/Staff Counterpart (Mentor): Student must find