



# FEED THE FUTURE

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



## BIOTECHNOLOGY POTATO PARTNERSHIP ANNUAL REPORT 2018



# GLOBAL ACUTE FOOD INSECURITY INCREASED FROM 108 MILLION TO AROUND 124 MILLION PEOPLE IN A ONE-YEAR PERIOD\*

## ONE OUT OF EVERY NINE PEOPLE IN THE WORLD IS UNDERNOURISHED\*\*

“We will be guided by the science-based information, not by the nonscientific whispering of a section of people. As human beings, it is our moral obligation that all people in our country should get food and not go to bed on an empty stomach. Biotechnology can play an important role in this effect.”

- *Matia Chowdhury*  
*Minister of Agriculture*  
*Bangladesh*



*Minister Chowdhury addresses  
the audience at the Project's  
Launching Ceremony in Dhaka,  
Bangladesh December 2017.*

\*Global Report of Food Crises 2018, Food Security Information Network

\*\* The State of Food Security and Nutrition in the World, Food and Agriculture Organization of the United Nations. 2018

## A Letter from the Project Director



### Biotechnology Potato Partnership

The Feed the Future Biotechnology Potato Partnership is a five-year, \$5.9 million multi-institution cooperative agreement between MSU, USAID, Simplot Plant Sciences and other global institutions to develop and bring to market improved potato products in farmer- and consumer-preferred varieties in Bangladesh and Indonesia. The Partnership 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 our focus countries.

Specifically, our project builds strategic human and institutional capacity of our in-country partners 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. Together with our partner institutions, we 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, 2017 to September 30, 2018), which represents year three of the project, BPP continued to make good progress towards its goals and objectives. Our project successfully implemented activities of the grant focused on the following:

- Expanding our global partnership network in modern biotechnology R&D, technology transfer and commercialization
- Implementing technical activities focused on research, testing, and deregulation of late blight resistant (LBR) potatoes
- Building human and institutional capacity and capabilities of scientists and researchers of BARI and ICABIOGRAD on crop biotechnology, biosafety and regulatory compliance
- Modern biotechnology education, communication, and outreach to inform the public and stakeholders on the benefits of LBR potatoes
- Implementing cross-cutting areas with 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 the Biotechnology Potato Partnership for year three and provides evidence of the project's performance and contributions to providing science-based answers and solutions to achieving global food security, agricultural development, equality and sustainability.

Regards,

A handwritten signature in blue ink, appearing to read "D. Douches".

Dr. David Douches  
Project Director  
Feed the Future Biotechnology Potato Partnership  
Michigan State University



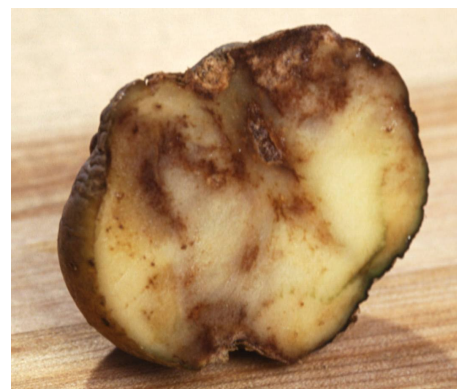
## TECHNICAL

### OVERVIEW

Late Blight (LB) disease, caused by a water mold, is the most devastating global threat to potato and tomato crops with yield losses and cost of control measures estimated at over 6.7 billion dollars annually (<https://usablight.org/>). Late Blight can cause total crop devastation which threatens global food security and farmer livelihoods. These impacts are especially hard hitting in the project's partner countries of Bangladesh and Indonesia where weather conditions create the perfect environment for the disease to flourish. The project utilizes genetic modification (GM) to develop potato varieties that are inherently resistant to LB.

The Cambridge Dictionary defines GM as *the process of changing the structure of the genes of a living thing in order to make it healthier, stronger or more useful to humans*. The Feed the Future Biotechnology Potato Partnership works with research partners to identify and develop potato varieties through genetic modification that exhibit high levels of plant resistance to late blight disease.

Genetic improvement has always been central to improved agricultural productivity. Dating back thousands of years, the most common form of genetic improvement is conventional plant breeding. Conventional plant breeding crosses together plants with desired traits and selects offspring with the newly combined characteristics. It may take many years of conventional breeding to achieve the desired results, if it happens at all. GM takes the desired traits and inserts them directly into the plant, thus simplifying the process. GM is a much more precise way to introduce new genes into a species. The Feed the Future Biotechnology Potato Partnership (Project) is working to insert three late blight resistant (LBR) genes from wild potato varieties into farmer and consumer preferred varieties for distribution to smallholder farmers in Bangladesh and Indonesia.



*Potato infected with Late Blight*

### ACTIVITIES AND HIGHLIGHTS

Activities of the technical team focused on improving potato varieties susceptibility to late blight with single or multiple LBR resistant (R) genes. During this fiscal year, the technical team focused on three potato technologies:

#### I. SIMPLOT 3 R-GENE LBR POTATO

The focus with private sector partner, Simplot Plant Sciences (Simplot) was the continued development of the GM LBR potato with three resistance genes. These three genes, from wild potato varieties, have demonstrated good resistance to LB. Simplot activities included the successful genetic transformation of the Granola potato variety (preferred in Indonesia) and the Diamant potato variety (preferred in Bangladesh) with these three resistance genes. The highest performing events from these transformations are expected to be transferred to Michigan State University (MSU) next year for field testing.

## 2. CIP'S 3 R-GENE LBR POTATO

The project also conducted testing of a 3 R-Gene GM potato developed by the International Potato Center (CIP). This potato uses a different combination of 3 R genes than the Simplot LBR potato. Field experiments, including detached leaf bioassays (DLB), were done on this potato. DLB involve taking leaves from a plant and exposing them to a disease or insect, in our case, LB. The exposed leaves are monitored for a period of time and analyzed to determine if the plant is susceptible or resistant to what it has been exposed to. The results of these tests have determined that a 3 R-gene combination is extremely effective against LB.

## 3. LEGACY POTATO

At the request of USAID, the Project continued work on the Legacy potato, a single R-gene LBR potato developed under a previous USAID project for Bangladesh and Indonesia. The Project monitored seed production activity within the Bangladesh Agricultural Research Institute (BARI) and Indonesian Center for Agricultural Biotechnology Genetic Resources and Development (ICABIOGRAD). Field testing determined that the combination of three R-genes is highly more effective than a potato with only a single R-gene. Fiscal year three marks the end of the Project's commitment to this potato.

Another major accomplishment of the technical team was the identification of LB strains in Bangladesh and Indonesia. Understanding which strains of LB are prevalent in partner countries will help the Project design integrated pest management strategies for long term success of the project.

# REGULATORY

## OVERVIEW

The Project's Regulatory team ensures that all project activities comply with internationally accepted practices, standards and national biosafety regulations. Standard Operating Procedures (SOPs) which detail step-by-step instructions on how to carry out complex, but often routine operations can be critical in ensuring compliance with GM regulations.

## ACTIVITIES AND HIGHLIGHTS

This year, the regulatory team focused on the design, development and training of SOPs for critical processes and procedures involved in the Project for partner organizations BARI and ICABIOGRAD's implementation. By using non-biotech potato materials along with simulating field conditions to conduct 'mock field trials', the project can test the efficiency of biosafety procedures, regulatory compliance and oversight.

Implementation of carefully designed SOP's will ensure compliance with international biosafety standards regarding GM field trial site design, data collection, planting, harvesting and post-harvest management of field trial sites. The development of these tools, checklists and training exercises will prepare BARI and ICABIOGRAD for the upcoming confined field testing of the LBR potato.



## HUMAN AND INSTITUTIONAL CAPACITY DEVELOPMENT

### OVERVIEW

To create sustainable growth and success with the Project's in-country partners, Human and Institutional Capacity Development (HICD) was a major focus during this program year. The Project executed strategic HICD building and support activities to enhance BARI and ICABIOGRAD's scientific research ability and capacity to efficiently and effectively access, sustainably use, and deploy biotech potato products. Institutional regulatory and biosafety capacity was built in partner institutions through quality management systems, work-based training and biosafety audits. Institutional capacities and competencies of in-country partners and scientists are regularly monitored and evaluated.

### ACTIVITIES AND HIGHLIGHTS

After intensive training of core scientists from both institutions at MSU efforts this year focused on training follow-up in two main areas. First, the design of additional tools to ensure that the learning will have a lasting impact, and second, that the in-country partners are prepared when the LBR potato arrives in their institutions.

This year, the Project worked with partner BARI to renovate their tissue culture lab to meet certification by the Bangladesh National Technical Committee of Crop Biotechnology. This state-of-the-art facility will house the majority of the research activities in country for the project.

Design, development and implementation of a 'test run' manual was executed this year. This manual and exercises serve as a follow up and supplemental reference to the in-country scientists' training at MSU on molecular, tissue culture, and pathology activities. The exercises provide practice of essential skills needed to successfully move forward the project and will ensure competencies prior to the potato's arrival in country.



*Building Institutional Capacity is a goal of the Feed the Future Biotechnology Potato Partnership. The project supported facilities upgrade and training at the Bangladesh Agricultural Research Institute.*

*Harvest time in Rangpur, Bangladesh.*

*A local woman uses hand tools to dig potatoes.*

*Women are an important component of building resiliency and sustainability.*



## SOCIO-ECONOMIC DIMENSION

### OVERVIEW

The Project places great importance on gender equality goals and improving the social and economic standing of women. Gender balance contribution and socio-economic impact of biotech potato products will be monitored and assessed regularly. The Biotechnology Potato Partnership strives for equal participation of women and men in short-term trainings, workshops and other events sponsored by the project and ensures that technological adoption and use is gender-neutral.

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

### ACTIVITIES AND HIGHLIGHTS

This year the project exceeded two gender-based targets this year. First an increase in the participation of women in sponsored events saw a 50-50 women: men ratio and second, female participation in both in-country partners technical teams surpassed targets.

Evaluation methodologies and tools, and in-country collaborators who will help assess the socio-economic impacts of biotech potato in Bangladesh and Indonesia were identified this year. The project will work with these in-country collaborators to execute a socio-economic survey on potato production in Bangladesh and Indonesia. Completion and testing of the survey questionnaire were also achieved during this year.

## COMMUNICATIONS

### OVERVIEW

The Biotechnology Potato Partnership actively contributes to expanding knowledge and information on the benefits of modern biotechnology and LBR potato. Sharing objectives, progress, results, impact, challenges and successes with various stakeholders is critical for project success. The project focuses on internal and external communications activities with similar messages synergizing stakeholders.

### ACTIVITIES AND HIGHLIGHTS

This year increased visibility and outreach were the focus of communications. This was accomplished through networking partnerships, conferences, workshops, academic journals, popular press, e-publications, web <http://www.canr.msu.edu/biotechpp/> and social media. Publications and presentations generated from the project increased over 80% this year.

The project's social media following in [Twitter](#) continues to increase as the project receives more visibility and increased presence on the site. Tweets are focused on information regarding the project's activities as well as other important developments in modern biotechnology. The project will continue to focus on social media activities.

A formal partnership was established with Indonesian Biotechnology Information Center (IndoBic) to manage communications efforts in Indonesia. This addition to the communications team complements the existing staff in Bangladesh and provides the project with on the ground support in both partner countries. New partnerships with global biotech communications groups continue to be a priority for the project and this year we began discussions with the International Service for the Acquisition of Agri-Biotech Applications (ISAAA) and CropLife.



*Project Director Dave Douches and Bangladesh delegates, including Minister of Agriculture Matia Chowdhury, speak during the official launch of the project in Dhaka, Bangladesh.*

## Official Project Launch in Partner Countries

In December 2017 and January 2018, the project was officially launched in Bangladesh and Indonesia. More than 400 participants, including project personnel from the U.S., academic and R&D institutions, private sector groups and farmers associations in Bangladesh and Indonesia, attended these events.

The launching ceremony in Bangladesh included a community outreach program that detailed the benefits and cost-saving potential of the 3 R-gene LBR potato. The launch in Indonesia was followed by a Technical Advisory Board (TAB) meeting, which facilitated face-to-face discussions on strategy with global project advisors.



*Project personnel and stakeholders gather for the official project launch in Bogor, Indonesia*



## INTELLECTUAL PROPERTY

### OVERVIEW

Management of Intellectual Property is necessary to protect the research and development of cutting edge technologies and innovations. The Biotechnology Potato Partnership, through MSU, ensures that new product developments are properly licensed and managed at all stages of the program.

### ACTIVITIES AND HIGHLIGHTS

The formal agreement between MSU and J. R. Simplot Company for the transfer of LBR potato in farmer and consumer preferred varieties for commercialization in Bangladesh and Indonesia was signed this year. Embedded in this agreement is the freedom-to-operate and permission to use Simplot licensed genes for further genetic transformation at MSU.

Similarly, the agreement of cooperation between the CIP and MSU was formalized this year. The agreement involves technical and scientific cooperation for LBR transgenic potato germplasm for testing. Both agreements will further the research and development of LBR potato.

## NETWORK & PARTNERSHIPS

The Project's network and partnerships include strong relationships with leading and innovative global institutions in research, development and outreach. This year, the Biotechnology Potato Partnership expanded relationships with global partners specializing in biotech communications and biotech potato research. This has allowed for mutual access of technology and exchange of information and resources. The project's global partners represent public, private and non-government organizations from five (5) countries.

New partnership opportunities and engagement with other global biotech communications groups continue to grow. Meanwhile, talks with local foundations and private sector companies in Bangladesh are ongoing to initiate a national dialogue on seed system development and how public and private sectors can work together for potato seed production in Bangladesh.

**FEED THE FUTURE  
BIOTECHNOLOGY  
POTATO PARTNERSHIP  
COLLABORATIVE  
NETWORK**



**IndoBiC**

Venganza



Cornell University



## SUMMARY

Potatoes are a main food source for people worldwide. They are low in calories and high in vitamins C and B6. There is more potassium in a potato than a banana. Improvements in potato growing systems can have a major impact on developing countries facing exploding populations. According to the latest UN World Population Prospects report, 8.5 billion people will inhabit the world by 2030 and 9.7 billion by 2050. Half of this population increase is expected to be concentrated in nine countries, many of which are in South East Asia.

The successful development, deregulation and commercialization of a Late Blight Resistant potato for use by smallholder farmers in Bangladesh and Indonesia continues to drive the Project to create collaborative networks and innovative ways to build lasting human and institutional capacity.

This achievement will contribute to reduced malnutrition and improved health, reduced use of harmful pesticides, reduced pre- and post-harvest losses, the improved social and economic standing of women and catalyzed economic growth. The Feed the Future Biotechnology Potato Partnership will continue to work to provide science-based answers to sustain farmers and solving hunger to secure our planet and our future.

**For More Information on the Feed the Future Biotechnology Potato Partnership**  
visit [www.canr.msu.edu/biotechpp/](http://www.canr.msu.edu/biotechpp/) and follow us on 



TAKING A BREAK FROM THE POTATO HARVEST  
TO ENJOY A HEALTHY POTATO SNACK.

RANGPUR, BANGLADESH



# FEED THE FUTURE

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

[www.feedthefuture.gov](http://www.feedthefuture.gov)