



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



BIOTECHNOLOGY POTATO PARTNERSHIP ANNUAL REPORT 2020



ANNUAL REPORT FISCAL YEAR 2020

Feed the Future Biotechnology Potato Partnership

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COUNTRIES WHERE THE PROJECT WORKS:

Bangladesh, Indonesia and United States

PROGRAM PARTNERS:



Acronyms

BAU	Bangladesh Agricultural University
BARI	Bangladesh Agricultural Research Institute
BPP	Biotech Potato Partnership
CARE-IPB	Centre for Dispute Resolutions, Regulation & Policy Analysis and Community Empowerment at Bogor Agricultural University
CFT	Confined Field Trial
CIP	International Potato Center
DAP	Days after planting
DDL	Development Data Library
EMMP	Environmental Management and Mitigation Plan
FFB	Farming Future Bangladesh
FTF	Feed the Future
FY	Fiscal Year
GM	Genetically modified
HICD	Human and Institutional Capacity Development
ICABIOGRAD	Indonesian Center for Agricultural Biotechnology Genetic Resources & Development
ISAAA	International Service for the Acquisition of Agri-biotech Applications
JRSC	J.R. Simplot Company
JTWG	Joint Task Working Group
IEE	Initial Environmental Examination
IndoBic	Indonesian Biotechnology Information Centre
IVEGRI	Indonesia Vegetable Research Institute
LBR	Late blight resistant (resistance)
M&E	Monitoring and Evaluation
MSU	Michigan State University
MTA	Material Transfer Agreement
NFT	Nutrient Film Technique
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
PPE	Personal Protection Equipment
R&D	Research and Development

SOP	Standard Operating Procedure
SNV	Single Nucleotide Variant
TLA	Targeted Locus Amplification
UMN	University of Minnesota
U of I	University of Idaho
USAID	United States Agency for International Development
USDA-FAS	United States Department of Agriculture – Foreign Agricultural Service



The Feed the Future Biotechnology Potato Partnership seeks to bring a late blight resistant potato to smallholder farmers in Indonesia and Bangladesh. Photo above depicts women working in Indonesian potato field. Photo courtesy of the Biotechnology Potato Partnership.

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I. EXECUTIVE SUMMARY

The Feed the Future - Biotechnology Potato Partnership (BPP) is a five-year, \$5.9 million multi-institution cooperative agreement between MSU, USAID, Simplot Company and other global institutions to develop and bring to market improved potato products in farmer- and consumer-preferred varieties in Asian countries. BPP offers biotech potato products with broad-spectrum resistance to late blight (*Phytophthora infestans*), the most devastating potato disease in the world, and highly endemic throughout Bangladesh and Indonesia.

Specifically, BPP provides strategic human and institutional capacity building and support (research, development and outreach) to in-country partners in Bangladesh (BARI) and Indonesia (ICABIOGRAD) to support access to, technology transfer, and sustainable use of biotech potato technologies. The project also monitors and evaluates environmental impact, gender balance contribution and socio-economic impact of these biotechnologies. BPP and partner institutions will steward biotech potato products for distribution to low-income farmers and eventual commercialization in Bangladesh and Indonesia. All these activities support and align with USAID's goal of increasing food security and resilience.

This fiscal year (October 1, 2019 to September 30, 2020), BPP continued to make significant progress towards contribution to its goals and objectives. The project successfully implemented activities of the grant focused on the following:

- a) strengthening the project's global partnership network in modern biotechnology R&D, technology transfer and commercialization;
- b) implementing technical activities focused on research, testing, and deregulation of late blight resistant (LBR) potatoes;
- c) building human and institutional capacity and capabilities of partner country scientists and researchers on crop biotechnology and biosafety and regulatory compliance;
- d) modern biotechnology education, communications, and outreach to inform the public and stakeholders on the benefits of LBR potatoes; and
- e) implementing cross-cutting areas: environment, gender and socio-economic components that intersect or are integral components of many of project's activities.

This annual report summarizes all of the achievements of BPP for FY 2020 and provides evidence of the project's performance and contributions to providing science-based answers and solutions to bring about food security, agricultural development, equality and sustainability.



Smallholder Bangladesh potato farmer during harvest. Photo courtesy of the Biotechnology Potato Partnership

II. PROJECT ACTIVITIES AND HIGHLIGHTS

A. Network and Partnerships

BPP's network and partnerships include strong relationships with leading and innovative global institutions in research, development and outreach. The project has formal and informal agreements with 20 global institutions from five countries. A collaboration between BPP, USDA FAS – Indonesia, CropLife – Indonesia, Centre for Dispute Resolutions, Regulation & Policy Analysis and Community Empowerment at Bogor Agricultural University (CARE IPB) and IndoBIC/ISAAA resulted in a consumer perception study on the attitudes and opinions of genetically modified (GM) organisms. This important research data will help lead marketing and messaging strategies during project phase two commercialization.

B. Technical Activity

BPP intends to increase resistance to late blight in susceptible potato varieties with the insertion of three (3) resistant genes (3R-gene) from wild potato species that are naturally resistant to late blight disease.

This year, the project's most significant technical activity was the import of both the Granola and Diamant 3R-gene lines into Indonesia and two confined field trials (CFT) conducted on Indonesian soil.

Despite the onset of the COVID-19 pandemic in third quarter of FY 2020, the project complied with COVID-19 restrictions and found effective ways to conduct work and move research activities forward while staying safe and following all project and local government mandates.

The Diamant 3R-gene CFT, planted in Indonesia, March 2020, tested two Bangladesh farmer-preferred variety Diamant 3R-gene lines, non-transgenic Diamant and varieties Granola, Katahdin, Atlantic, and two single R-gene lines against late blight disease. The CFT looked at both sprayed with fungicides and not sprayed plots. The result found no late blight infection of the 3R-gene lines from the first observation conducted at 28 days after planting (DAP) to harvest 94 DAP. Other diseases such as bacterial wilt, suspected potato virus Y and early blight were found on these two lines.

Other data collected included: tuber yield per plot, tuber yield ton/ha, tuber yield per plant, average tuber number and tuber yield losses by late blight. In both sprayed and unsprayed plot, the two Diamant 3R-gene lines showed the highest yields per category and the lowest tuber yield lost due to late blight. The results of this trial in Indonesia are significant for progress in Bangladesh since the events have not yet been imported for trial in Bangladesh.

The Granola 3R-gene CFT was planted at IVEGRI on July 21, 2020. This CFT tested six Indonesia farmer-preferred variety Granola 3R-gene events, and non-transgenic variety Granola against late blight disease. The population of each plot was 30 plants with four replications. This CFT did not compare sprayed vs non-sprayed plots. It was a cultivar vs late blight susceptibility study and none of the plots



The 3R-gene Diamant confined field trial planted in Indonesia in March of 2020. Photo courtesy of Biotechnology Potato Partnership.

were sprayed with fungicides. All plots were treated with insecticides to control insect pests. Observation of late blight was based on a rating system used to estimate the severity of potato late blight while observation on the bacterial wilt and viruses were based on the incidence of the disease. The first observation was made at 14 DAP and continued until before harvest, when plants were sprayed with herbicide to stop the plant growth.

Plant observations were made on the number of plants growing, starting at 21 DAP. Plant vigor was observed starting at 28 DAP. Observation of late blight and other pests and diseases started at 21 DAP.

In December 2019, the Pathology Lead travelled to Bangladesh to review the BARI pathologists progress in culturing of *P. infestans* isolates and to plan the *P. infestans* isolate collection survey that was to be carried out in the 2019/2020 Bangladesh potato growing season (Jan and Feb 2020). During the 2019/2020 potato growing season there was a large outbreak of late blight in Bangladesh. The Bangladeshi pathologist conducted an extensive isolate survey in every major potato growing region of Bangladesh. Isolates of *P. infestans* were collected from both infected potato and tomato plants on Flinders Technology Associates (FTA) cards for identification and further analysis. Bangladesh experienced very little late blight in the 2018/2019 growing season so this collection was especially important.

In Indonesia, a *P. infestans* isolate survey was carried out on the island of Sumatra, this expands the collection areas from the previous areas of Central, East and West Java. Substantial data have been collected and analyzed on which strains are prevalent in the regions. The results of this multi-year survey have been published in the journal Plant Pathology (<https://doi.org/10.1111/ppa.13269>). Knowledge of pathogen diversity and evolution is important for breeding late blight resistant potatoes and design of appropriate control and mitigation strategies.

The U.S. Technical Team at MSU conducted two CFT's. An agronomy field trial with both the 3 R-gene Diamant and Granola events was planted from NFT mini tubers at the MSU Montcalm Research Center. A CFT late blight trial was also planted at MSU which evaluated 3 R-gene Diamant and Granola events planted from tissue culture plants.

Another major accomplishment of the technical team was the advanced molecular analysis needed to identify and select events to move forward for commercialization. After advanced molecular analysis three events have been selected to advance to regulatory characterization and commercial release: MSUDIA_UB255, MSUDIA_UB15 and MSUGRA_UG269. Two additional events, MSUGRA_UG247 and MSUGRA_UG277 events are waiting field data results to determine if they will also be selected. The advanced molecular analysis included: 1. Determination of the insertion site of the inserted T-DNA, 2. Characterization of the insertion for deletions and extra inserted DNA, 3. Sequencing of the junction between insert and chromosome, 4. Sequencing the 1kb of flanking chromosomal DNA on the left and right border, 5. Matching the flanking chromosomal DNA to the MSU DM Database and confirmation that the insert does not interrupt any genes, 6. Analysis of the left and right junction regions for newly created open reading frames.

C. Biosafety Regulatory Capacity Development and Activity

BPP ensures that all biotech potato R&D conducted by in-country partners are carried out in compliance with internationally accepted standards and national biosafety regulations. During the first half of 2020, efforts focused on the processing of the regulatory applications of biotech potato that will be field tested and managed by BARI and ICABIOGRAD. A draft of the regulatory submission plan was also completed this fiscal year.

Indonesia - All biosafety and import permits for the Diamant and Granola events for CFT were approved. Further review and training of the standard operating procedures for regulatory compliance,

co-developed with the team during FY2019, in preparation for the CFTs was completed in Indonesia. In addition, amendments to the Initial Environmental Examination (IEE) as required by USAID were secured for the Indonesian CFTs. The project ensures that the Environmental Management and Mitigation Plan (EMMP) aligns with the amended IEE.

Bangladesh - In March 2020, the Bangladesh National Biosafety Committee approved the permit for contained use research for the 3R-gene Diamant events. The COVID-19 pandemic impacted the project's ability to secure an import permit in a timely manner due to closed offices and strict travel restrictions. This resulted in further project delays.

D. Human and Institutional Capacity Development (HICD) Activity

BPP provides strategic HICD building and support to enhance BARI and ICABIOGRAD's scientific research ability and capacity to efficiently and effectively access, sustainably use, and deploy biotech potato products. Core partner teams from both institutions have received extensive training at MSU in breeding, pathology and tissue culture skills during earlier years of the project.

In addition, during FY2019 a GM Capacity Building Manual (previously called Test Run Manual) was developed to document the actual in-country capacities in biotech and biosafety. This was supplemented with the execution of a mock CFT that helped document the preparedness of in-country partners in carrying out CFT-related pathology activities and ability to achieve regulatory compliance for biotech potato products. During FY2020, the U.S. team analyzed the final data from these activities. A manuscript showcasing learning and best practices on HICD was completed and submitted for peer review and publication.



Biosafety training on SOP's and CFT study plan was conducted to prepare for the arrival of the GM potatoes in Indonesia. Photo courtesy of the Biotechnology Potato Partnership.

Additional HICD activities as well as the impact of COVID-19 are outlined in section VI of this report.

The project also maintains a [HICD interactive dashboard](#) to provide a snapshot of the important activities and progress in this area.

E. Gender Priorities and Socio-Economic Assessment Activity

BPP monitors and assesses gender balance contribution and socio-economic impact of biotech potato products. The project since inception ensures that there is equal participation of women and men in short-term trainings, workshop and other events sponsored by the project.

Due to budget constraints, the Socio-Economic lead's level of effort was reduced to zero. A scheduled product market analysis slated for Bangladesh was also postponed due to budget restrictions. The project team had been actively seeking other funding sources to continue this and other work. However, with the COVID-19 pandemic these activities were put on hold.

F. Communications and Outreach Activity

BPP actively contributes to expanding knowledge and information on the benefits of modern biotechnology and LBR potato. The Project Team participates in knowledge generation through scholarly output and implements education workshops and discussions on the application of modern biotechnology to address significant issues in global agriculture such as late blight disease.

The COVID-19 pandemic challenged communication efforts as in-person meetings and events were pivoted to online platforms. The project increased communications with USAID DC and Missions to ensure timely sharing of information during the pandemic.

III. KEY ACCOMPLISHMENTS

- Approval by USAID DC of raised ceiling budget request – this allowed for the project to receive an additional \$675,000 in funds. The additional funds were critical to Year 5 activities as these funds replaced research dollars spent by the project in Years 1-2 to work on additional activities mandated by USAID that were not part of the original grant.
- Significant molecular characterizations completed on both Diamant and Granola 3-R gene events at MSU. Final event selection of two Diamant 3-R gene events for further development.
- Obtained all necessary regulatory permits and imported the Diamant and Granola 3-R gene events into Indonesia
- Completed first CFT in Indonesia with Bangladesh farmer-preferred variety Diamant 3-R gene events
- Planted first CFT in Indonesia with Indonesia farmer-preferred variety Granola 3-R gene events
- Received Bangladesh National Committee on Biosafety (NCB) approval for Import of Diamant 3-R gene material for contained trial
- Amended the Memorandum of Understanding (MoU) with Bangladesh Agricultural Research Institute (BARI) which contains provision on change of project's partner from BARI's Tuber Crops Research Center (TCRC) to BARI's Biotechnology Division
- New Principal Investigator named at BARI Biotechnology Division in Bangladesh
- A study titled, Genotypic and phenotypic characterization of *Phytophthora infestans* populations on Java, Indonesia published in the journal Plant Pathology
- A comprehensive tour of the major potato growing regions of Bangladesh and over 200 late blight samples of *P. infestans* isolates collected for further research
- Participation in consumer perception study of GM acceptance conducted in Indonesia. This study was a collaboration with USDA-FAS Indonesia, Crop Life Indonesia, Centre for Dispute Resolutions, Regulations & Policy, Analysis and Community Empowerment at Bogor Agricultural University (CARE IPB), IndoBic, and International Service for the Acquisition of Agri-biotech Applications (ISAAA).
- Risk Communication Workshop held in Indonesia for both the Diamant and Granola 3-R gene events

IV. PROJECT OVERVIEW AND STRUCTURE

The Feed the Future Biotechnology Potato Partnership (BPP) is a five-year, \$5.9 million multi-institution cooperative agreement with USAID to introduce bio-engineered potato products in farmer- and consumer-preferred varieties into Bangladesh and Indonesia. The biotech potato products with stacked resistance genes offer broad-spectrum resistance to late blight (*P. infestans*), the most devastating potato disease in the world, and were developed through gene insertion. The project involves a collaborative partnership between USAID, Michigan State University (MSU), the University of Minnesota (UMN), the University of Idaho (U of I), the Bangladesh Agricultural Research Institute (BARI), the Indonesian Center for Agricultural Biotechnology Genetic Resources Research and Development (ICABIOGRAD), the Indonesia Vegetable Research Institute (IVEGRI), the International Potato Center (CIP), and the J.R. Simplot Company (JRSC). BPP and partner institutions will steward these biotech potato products for distribution to low-income farmers and commercialization. The project provides strategic human and institutional capacity building support (research, development and outreach) to in-country partners to support access to, technology transfer, and sustainable use of biotech potato products.

BPP contributes to the goals of: 1) reducing malnutrition and improving health; 2) reducing the use of harmful pesticides; 3) reducing pre-and post-harvest losses; 4) improving the social and economic standing of women; and 5) catalyzing economic growth. Specifically, BPP is working toward the following objectives:

- Objective 1** Build a network of late blight related potato projects
- Objective 2*** Bring the results of the ABSPII SP951 hybrid (Legacy Potato) to deregulation, dissemination, and commercialization
- Objective 3** Develop, test, and deregulate a 3 R-gene LBR potato in Granola & Diamant varieties
- Objective 4*** Test a 3 R-gene LBR potato containing the *blb1*, *vnt1*, and *mcq1* resistance genes in the Desiree variety in Indonesia and Bangladesh
- Objective 5*** Test the resilience of RNAi technology in the Katahdin variety at MSU
- Objective 6** Build the bio-safety capacity of partner institutions in Indonesia and Bangladesh
- Objective 7** Build the scientific capacity of partner institutions in Indonesia and Bangladesh
- Objective 8** Improve gender balance in partner institutions
- Objective 9*** Demonstrate the socio-economic benefits of 3 R-gene LBR potatoes
- Objective 10** Advance the knowledge of the scientific community regarding GM LBR potatoes
- Objective 11** Effectively communicate project achievements and benefits of the GM potato to project personnel, stakeholders, and the public

* Objectives 2 and 4 were discontinued last year. Objective 5 has been completed with all activities and accomplishments included in FY 2018 Annual Report. Objective 9 has been revised by USAID and shifted to a market analysis.

BPP uses these strategic goals and objectives to develop annual operational goals that keep the project and the whole Project Team focused and accountable.

BPP is led by a Partnership Director (Dr. David Douches, MSU), supported by a MSU Project Management Team (Dr. David Douches, Ms. Kelly Zarka and Ms. Janet Fierro), In-Country Manager (Dr. Karen Hokanson, UMN), Technical Assistant (Ms. Kelly Zarka, MSU), Regulatory Affairs Lead (Dr. Karen Hokanson, UMN), Project Pathologist (Dr. Phillip Wharton, U of I), Monitoring and Evaluation Lead (Dr. Jane Payumo, MSU), Communications Lead (Ms. Janet Fierro, MSU), and Financial Lead (Ms. Leigh Baker, MSU). A Technical Advisory Board, representing USAID (Dr. Tracy Powell) and public and private sector

groups from the U.S., country partners, and other countries, also provides strategic technical or specialist advice to the project.

V. RESEARCH PROJECT REPORT

Objective 1 – Build a Network of Late Blight Related Potato Projects

Description: BPP involves a collaborative partnership between USAID, Michigan State University (MSU), the University of Minnesota (UMN), the University of Idaho (U of I), the Bangladesh Agricultural Research Institute (BARI), the Indonesian Center for Agricultural Biotechnology Genetic Resources Research and Development (ICABIOGRAD), the Indonesia Vegetable Research Institute (IVEGRI), the International Potato Center (CIP), and the J.R. Simplot Company (JRSC). BPP expands this network and pursues strategic partnership with other global institutions working directly or indirectly with late blight related potato projects.

Location: United States, Bangladesh, Indonesia, Peru, Kenya

Collaborators: BARI, Bangladesh; ICABIOGRAD, Indonesia; CIP, Peru/Kenya; Simplot Plant Sciences, United States; and Indonesian Center for Agricultural Biotechnology Genetic Resources Research and Development (ICABIOGRAD), Indonesia.

Achievements: The project continues to value collaboration and network building. With material transfer agreements (MTA) in place with both in-country partners, the project worked to obtain the required regulatory import and research permits necessary as outlined by the governing biosafety regulatory country frameworks. These permits will allow for the transfer of the 3R-gene events into each country for further research and testing.

In Indonesia, the project was successful in obtaining all required permits and imported the Diamant 3R-gene and Granola 3R-gene materials into Indonesia. Once imported, the first CFT was planted in Indonesian soil during the second quarter of Year 5. The second CFT was planted during the third quarter of Year 5, six months ahead of schedule.

In Bangladesh, the project obtained approval from the Bangladesh Biosafety Core Committee and final approval by the country's National Committee on Biosafety (NCB) on an application to import Diamant 3-R gene material into Bangladesh. The NCB also approved an application for contained use – greenhouse trial. The import into Bangladesh is still pending as COVID-19 delayed the projected timeline.

Working with partners and global institutions that share the same vision in developing and promoting the benefits of genetically modified late blight resistant potatoes, BPP leverages people and resources. The project currently engages with 20 global partners focused on research, outreach and advocacy, development, and education.

Capacity Building: Please refer to section VI on Human and Institutional Capacity Development.

Lessons Learned: Moving biotechnology products through partner countries national biosafety frameworks takes time and patience. The project is proactive in understanding the partner country biosafety frameworks where possible, taking time to comprehensively understand the procedures and participating in mutual exchange when appropriate. These advance discussions and planning with in-country partners resulted in timely approvals.

Objective 2 - Bring the results of the ABSPII SP951 hybrid (Legacy Potato) to deregulation, dissemination, and commercialization

Activities on this objective have been completed and are no longer reported. The project expects two publications:

The first, “Molecular Characterization for Risk Assessment of a GM Late Blight Resistant Potato: An Unusual Case,” has been submitted to Transgenic Research and is pending approval.

The second publication titled “Experience in Developing Genetically Engineered Potato Resistant to Late Blight Disease” will appear as a book chapter in Genetically Modified Crops in Asia-Pacific from Research to Commercialization to be published by CSIRO.

Objective 3 - In conjunction with the J.R. Simplot Company, develop, test, and deregulate a 3R-gene LBR potato in the Granola and Diamant varieties

Description: BPP with Simplot Plant Sciences, develops, evaluates and selects best multi-gene construct with three different LBR genes in Diamant and Granola varieties that will provide for superior and durable resistance to late blight compared to the single R-gene LBR potato. This construct will use a potato gene for herbicide tolerance as a marker, so the potato is free of antibiotic resistance genes.

Location: United States, Bangladesh, Indonesia

Collaborators: BARI, Bangladesh; ICABIOGRAD, Indonesia; Simplot Plant Sciences, U.S; University of Idaho, U.S.

Achievements: A significant accomplishment by the MSU team was the selection of two events out of the ten Diamant 3R-gene events received from Simplot. These two events were selected based on a review of field and greenhouse trial data and molecular assessment. The team examined characteristics such as plant growth, canopy growth, tuber type from trial data.

The successful receipt and planting of the selected two 3R-gene Diamant events and six 3R-gene Granola events by the Indonesian team marked another project milestone for FY2020. The trials provide the team with the first data from in-country research and will be an indication of future project success.

Another accomplishment was a late blight isolate collection trip in the main potato growing regions on the island of Sumatra in Indonesia. Understanding of the isolates present in the geographic areas is paramount. The isolates were the first to be collected by the team in this area and will provide invaluable information in the development of mitigation plans. The Bangladesh team also achieved a major milestone with a successful isolate collection trip to every major potato growing district in



*Planting the first Indonesian CFT with GM Diamant tubers.
Photo courtesy of Feed the Future Biotechnology Potato Partnership.*

the country. Approximately 260 samples were collected on FTA cards. This marks the second successful late blight isolate collection by the Bangladesh team.

Capacity Building: Please refer to section VI on Human and Institutional Capacity Development.

Lessons Learned: Accessing available, carefully tested transformation technology of the private sector is the best approach to creating transgenic events that will meet the regulatory review and commercial production requirements. However, continual field and lab research is required to ensure the materials developed will continue to perform as anticipated.

Objective 4 - In conjunction with Venganza Laboratories, test the resilience of RNAi technology in the Katahdin variety at MSU

Activities on this objective have been completed and are no longer reported.

Objective 5 – Test the resilience of RNAi technology in the Katahdin variety at MSU

Activities on this objective have been completed and are no longer reported.

Objective 6 - Build the biosafety capacity of partner institutions in Indonesia and Bangladesh

Description: BPP builds institutional regulatory and biosafety capacity in partner institutions through quality management systems, work-based training and biosafety audits. The project ensures that all biotech potato R&D is in compliance with internationally accepted practices standards and national biosafety regulations.

Location: United States, Bangladesh and Indonesia

Collaborators: BARI, Bangladesh; ICABIOGRAD, Indonesia; University of Minnesota, U.S.

Achievements: BPP continued to provide clear and effective guidance and compliance assistance to partner institutions in Indonesia and Bangladesh. In conjunction with in-country partners, the project developed the necessary SOPs for the receipt, handling, planting, harvest and post-harvest management and reporting of incidents and corrective actions of GM potatoes. Further training was given on CFT study plan development, including biosafety relevant information on the regulatory compliance plan and SOPs and records of compliance that need to be maintained by both institutions.

The Indonesian team also held a biosafety training workshop in November for all trial personnel for the planned CFTs, which is a requirement of the national regulatory authorities. The training was led and conducted entirely by the Indonesian team in accordance with the CFT SOPs.

Capacity Building: Please refer to section VI on Human and Institutional Capacity Development

Lessons Learned: BARI and ICABIOGRAD have specific institutional values, conditions, capacities and needs in terms of implementing biosafety for biotechnology products. Constant training and involvement of the local scientists themselves and their feedback to the plan and various procedures are crucial to biosafety mainstreaming into institutional development plans, and the success of building BARI and ICABIOGRAD's institutional biosafety capacity. Attention will continue to be addressed building in-house biosafety capacity for both BARI and ICABIOGRAD.

Objective 7 - Build the scientific capacity of partner institutions in Indonesia and Bangladesh

Description: BPP builds institutional scientific capacity in partner institutions in various areas including: tissues culture, pathology, and microbiology.

Location: United States, Bangladesh and Indonesia

Collaborators: BARI, Bangladesh; ICABIOGRAD, Indonesia

Achievements: Many of the expected HICD achievements during the first half of FY2020 were not met due to travel restrictions imposed due to the COVID-19. The Indonesian team did benefit from in-person trainings on pathology and regulatory compliance, but the Bangladeshi team was unable to travel to Indonesia as planned for on-the-ground CFT training which would have showcased the Indonesian Diamant trial.

It was also decided during the first half of FY2020 that a shift in project work from BARI's TCRC to the Biotechnology Division was necessary to achieve self-reliance – an important goal of USAID. Further development of the Biotechnology Division scientists will better position BARI in independent management and development of the technology. This move required an amendment to the MoU and further governmental approvals, which was received during FY2020 but was seriously delayed due to COVID-19 pandemic as offices were shut and access to key government officials became extremely limited.

Capacity Building: Please refer to section VI on Human and Institutional Capacity Development

Lessons Learned: Having a competent dedicated team assigned to the project is critical for the success of the project and for building the necessary institutional capacities. Sometimes it is necessary to take a step back and reassess the project team's abilities and capabilities along with their probability for success rather than forge ahead with repetitive training where core competencies do not exist.

Objective 8 - Improve gender balance in partner institutions

Description: BPP ensures that technological adoption and use is gender-neutral. The diverse gender roles must be identified and must be understood clearly through a participatory process.

Location: United States, Bangladesh and Indonesia

Collaborators: BARI, Bangladesh; ICABIOGRAD, Indonesia

Achievements: The project continues to ensure that activities in research, capacity building and outreach continue in a gender-responsive way. Female participation in the technical team for both in-country partners exceeded project targets against this year; two females are working in the ICABIOGRAD team and one in the BARI team. The project also ensured that there is equal participation of women and men in short-term trainings, workshop and other events sponsored by the project. Equal participation of men and women will also be promoted when the 3R-gene LBR potato is ready for deployment in both countries.

Capacity Building: Please refer to section VI on Human and Institutional Capacity Development

Lessons Learned: While the project team strives to achieve gender balance in most activities, some socio-cultural and institutional factors tend to skew equal engagement by men and women in project activities.

Objective 9 - Demonstrate the socio-economic benefits of 3R-gene LBR potatoes

Description: The project focuses on socio-economic impacts of modern biotechnology in relation to technology acceptance, affordability, adoptability, gender equity, appropriateness, and economic and communal implications as well as socio-economic considerations in biosafety decision-making.

Location: United States, Bangladesh and Indonesia

Collaborators: BARI, Bangladesh; ICABIOGRAD, Indonesia; IVEGRI, Indonesia

Achievements: There is no progress to report on this objective.

During FY2019 the project submitted to USAID, “*Evaluating Potential Socioeconomic Impacts of Late Blight Resistant Potato in Bangladesh and Indonesia: Rationale, Research Protocol and Work Plan*” which included three *ex-ante* studies: 1. Deriving financial costs and returns, 2. Measuring technical efficiency at farm-level, and 3. Modeling cost-benefit analysis. After review, USAID did not support the completion of the work plan in either Indonesia or Bangladesh. The project was asked instead to conduct a product market demand analysis in Bangladesh only. The project did solicit a proposal to have this study conducted during FY 2020 but due to budget constraints it was eliminated. The project has requested that this objective be removed or revised to reflect the new directive. To date, this has not occurred.

Capacity Building: Please refer to section VI on Human and Institutional Capacity Development

Lessons Learned: Changes to project objectives must be clearly defined and timely communicated.

Objective 10 - Advance the knowledge of the scientific community regarding GM late blight resistant potatoes

Description: BPP produces scholarly publications and presentations related to the use, dissemination and deployment of modern biotechnology.

Location: United States, Bangladesh and Indonesia

Collaborators: BARI, Bangladesh; Farming Future Bangladesh, Bangladesh; Bangladesh; ICABIOGRAD, Indonesia; IndoBic, Indonesia; Simplot Plant Sciences, United States; Alliance for Science, United States

Achievements: Efforts continue to increase the biotech potato project’s visibility and impact, and make results of project’s activities more accessible to the global scientific community. A total of six presentations were made during FY2020. Audiences included international agricultural researchers, undergrad and graduate agricultural students, and potato industry leaders. In addition, three peer reviewed publications were completed during the fiscal year. One has been published (<https://doi.org/10.1111/ppa.13269>) and the other two are pending journal publication.

Also, important to note, several workshops, conferences and events were cancelled due to COVID-19. This impacted the project’s ability to participate in such events.

Capacity Building: Please refer to section VI on Human and Institutional Capacity Development

Lessons Learned: Relevant communication and right visibility strategies are critical for the project to share its objectives, progress, results, impact, challenges and successes with various stakeholders.

Presentations and Publications:

Dangi, S., Wharton, P., Ambarwati, A., Santoso, T., Kusmana, Sulastrini, I., Medendorp, J., Hokanson, K. and Douches, D. (2020) [Genotypic and phenotypic characterization of *Phytophthora infestans* populations on Java, Indonesia](https://doi.org/10.1111/ppa.13269), *Plant Pathology* <https://doi.org/10.1111/ppa.13269>

Zarka, K.; Hokanson, K.; Douches, D., “Molecular Characterization for Risk Assessment of a GM Late Blight Resistant Potato: An Unusual Case,” submitted to *Transgenic Research*

Medendorp, J.; Payumo, J.; Weebaddee, C.; Zarka, K.; Hokanson, K.; Wharton, P.; Douches, D., A Roadmap for Developing Capacity in Plant Biotechnology Field Research: Lessons Learned, submitted to *The Journal of Agricultural Education and Extension*

Douches, D., (December, 2019). USAID Feed the Future Biotechnology Potato Partnership Project Update. Chicago, IL: NCCC215 Potato Breeding and Genetics Technical Meeting Committee Meeting

Douches, D., (January, 2020). USAID Feed the Future Biotechnology Potato Partnership Project Update. Las Vegas, NV: Potato Expo

Douches, D., (January, 2020). USAID Feed the Future Biotechnology Potato Partnership Project Overview Webinar. Virtual: World Potato Congress Webinar Series

Wharton, P., (January, 2020). Genotypic characterization of *Phytophthora infestans* isolates from Indonesia. Idaho Potato Conference.

Douches, D., (February, 2020). USAID Feed the Future Biotechnology Potato Partnership Project Update. Washington DC: Plant Breeding Association Meeting

Douches, D., (March, 2020). USAID Feed the Future Biotechnology Potato Partnership Project Overview. East Lansing, MI: Michigan State University Horticulture/Plant and Soil Sciences Seminar Series

Fierro, J., (Oct, 2019). USAID Feed the Future Biotechnology Potato Partnership Project Communication Strategy. Ithaca, NY: Cornell Alliance for Science Global Leadership Fellows Communications Week

Objective 11 - Effectively communicate project achievements and benefits of the GM potato to project personnel, stakeholders, and the public

Description: BPP generates publications and messaging targeted to internal and external audiences. External messaging is focused on the promotion of the value and safety of modern biotechnology in agriculture. Internal communications focused on project personnel are designed to achieve knowledge sharing across area of project expertise and keep project personnel informed on day-to-day project activities, progress and challenges.

Location: United States, Bangladesh and Indonesia

Collaborators: BARI, Bangladesh; Farming Future Bangladesh, Bangladesh; ICABIOGRAD, Indonesia; IndoBic, Indonesia; USDA-FAS, Indonesia; Simplot Plant Sciences, U.S.; Alliance for Science, U.S.

Achievements: The project showed continued growth in social media with Twitter followers up 9% and Facebook followers up 10% from FY2019.

The project Indonesian team also held a Risk Communication Workshop in November 2019 in Lembang, Indonesia as required by the Minister of Environment as part of the import and research permit application process. The objectives of this workshop were to update stakeholders on the recent status of the 3R-gene potatoes, review GM crop regulations in Indonesia and provide knowledge and experience in communicating the risk of GM materials. A total of 38 participants (14 women and 24 men) attended the workshop which was conducted by collaborating partner IndoBic, a division of ISAAA.

The project also engaged with a Gates Foundation research project studying consumer perceptions of GMO's among Bangladeshi's. Based on the results of the research the project outcome will provide key messaging strategies that all biotech projects working in Bangladesh can adopt in crafting consumer messaging. Having a data-driven message strategy will help to ensure the right message is delivered to the right audience.

The project also initiated a consumer perception study to better understand stakeholder opinions of genetically engineered biotechnology in Indonesia. The results will provide a benchmark to drive communication strategy review and messaging. As project funds are tight, BPP sought the collaboration of key strategic partners within and outside MSU for cost sharing and expertise in implementing the study. The study conducted by IndoBic and Centre for Dispute Resolutions, Regulation & Policy Analysis and Community Empowerment at Bogor Agricultural University (CARE IPB) in the third and fourth quarters of FY 2020 was led by USDA-FAS in Indonesia with CropLife Indonesia and ISAAA assisting in the funding of the study. COVID-19 has impacted some activities of the study and required that others be redesigned or postponed. Full results are expected by late 2020.

Capacity Building: Please refer to section VI on Human and Institutional Capacity Development

Lessons Learned: Biotechnology messages must resonate with the target audience. Generic messages will not be adequate in conveying messages that have the potential to change attitudes and opinions.



Smallholder farmers in Bangladesh face high input costs to combat late blight disease which can quickly destroy an entire crop if they do not spray chemical fungicides often. A late blight resistant potato is estimated to reduce fungicide costs by up to 90% in Bangladesh. Photo courtesy of the Biotechnology Potato Partnership.

VI. HUMAN AND INSTITUTIONAL CAPACITY DEVELOPMENT

The first half of 2020 involved significant refresher training on SOP's developed during FY2019 for technical and regulatory activities with in-country researchers. The project continues to implement a 'train the trainer' methodology. The success of this approach was evident during an SOP training workshop led by the project's principal investigator in Indonesia. Previously trained by the U.S. technical and regulatory teams, the PI led the training of seven research scientists, technicians and field managers on using SOP's and study plans to conduct compliant CFT's.

Another achievement was the continued improvement of pathology outputs from Bangladesh partner, BARI. After much in-person and virtual training on how to isolate the LB pathogen, the pathology scientist at BARI conducted a comprehensive tour of the major potato growing regions of Bangladesh and collected over 200 samples for further research. This could not have been achieved without extensive training from the U.S. project team in this area.

The project was unable to carry out planned HICD activities for the Bangladesh technical team due to travel restrictions as a result of the coronavirus pandemic. The Bangladesh team was to travel to Indonesia to experience the 3R-gene Diamant trial first hand. The Bangladeshi's would have worked side-by-side to their Indonesian counterparts gaining insight and knowledge on critical data collection procedures and activities required of GM CFT's. The project team will need to develop alternative virtual trainings to substitute for these missed activities.

VII. ENVIRONMENTAL MANAGEMENT AND MITIGATION PLAN (EMMP)

The project's EMMP was revised and approved on July 30, 2018. The plan, which is now integrated in the project's Monitoring and Evaluation (M&E) plan consisted of Initial Environmental Examination (IEE) conditions that will have to be met, mitigation and monitoring procedures and timing, and responsible parties. The EMMP covers five main activities and that include: 1) research with regulated GM potato in contained use conditions (laboratory or screenhouse/greenhouse research) in partner countries; 2) import of regulated GM potato into partner countries; 3) research with regulated GM potato in CFTs in partner countries; 4) use of pesticides in research trials under four (4) hectares in partner countries; and 5) commercial release of GM potato. Monitoring will include audit of laboratory and greenhouse activities, record of all training, record of material movement, audit of import activities, CFT, and pesticide use.

Trainings were held in BARI and ICABIOGRAD by the project Regulatory and Pathology Leads on SOPs for CFT and the Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP). Guidance on the safe application of chemicals during CFTs included use of appropriate personal protection equipment (PPE) was also included in the trainings. Project funding was provided for PPE, if/where needed, but in all cases, it was ascertained that all necessary PPE was already available in both in-country partners. Project personnel will address any issues with revisions to the SOPs as necessary to ensure EMMP monitoring and compliance with future project activities. The project has also submitted and received amendments to the IEE specifically for CFTs in Indonesia. An amendment to the IEE for project activities in Bangladesh is under development and will be submitted prior to in country CFT activity.

VIII. OPEN DATA MANAGEMENT PLAN

The project's data management plan, also now integrated in the project's M&E plan, was revised and approved July 31, 2018. All data, analytical methods, and findings generated by the project are being packaged and shared freely available to the wider scientific community and have no restrictions. Preliminary project results are publicly shared through the biotech potato project's website, workshops and conference presentations and soon in peer-reviewed journal publications.

The project started sharing annual report to USAID's Development Experience Clearinghouse: <https://dec.usaid.gov/dec/home/Default.aspx> as required by the USAID's new open data policy. The project will also share data to the USAID's Development Data Library (DDL) <https://www.usaid.gov/data>. When appropriate, data generated by the program will also be deposited in an open source research data repository (preferably Dataverse dataverse.org , or Mendeley: <https://www.mendeley.com/>) or other discipline-based repositories, if available, to help increase the project's research outputs' visibility and linked from the DDL. All these initiatives will make the biotech potato program's outputs more discoverable by the scientific and research community but also encourage credit, attribution, and increased citation.

IX. PROJECT MANAGEMENT ACTIVITY

The first half of FY2020 was devoted to addressing staffing changes in the project management position as the project manager left the project at the end of October. Project management duties were delegated to a Project Management Committee consisting of MSU based Project Director, Technical Project Lead, and Communications Lead. The project's Regulatory Lead assumed management of in-country activities and reporting. Activity was focused on receiving approval of a raised ceiling budget request from USAID. This request had been in process since 2016. The project received approval of the raised ceiling from USAID DC in the first quarter of FY2020. Based on this raised ceiling the Bangladesh mission released \$500,000 in funds critical to the continued operation of the project. However, a request for additional funds from USAID DC was ultimately rejected. This resulted in a restructuring/reduction of personnel and revised work plan activities to provide for a balanced budget for year five.

Among the changes made to project personnel and workplan were:

- Elimination of Bangladesh tissue culture lab staff, project office and office staff and reduction in country coordinator's level of effort percentage
- Elimination of Project Manager, Socio-Economic Lead, HICD Lead, IP Lead positions among the U.S. management team
- Reduction in level of effort percentages for Project Director and Communications Lead among the U.S. management team
- Elimination of Indonesian In-Country Communications Coordinator and reduction of Indonesian country coordinator level of effort percentage
- Elimination of seed sector study planned for Bangladesh
- Reduction of travel activity
- Reduction of the level of support for Indonesian Consumer Perception Study

The need for a raised ceiling and additional funding for the project was first brought to the attention of USAID Washington in the fourth month of the project (January 2016), and the first raised ceiling request was submitted on February 22, 2016. A lack of resolution of this pressing matter has led to the financial crisis in the last year of the project, something that Project Management had sought to avoid by submitting the raised ceiling request early in the project cycle. The additional funding was required due to additional project activity mandates from USAID that were outside the initial project scope and scale. The project completed these

requested additional activities in years one through four however the lack of funding for them has impacted the current status of the project and slowed activity.

During the second half of FY2020, project management's main focus was how to safely and effectively continue research activity during a global pandemic with the onset of COVID-19. U.S. project members shifted from office/lab duties to restricted at-home work and international partners followed the directive of their respective governments to ensure a "safety first" edict. All travel (domestic and international) was cancelled indefinitely.

The management team took care to follow USAID COVID-19 directives and guidelines and adjusted workplan activities based on these directives. The project continued to support all project personnel and provide necessary leadership and guidance.

The project continues to execute an active adaptive management approach to operations on a day to day basis providing alternatives to issues as they arise. This approach along with consistent communication with project leads, advisors and USAID ensure all project personnel are updated on achievements and challenges.

The project continued towards reaching critical milestones during FY2020 as detailed in the above achievements. BPP management and the Project Team will continue to look for ways to improve project operations and management while maintaining a high standard of research excellence and accountability.

The M&E lead continued to provide additional support to integrate monitoring and reporting of progress to project management. Efforts focused on an HICD manuscript showcasing a study on BPP's unique approach on capacity building for biotech and biosafety-related projects funded by the U.S. government.

Regular updating of the project management dashboard which contains important information about the project including project metrics, yearly tasks and budget is a regular function of the M&E lead, as well as, managing FTFMS project indicators and contributing indicators such as publications, presentations, global partners, stakeholders reached and training. These efforts are focused on designing tools and solutions that support M&E activities that can guide future intervention if necessary.



Field workers at the 3R-gene Granola CFT in Indonesia stay safe by following COVID-19 protocols with protective equipment and safe distancing. Photo courtesy of the Biotechnology Potato Partnership.

X. ISSUES

- The coronavirus pandemic became a significant concern near the end of the second quarter. It has already impacted travel and government offices in Bangladesh have been shut and the rest of the project team, including our Indonesian team is adjusting to working from home with only essential research being conducted. The full extent of the impact of the pandemic is still to be realized.
- HICD efforts to bring the Bangladesh core technical team to Indonesia for training on GM CFT's was canceled due to COVID-19.
- Leadership at the division level at BARI is not adequate to effectively manage the project through the regulatory and commercialization stages within the Bangladesh framework. BPP management has requested that project management moves from TCRC to the Biotechnology Division at BARI. This change requires an amendment to the MoU which can be time restrictive to workplan activity. However, the team believes this change is required for project success. In addition to the time delay, BPP will need to manage internal political and cultural nuances that may arise within BARI from this reassignment. BPP will need to be sensitive to the culture and work within the framework.
- Project management faced many budget issues at the beginning of FY2020. Although a raised ceiling was ultimately approved by USAID and the Bangladesh Mission committed critical funding, USAID DC declined to provide the project with additional funds to complete all scheduled project activities. The shortage of funds resulted in many project position cuts and level of effort reductions. This created voids in service areas and required existing personnel to shift focus and efforts.
- Lack of direction by USAID on Socio-economic objective continues to stall efforts in this area.
- Working with the regulatory committees in Bangladesh continues to be complicated. Although the committees (the Institutional Biosafety Committee (IBC) and the National Committee on Biosafety (NCB)) were both receptive to the idea of allowing for simultaneous greenhouse and field trials, in the end the NCB only approved the greenhouse (contained) trial.
- The current project end date is September 30, 2020. Although, BPP has submitted a concept note during USAID's APS biotechnology open call in November 2019 and the project has received an invitation to continue to the co-creation proposal phase, the project is concerned that there may be a gap in activity if funding for phase 2 is not received by June 2021. A pause in activity would be a detrimental blow causing uncertainty of personnel and project success.

XI. FUTURE ACTIVITIES – NO COST EXTENSION PERIOD

Project Management – Focus efforts on building the relationship with the BARI Biotechnology Division, new project PI and technical team members. Work with USAID on the co-creation proposal development phase for the continuation of the project through new funding and planning for an expected phase two to commence as soon as possible or by June 1, 2021 at latest will be a major focus. Should USAID inform BPP that funding will not continue project management will need to shift focus on program closeout activities and final reporting. Project management will also continue to pursue alternative funding sources to fund activities such as seed sector studies, consumer perception studies, market and socio-economic studies and activities outside the scope of the USAID project.

Technical Activities - Continue molecular analysis on Granola events for selection of final two events for further research and commercialization.

Pathology – Complete analysis and publish the data from the Diamant 3R-gene CFT in Indonesia. Analyze data from Granola 3R-gene CFT in Indonesia. In conjunction with ICABIOGRAD complete the experimental design for the second Granola 3R-gene CFT. Genotyping of late blight isolates from in Indonesia and Bangladesh collected during FY2020. Complete the experimental design and provide oversight

for the greenhouse trial of 3R-gene Diamant lines at BARI in Bangladesh. Analyze data from Bangladesh greenhouse trial.

ICABIOGRAD – Harvest and report data on Granola 3R-gene CFT. Plan for second Granola 3R-gene CFT in spring of 2021.

BARI – Prepare for receipt of Diamant 3R-gene events, conduct greenhouse trial, and submit application for CFT to regulatory authorities.

HICD – Continue to build the capacity of partner institution researchers through online training and mentoring sessions.

Regulatory – Support the conduct of the contained trial and the application for a CFT permit of the 3R-gene Diamant events in Bangladesh. Submit IEE revision requests with USAID for Bangladesh activity. Provide support to current and future Granola 3R-gene CFTs in Indonesia and greenhouse trial in Bangladesh. Planning for phase two activities.

Socio-Economic – At this time, no socio-economic activity is planned for the no cost extension project period.

M&E – Translate the no cost extension workplan into project metrics and indicators to project dashboard. Help synthesize progress reports for the project to prepare for annual FTFMS reporting using USAID’s new digital information system.

Communications – Continue to grow social media following and activity. Focus on growing quarterly report subscriptions. Continue to manage internal project communications. Continue to grow advocacy and outreach networks. Promote project publications for greater exposure. Explore effective and creative ways to maintain engagement during the coronavirus pandemic and the restrictions it presents.

**For More Information on the Feed the Future Biotechnology Potato Partnership
visit www.canr.msu.edu/biotechpp/ and follow us on**





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