CGIAR Annual Report

2018

Excellence in Breeding

PLATFORM

Tools and services that create synergies and accelerate genetic gains of breeding programs targeting the developing world.

CGIAR

Excellence in
Breeding
Platform

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CGIAR Excellence in Breeding Platform (EiB)

Led by the International Maize and Wheat Improvement Center (CIMMYT)

Modules:

- Module 1: Product design and management
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- Module 4: Phenotyping tools and services
- Module 5: Bioinformatics, biometrics and data management

List of participating Centers and other key partners:

AfricaRice

Biosciences eastern and central Africa - International Livestock Research Institute Hub

Bioversity International

International Center for Tropical Agriculture (CIAT)

CIMMYT

International Potato Center (CIP)

Cornell University

Corteva Agriscience

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Diversity Arrays Technology (DArT)

The Crop Trust

Food and Agriculture Organization of the United Nations (FAO)

International Center for Agricultural Research in the Dry Areas (ICARDA)

Institut National de la Recherche Agronomique (INRA)

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

International Institute of Tropical Agriculture (IITA)

International Livestock Research Institute (ILRI)

Integrated Breeding Platform (IBP)

International Rice Research Institute (IRRI)

James Hutton Institute

John Innes Centre

Kansas State University

Nottingham University

Monsanto

Oregon State University

Queensland University

Syngenta

United States Department of Agriculture (USDA)

Wageningen University

World Agroforestry Centre (ICRAF)

WorldFish

EXECUTIVE SUMMARY

Part A: NARRATIVE SECTION

1. Key Results

1.1 Platform Achievement Highlights

A key output for EiB has been the Platform's contribution and response to the Crops to End Hunger initiative (CtEH). First, through contributions to SMO documentation to initiate CtEH and through a series of meetings including as a member of the Technical Experts Group. Second, by responding to CtEH including the development of a process for CGIAR programs to formally respond to BPAT recommendations. Central to this process are the Improvement Plans for which EiB developed a standardized template. In 2018 EiB held two very successful and large Contributor's Meetings. At the second of these, responding to CtEH as a CGIAR system was a key focus of the meeting. Working closely with GIZ, USD$7.4 M of new funding has been made available by GIZ for the CGIAR to respond to CtEH and to be disbursed by EiB.

EiB has begun to introduce continuous improvement in the area of product management, including an annual stage gate product advancement approach supported by an online product profile tool designed to focus on market knowledge for variety turnover.

Capacity development workshops to support breeding scheme optimization were held in Africa and Asia, with a breeding scheme assessment tool applied to NARO and KALRO breeding programs. Collaboration with the Roslin institute to develop a world-class breeding simulation tool is ongoing. EiB also contributed to the BMGF meeting on rapid cycle recurrent selection.

Business volume for low-density genotyping services grew from $200k in 2017 to $800k in 2018, covering 14 CGIAR mandate crops, and being applied to key traits and quality control by smaller crop breeding programs in Africa and Asia.

Operations, phenotyping and mechanization assessments were carried out in eight stations across three Centers and four countries. Templates for plot cost analysis and quality trait inventory were developed and shared. A quality analysis workshop in Hyderabad, India was well-attended by CGIAR and NARS scientists, and external partners/vendors.

For bioinformatics, biometrics and data management, significant advancements were made in system interoperability, data analytics and capacity development. An EiB Galaxy instance was launched to allow researchers to easily run state of the art analytical pipelines in a web interface. Communities of practice (CoP) were initiated and self-organized three workshops, three hackathons and seven sabbaticals.

Version 1 of the online Toolbox went live, hosting pre-selected materials of priority to breeders and supporting the activities of all Modules.

1.2 Platform Progress towards Outputs and Outcomes (spheres of control and influence)

1.2.1 Overall Platform progress

EiB has had a good year and grown its team from 3 FTE at year start to 10 FTE at year end. Changes were made to the platform steering committee (PSC) to increase CGIAR representation and two successful contributors' meetings were held, with up to 135 participants. EiB has contributed significantly to CtEH, in addition to working closely with GIZ to facilitate a transfer of $7.4M to begin funding CGIAR efforts to respond to CtEH. Despite the small size of the team throughout most of the year, there has been significant engagement with CGIAR breeding teams which has bought immense value. Significant external engagements have also been initiated which is likely to result in additional funding.

Key outputs for EiB over the past year include:

- Building the team: from 3 FTE at year start to 10 FTE at year end.
- EiB contributed significant technical input into the Funders' Crops to End Hunger Initiative (CtEH).
- EiB responded to the CtEH initiative by developing and providing a standardized template for CGIAR breeding organizations to develop and communicate an improvement plan.
- Worked closely with GIZ to facilitate transfer of $7.4 from GIZ to CGIAR for the direct purpose of responding to the CtEH initiative.
- Change to Platform Steering Committee to include a representative from each CGIAR breeding center.
- Successfully scoped phenotyping and breeding process opportunities and challenges at ICRISAT, IITA, CIP, IRRI and have started the process with CIMMYT. Together with the breeding teams at these organizations, a plan for taking next steps, seizing opportunities and overcoming challenges has been developed.
- Two Contributors meetings. The annual contributor's meeting was moved forward 4 months (which meant 2 meetings in 2018); both were a success. The November meeting attracted over 130 contributors, primarily from the CGIAR.
- The EiB "Toolbox", the online platform for sharing tools services and practical advice has gone live (http://excellenceinbreeding.org/toolbox).
- Began development of a sophisticated breeding scheme simulation and decision support tool in collaboration with Roslin Institute in the UK. It is highly likely this collaboration will lead to additional funding in the form of a $3.5 M supplementary grant over 3 years starting in 2019.
- With a contribution from IRRI, EiB has made available a breeding program costing tool to cost out all breeding program costs.
- Supported fast-tracking development of B4R and the Enterprise Breeding System (EBS).
- Appointed a consultant who has made significant progress toward scoping whole genome genotyping options for EiB to target reduced cost genotyping through aggregated demand.
- Secured a further contract with INTERTEK which includes low cost genotyping for forward marker applications for CGIAR breeding teams

1.2.2 Progress by module

Module 1. Product design and management

Module 1 is inherently linked to other Modules, in that it sets overall objectives which other Modules are engaged in delivering. This defines the approach to workshops with member institutions, which have cross-module participation in order to provide a team-oriented response.

In 2018, Module 1 developed and launched an on-line product profile tool designed to increase accountability for delivering products and supporting CGIAR and NARs variety development and turnover objectives. As part of the product design process, the product profile tool incorporates best practices such as demand-led breeding, upfront planning and cross-functional teams. Product profile workshops have been held across 6-8 centers and CRPs.

The product profile tool guides product engineering by Module 2, which will develop the appropriate breeding scheme; Module 3 aligns the appropriate markers; Module 4 recommends the appropriate phenotyping support and Module 5 makes appropriate data management and bioinformatics systems available.

Additionally, Module 1 has begun introducing a continuous improvement philosophy in the area of product management by incorporating a transparent, annual product advancement process following the stage-gate approach adapted to public sector breeding programs.

Modules 1 and 3 have begun working together to develop a common CGIAR stage-gate management system for products/germplasm and traits.

Module 2. Optimizing breeding schemes

Module 2 has been significantly impacted by the challenge of filling the position of Module 2 lead, despite using a head hunter. This has resulted in there being no staff to progress or even coordinate Module 2 activity. A Module 2 lead has now been successfully recruited and will begin in June 2019. To catch up on Module 2 objectives, a consultant has been identified and will start in April 2019. In addition, a second full time module 2 specialist with expertise in quantitative genetics, biometrics, breeding pipelines, developing simulations and simulation tool development will be recruited in 2019. To overcome the location challenges experienced with filling the Module 2 lead position, this additional position will be based in Edinburgh. This person will work closely with John Hickey's group at the Roslin Institute which is world renowned and presents an attractive proposition for professional reasons.

Despite the challenges mentioned above, significant outputs have been achieved in Module 2 including:

- Capacity development workshops were held in CGIAR centers across Africa and South Asia presenting concepts and recommendations for optimizing breeding schemes.
- A tool for capturing breeding schemes has been drafted. The purpose of this tool is for application to CGIAR and NARS breeding programs.
- Contribution to CtEH approaches.
- Contribution to the BMGF meeting on rapid cycle recurrent selection.
- Together with the NARS coordinator, EiB has captured breeding schemes from NARO and KALRO breeding programs in Uganda and Kenya respectively.
- EiB has initiated work with the Roslin Institute to further develop Roslin Institute's breeding simulation tool and also to develop simulations for the purpose of education and displaying simulated outcomes of alternative breeding schemes to CGIAR and NARS breeders.

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- Working closely with the Roslin institute, a project proposal has been developed to take the above mentioned breeding simulation tool from its current state to a world class tool with a level of sophistication and utility that will enable this tool to become key to the optimization of CGIAR and NARS breeding programs.

Module 3. Genotyping/sequencing tools and services

- Increased adoption of low density genotyping through High Throughput Genotyping Project (HTPG), with a growth in total demand from $200K in 2017 to $800K across 14 CGIAR mandate crops in 2018.
- HTPG provided access to low-cost genotyping for many smaller crop breeding programs in sub-Saharan Africa, Asia and South America, allowing them to utilize molecular tools to expedite the product development process and deliver improved seeds with better quality and tolerance to biotic and abiotic stresses. Examples include:
  - Maize: maize lethal necrosis, pro vitamin A
  - Rice: submergence tolerance, blast and bacterial leaf blight resistance
  - Cassava: mosaic virus resistance
  - Wheat: rust and physiological traits
  - Potato: late blight resistance, zinc and iron content
- Use of low density genotyping for quality control (QC) in cassava and rice by national breeding programs in Africa.
- Significant improvements have been made in sampling logistics and genotyping job submission workflow by national partners under HTPG as a result of routine hands-on training and protocols published on the EiB Toolbox.
- Contributors for marker assisted selection (MAS) and genomic selection (GS) use case documentations have been identified. The timeline for development of these use cases has been deferred to a later stage due to reprioritization on objectives related to CtEH. The same scenario applies to cost/benefit analysis on MAS and GS applications.
- Service contract renegotiation for HTPG Project has completed and low-cost genotyping will continue to be offered to all users with significant cost reduction (up to 50%) on larger numbers of marker panels.
- A "simple tracker" application to support routine HTPG job submissions and result interpretation has been developed and deployed via the EiB Galaxy instance. Further development will involve integration with module 5 Enterprise Breeding System roadmap in 2019.

Module 4: Phenotyping tools and services

Two new staff, Steven Corak and Gustavo Teixeira were added to the module 4 leadership team in 2018. Their initial focus has been to conduct "current state assessments" of CGIAR breeding trial execution/operations to support CG centers' and breeding programs' efforts to create improvement plans. Diagnostic procedures were developed, along with report-out action plan templates, while a total of 8 stations across 3 Centers in 4 countries were evaluated between August and December of 2018.

Vincent Vadez (former module lead) continued his focus on high-throughput phenotyping, quality trait initiatives, and plot cost analysis template development. A plot cost analysis template was developed, shared with contributors at the annual meetings, and uploaded distributed via the EiB Toolbox. A quality analysis workshop conducted during August 2018 in Hyderabad, India was well-

attended by CGIAR and NARS scientists, as well as external scientific partners and vendors. A quality trait inventory template was also prepared for distribution.

A survey has been drafted and will be distributed during first quarter 2019 to aggregate demand for handhelds, printers, barcode readers, and seed counters. These items were identified as priorities during the 2018 Contributors' meeting. Results will be used to negotiate pricing agreements with equipment suppliers. Additional activities in 2019 will include: quality analysis workshops in western and eastern Africa, continued support of Center improvement plan activities, implementation of a cloud-based image data processing service, and development of a proposal for creating a "global support network" to facilitate sustainable modernization.

Module 5: Bioinformatics, biometrics and data management

Module 5 made significant progress in period 1 regarding systems interoperability, data analytics and capacity development. In the area of interoperability, a common architecture was defined to align functionality and define data exchanges between various systems being developed for CGIAR breeding programs. As a funded project, BrAPI made significant advances in stabilizing the API definitions and providing validation to ensure consistent implementation and facilitate interoperability. The Enterprise Breeding System project made substantial advances such as initiating a software development project to fully integrate several key systems. The development and launch of the EiB Galaxy instance marked important progress in the area of data analytics; for the first time researchers across the CGIAR can easily access and run state of the art analytical pipelines through a web interface (http://galaxy-demo.excellenceinbreeding.org). The EiB Module 5 communities of practice (CoPs) were initiated with wide participation from across the CGIAR. Under the current structure, the CoPs are self-organizing and actively engaged in planning/participating in workshops, hackathons and sabbaticals. In 2018 the CoPs ran 3 hackathons, 3 workshops, and 7 sabbaticals. Positive feedback was received from all events, particularly for the sabbaticals which have enabled researchers to acquire new skills and establish collaborations across CGIAR centers.

Toolbox

The development and deployment of the Toolbox on the live website was a significant milestone, achieved through cross-module collaboration regarding content classification and content provision. The orientation of some toolbox-related activities has been extended considering the increasing importance and prioritization of the BPAT assessments and improvement plans for the cereal, legume and clonal crop communities.

The online content management system was pre-populated with tools identified as high value by EiB module leaders and community members, and are being used to support module training activities. The Toolbox domain includes space for new members to register themselves and provides space where in the future associated product profiles and improvement plans can be deposited and accessed across breeding teams.

1.2.3 Variance from Planned Program for this year

a) Have any promising areas of work been significantly **expanded**?

The Crops to End Hunger Initiative was only just in the planning phase at the time of setting the 2018 POWB. Contributing and responding to this initiative as it evolved was not planned but is aligned with the EiB Mission.

Module 2. Optimizing breeding schemes

During 2018, EiB became aware of the great importance of developing simulation capacity. For this reason, additional work was done in this area, both in terms of development and in terms of planning for future development.

The objectives of the BMGF workshop on rapid cycle recurrent selection overlaps significantly with the vision of Module 2 and so the opportunity was taken to contribute to this workshop despite this not being a part of the original plan.

Module 3. Genotyping/sequencing tools and services

Increased adoption of HTPG usage by small private companies and various non funder-focused public institutions took place. No resources were invested from EiB, though the addition of new users has helped build a larger business volume to maintain the existing service contract and negotiate lower pricing for the community. These new users include USDA, CSIRO, and Embrapa.

(b) Have any areas of work been dropped or significantly **cut back**?

Module 1. Product design and management

Module 1 focuses on increasing variety turnover and rather than increasing the rate of genetic gain. For this reason, EiB management has transferred all genetic gain activities to Module 2.

Module 2. Optimizing breeding schemes

There were no planned reductions in areas of work. Nevertheless, due to the lack of staff, only the highest priority areas of work were executed. These were listed above in 1.2.2.

Module 5: Bioinformatics, biometrics and data management

Progress on deliverables: 1. "Breeding use cases reprioritized based on landscape analysis: sample tracking for genotyping and field data collection apps" and 2. (i) "Core Systems are certified BrAPI v1 compliant; (ii) Workflow implemented for the case studies identified in Year 1", has been delayed to allow synchronization with the BMGF results framework.

(c) Have any Modules or specific areas of work **changed direction**?

Module 1. Product design and management

For the introduction of product profiles to be sustainable and meaningful, NARS programs need to be engaged in the development of the design of the products. In this model, the role of the CGIAR breeding programs is not to be directly involved in product development; NARS breeding programs are tasked with delivering products and are supported by the CGIAR.

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Module 2. Optimizing breeding schemes

There was a change in title for Module 2 from "Trait discovery and breeding tools and services" to "Optimizing breeding schemes." Compared with the submitted POWB for 2018, it does not appear this is associated with any change in workplan.

Module 3. Genotyping/sequencing tools and services

Development of cost/benefit analysis and use case documentations:

The new role undertaken by EiB to support centers in the development improvement plans has taken priority over the documentation of cost/benefit analyses and use cases. Another new development is the task of developing a trait stage-gate system in collaboration with various teams, linked to the module 1 product development stage gate.

Module 4: Phenotyping tools and services

The identification of gaps and best practices through on-site current status assessments is still ongoing. The identification of current laboratory use, capabilities and costs, along with needs prioritization, has taken place through the Regional Quality analysis workshop. Additional workshops will be conducted in 2019.

Communities of practice for high-throughput phenotyping and NIRS are pending the establishment of forums in the Web Portal (Toolbox team).

Module 5: Bioinformatics, biometrics and data management

Implementation of connectivity across the different tools/systems:

Integration and connectivity between tools/systems does happen as part of several projects. Module 5 focuses on integration use cases that span multiple projects and that help facilitate communication and coordination across project teams, rather than integration uses cases that are specific to a given project.

Toolbox

Within the Toolbox, some re-prioritization of activities has been conducted to enable item areas of need for BPAT and improvement plan-related implementation to be competed. The emphasized activities included the development of templates for improvement plans with the de-emphasized areas being the advancement of learning content definition within the Toolbox. No resources were re-allocated during this re-prioritization effort.

1.2.4 Altmetric and Publication highlights

N/A

1.3 Cross-cutting dimensions (at Platform level)

1.3.1 Gender

Module 1. Product design and management

- Module 1 sponsored a capacity development opportunity for a postdoc Gender researcher to attend the EiB Advisory meeting to discuss gender relevant products as part of the product profile development forum. The purpose of the development opportunity was for the postdoc to understand how breeders approach product design.
- Module 1 is also working with gender specialists as part of the cross-functional product design team. Discussions are ongoing with the Gender in Breeding Initiative to incorporate their tools into the product design process. Expectations are high at this early point in the project.

1.3.2 Youth and other aspects of Social inclusion / "Leaving No-one Behind[1]"

N/A

1.3.3 Capacity Development

Module 1. Product design and management

Module #1 approached capacity building through numerous workshops, small group meetings and individual opportunities.

Selected small group trainings of high impact include:

- Interactions with students from WACCI University, Ghana and Makerere University, Uganda with the aim to develop the next generation of plant breeders and seed scientists through a better understanding of a modern day-breeding program
- Interactions with students on integrating product design at Cornell University, US, Kasetsart University, Thailand and IRRI learning Center (Philippines)
- Integration of Gender Responsive traits or features into Plant Breeding:
  - Bela Teeken, Bela (IITA Interaction)
  - Mamta Mehar (WorldFish) – Guest participant and the EiB M1 Gender and Breeding Workshop

Module 2. Optimizing breeding schemes

Capacity development workshops on EiB collaboration were held at IITA in Ibadan (80 participants from NARS and CGIAR institutes from across Africa) and at ICRISAT in Hyderabad (50 participants from NARS and CGIAR institutes from across Africa). The workshop at IITA was a successful example

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[1] Leaving no-one behind is a key facet of the SDGs:
https://unstats.un.org/sdgs/report/2016/leaving-no-one-behind

of the contribution EiB is coordinating from the private sector as it included significant contribution from Bayer.

Module 3. Genotyping/sequencing tools and services

There were two types of workshops organized under Module 3 in partnership with HTPG project in 2018.

1. Joint workshops and project planning meeting i.e. with GOBii, Module 5, HTPG and TRB
    a. [GOBII-HTPG-EiB workhop at IRRI](#) (August, 2018) – high-level introduction to new users, primarily SE Asia NARS (around 40 participants).
    b. HTPG Annual meeting- IGSS - EiB Module 3 (80 participants, 8 CG with respective NARs in SSA)
2. Sampling logistics training (Hands-on)- mostly visits to project meetings and local stations:
    a. Uganda (NARO, CIAT)
    b. Kenya (ICRISAT, CIMMYT, KALRO)
    c. [Bangladesh (BRRI)](#)
    d. Senegal (AfricaRice)
    e. Nigeria (IITA)
    f. India (ICRISAT, NRRI, IGKV)

Module 3 has also focused activities on Research Assistants (Msc level) who work closely with principal breeders at Centers. They have been exposed to Module 1 principles and tools. Outstanding examples:

1. At Africa Rice, St. Louis Station, in Senegal – Africa Rice, Training Centre.
2. At ICRISAT Malawi Station, Groundnut breeding. (Wills Mbiriyawaka Munthali, m.wills@cgiar.org)

Module 4. Phenotyping tools and services

One workshop was completed on Quality Analysis to inventory and develop action plans to streamline the assessment of quality traits in the breeding process. Small group interactions took place toward the development of a cost template for the breeding programs.

Module 5: Bioinformatics, biometrics and data management

To date there have been 3 workshops, 3 hackathons, 7 sabbaticals, and a monthly seminar series (http://cbsugobii05.biohpc.cornell.edu:6084/pages/viewpage.action?pageId=9339229).

Additional information:

- https://btiscience.org/explore-bti/news/post/transforming-breeding-through-integrated-data-management-and-analysis/
- https://btiscience.org/explore-bti/news/post/gobii-eib-cross-project-workshop-showcases-integrated-breeding-resources-and-tools-to-african-partners/.

1.3.4 Climate Change

EiB's goal to improve breeding approaches across the CGIAR and with NARS will enhance their ability to respond to climate change.

2. Effectiveness and Efficiency

2.1 Management and governance

In 2018 there were no major changes to management, governance arrangements and practices.

2.2 Partnerships

2.2.1. Highlights of External Partnerships

Across the Platform in general EiB was able to attract significant contribution from the private sector, including for example through their active and significant contribution at both Contributor meetings held in 2018 and to the IITA workshop in Ibadan in March 2018.

Module 1. Product design and management

Module 1 co-developed a project with AbacusBio LTD on the economic assessment of traits for sub-Saharan Africa (Project title: Development Trait Prioritization as Part of a Sub-Saharan African Crop Variety Replacement Strategy). The scope of the project is to develop a trait impact assessment of two product profiles. Module 2 will then be involved in the design of an appropriate breeding scheme to develop the product in as short a time as possible.

Module 4. Phenotyping tools and services

Module 4 participated in interactions between ICRISAT and CORTEVA in India to observe state of the art breeding operations. A partnership with Hiphen has been agreed in the development of a data processing pipeline for data analysis of drone-generated remote sensing images.

Module 5: Bioinformatics, biometrics and data management

Collaborations with Cornell have developed software and tools to enable the use of genomic information to improve the efficiency of breeding programs. This includes the implementation of genomic selection in CIMMYT Maize, and deployment of a genomic information system.

2.2.2. Cross-CGIAR Partnerships

EiB works closely with all CGIAR breeding institutes and Platforms to enable breeding program improvements. This includes working closely with:

- AfricaRice
- Bioversity
- CIAT
- CIMMYT
- CIP
- ICRISAT
- ICRAF + CIFOR
- ICARDA
- IITA

- ILRI
- IRRI
- WorldFish
- Big Data Platform
- Genebanks Platform

Module 3. Genotyping/sequencing tools and services

The main focus of Module 3 is to coordinate all genotyping requirements across the system under unified platform(s) to achieve volume discounts. The effort has catalyzed a new way of collaborating across the system, especially though knowledge sharing, and also helped to improve resource use efficiency via outsourcing. However, one of the key challenges remained as many independently funded projects have dedicated genotyping resources with full autonomy to be utilize funds based on specific needed and there's a lack of incentive for some to join the shared services. This will hopefully improve as a result of the impetus provided by Funder's initiatives in the CGIAR system.

Module 4. Phenotyping tools and services

James Quilty of IRRI and Vincent Vadez of EIB collaborated to develop a cost analysis template to be distributed across all centers.

Several CGIAR centers, along with the Big Data Platform, are currently working together to benefit from a common data processing pipeline for data analysis of drone-generated remote sensing images

Module 5: Bioinformatics, biometrics and data management

Module 5 is facilitating collaboration, cross training of scientists, and sharing of software/best practices across CGIAR breeding programs.

2. 3. Intellectual Assets

(a) Have any intellectual assets been strategically managed by the Platform (together with the relevant Center) this year?

To contribute to the Intermediate Development Outcomes (IDOs) of the Agri-Food System CRPs, and thereby to the Systems Level Outcomes (SLOs) of the CGIAR, EiB has implemented the EiB Toolbox, a knowledge database that allows EiB members, contributors, and third parties, to access different types of Intellectual Assets (IA) in support of breeding activities. The Toolbox gathers IA developed by CGIAR Centers and a variety of partners; and therefore, various licensing schemes. To enhance adequate IA management the toolbox management team adopted the following measures:

- Content hosted and directly made available through the EiB toolbox are those available through standard open licenses or managed as International Public Goods and developed by the EiB Lead Center.
- For content owned by EiB Members to ensure proper attribution, access to the most updated version and the associated license, the Toolbox provides links to the repositories where the IA is made available.
- EiB relies on the distribution of good quality knowledge, know-how, information, and tools, with the least possible restrictions. Thus, EiB requires active sharing from a wide

community. To balance the need of sharing different types of IA with the stewardship associated with hosting and making IA available, controls in place include the management of the Toolbox through different level of permissions to users and members, with special emphasis on ability to share or access IA in the toolbox.

(b) **If relevant**, indicate any published patents and/or plant variety right applications (or equivalent) associated with intellectual assets developed in the Platform and filed by Centers and/or partners involved in the Platform, giving a name or number or link to identify them.

N/A

(c) List any critical issues or challenges encountered in the management of intellectual assets in the context of the work of the Platform.

In addition to those listed in the EiB proposal, a new challenge relates to the ability to stay up to date regarding stewardship associated to the online hosting and dissemination of contents/IA and the raising bar in different regions around the world.

2.4 Monitoring, Evaluation, Impact Assessment and Learning (MELIA)

- EiB was represented within the CGIAR Monitoring, Evaluation and Learning CoP again this year and was able to provide feedback on POWB and annual report templates and tools, as well as common reporting indicators and associated guidance for Phase II. The CoP also provided excellent opportunities to share best practices and learning among monitoring, evaluation and learning specialists.
- In 2018, EiB began to use MARLO to start to plan the work of its modules. This will support work planning and budgeting, monitoring research progress and reporting on Platform results in the coming years.
- No evaluations have been conducted, given that Excellence in Breeding is still in its first years of operations.

2.5 Efficiency

Module 1. Product design and management

Continued development of online public tools for product profiles and pre-breeding strategies.

Module 3. Genotyping/sequencing tools and services

Roughly 1.9 million data points generated under HTPG in 2018 ($800K USD). This would translate to a multi-fold cost saving (depending on scale of operation) for the same amount of information being generated in-house.

Module 5: Bioinformatics, biometrics and data management

The development of common architectural documents and a well-defined API will streamline development work and reduce redundancies in features developed across systems. The sharing of

analysis tools through the EiB Galaxy instance will enable all CGIAR researchers to use the most appropriate software and increase the accuracy of breeding decisions.

2.6 Management of Risks

Programmatic Risks:

Attracting the required staff to run the CGIAR EiB Platform took longer than expected, and many key positions remained open throughout the middle of 2018. Although an external headhunter was hired to assist in the recruitment of key Platform positions, the Module 2 lead position remained open all through 2018.

Contextual Risks:

In 2018 the CGIAR EiB Platform experienced no contextual risks.

Institutional Risks:

For the EiB CGIAR Platform, it is an institutional risk that breeders must be adequately funded and willing to learn, adopt and adapt documented tools. Although the Platform is not a funder, through center visits it has identified bottlenecks affecting breeding programs. In 2019, EiB will work closely with each Center to develop an improvement plan to define distinct improvement steps, detailing expected costs, timeframes, roles and responsibilities, and indicate the alignment of these suggested improvements with BPAT recommendations or other recommendations as appropriate.

2.7 Use of W1-2 Funding

W1/W2 funding was key to the realization of a successful Contributor's meeting with 120 attendees from all Centers. Furthermore, W1/W2 allowed the EiB to develop standardised tools and approaches effecting positively change throughout the system. The following tools have been developed, released, and being used extensively by Centres:

1. An online product profile tool was released with broad uptake.
2. A template for breeding program improvement plans was distributed for use by all Centers, as well as a digitization needs assessment.
3. Genotyping services support continues to expand, while EiB is developing an oversight role for software development.

3. Financial Summary

EiB's financial status and health is strong, in 2018 the Platform had a W1/W2 carry- over of USD $487,436.00 and W3/bilateral a carry-over of USD $2,081,116. (USD $162,652.00 is part of the B4R development). As part of the Crops to End Hunger Initiative (CtEH) in December 2018 EiB signed a

contract with GIZ for the period 2019-2021 at a value of US $7,940,192.00. EiB expects other funders to follow GIZ commitment to CtEH and for EiB to continue leading these efforts.

Due to an understaffed team, EiB was underspent in 2017 and the carryover of some of these funds into 2018 was critical for funding the Platforms achievements in 2018. Going forward, with close to a fully developed team, additional (and significant) expectations on EiB resulting from CtEH, and a backlog of activity to catch up on from the period when EiB was understaffed, operating on 59% of base budget (US$ 5.9 million instead of US$ 10 million as stated in the proposal as base budget) will present significant challenges to EiB.

Part B. TABLES

Table 1: Evidence on Progress towards SRF targets (Sphere of interest)

Not for Platforms.   (We have kept the tables in the template with the same numbering as CRPs, but feel free to renumber them in the Platform report, skipping unused tables.)

Table 2: Condensed list of policy contributions in this reporting year (Sphere of Influence)

Column 1	Column 2	Column 3	Column 4a	Column 4b	Column 4c	Column 4d	Column 4e
Name and description of policy, legal instrument, investment or curriculum to which CGIAR contributed (20-50 words, ideally around 30 words) Spell out acronyms in every row	Level of Maturity	Link to sub-IDOs (max. 2)	CGIAR cross-cutting marker score				Link to OICR (obligatory if Level of Maturity is 2 or 3) or link to evidence (e.g. PDF generated from MIS)
			gender	youth	capdev	Climate Change	

Table 3: List of Outcome/ Impact Case Reports from this reporting year (Sphere of Influence)

Column 1	Column 2	Column 3
Title of Outcome/ Impact Case Report (OICR) **with link** (e.g. to CLARISA dashboard, MARLO).	**Maturity level** drop down for: 1, 2, or 3	Indicate if this is: (drop down) - new outcome - updated Case- same level of maturity - updated Case- new level of maturity

Notes: Column 1: Please note that you have to use the common [CGIAR outcome/impact case report template](#), submit your outcome/ impact case in MARLO, MEL or other MIS. Column 2: The levels of maturity are described in the OICR template, with examples. Please consult planningandreporting@cgiar.org for any difficult cases.

Table 4: Condensed list of innovations by stage for this reporting year

Column 1	Column 2	Column 3	Column 4
Title of innovation with link (e.g. to CLARISA dashboard, MARLO).	Innovation Type	Stage of innovation	Geographic scope (with location)
Please see indicator guidance for details	e.g. genetic,	e.g.	e.g. global, regional- West Africa, national- Philippines

Table 5: Summary of status of Planned Outcomes and Milestones (Sphere of Influence-Control)

Please complete the table below and report the supporting evidence required through MIS – see Evidence C: Outcomes and milestones

Use outcomes from 2016 proposal (or latest version) and milestones from 2018 POWB.]

Module	Modlue outcomes 2022	Progress against outcomes	Milestone	2018 Milestone status	Evidence
Taken from proposal	Taken from POWB/ proposal	To be filled at reporting (prefilled from previous year, for updating)	Taken from POWB (to allow for changes)	To be filled at reporting (prefilled from previous year, for updating)	To be filled at reporting
1: Product design and management	Creation of clear product profiles, a stage gate process "from breeding cross-to-farm", and appropriate breeding schemes commensurate with level of investment,	Product profile creation is on track to have the complete Product Replacement Targets for the CGIAR + NARS identified by the end of the project. The Stage Gates system leading to a formalized product advancement process is also on track to monitor the progress of germplasm and traits development. Module 1 focuses on increasing variety turnover and less about	1. Members document current product profiles. 2. Members agree on standardized templates and approaches for defining and further improving product profiles. 3. Member breeding programs establish a format and process for implementing a stage gate system in	1) On-going 2) Completed 3) On-going 4) Transferred to Module #2 5) On-going 6) Completed 7) On-going 8) On-going	Product Profiles & Standardized Template progress has been demonstrated via written reports, the creation of a global map of product profiles and the extensive use of the product replacement tool on the EiB Toolbox by the submission of over 200+ product profiles. Stage Gates progress has been demonstrated by Trip Reports and submitted stage gates for review. Genetic Gain Assessment Management has agreed to move this component to Module 2. Collaboration between BPAT-EiB M1 is documented by common terminology and the use of a common product replacement strategy between the two groups. Follow-up occurs via verbal and written level between EiB M1, BPAT and the evaluated centers. According to EiB management, all centers will participate with EiB. There is a significant variation on how they are using the support.

	best practices and tools available results in accelerated breeding cycles and rates of genetic gain per unit time that are 25% greater than current approaches.	increasing the rate of genetic gain. This is why EiB management has transferred all genetic gain activities to Module 2. When centers properly design and manage products, then the rate of variety replacement will increase.	their breeding program. 4. Review of current approaches to assessing rate of genetic gains within member programs. 5. Benchmark and plan which CGIAR breeding programs have BPAT assessments completed. 6. Center leadership and participating breeding programs sign membership agreement documenting commitment to the EiB modernization process. 7. Pilot NARS identified to become EiB members. 8. NARS linkage coordinator and Product	On-going means that the tasks are progressing at an acceptable rate. However, under the philosophy of "Continuous Improvement", we will always strive for better performance.	National program participation has been very strong in Module 1 activities. EiB has trained many national programs as they have been included in the CGIAR - EiB Module 1 workshops. National programs have submitted product profiles along with CGIAR programs. The national programs look at product profiles as a way to communicate to the CGIAR centers the needs of the client.
2: Optimizing breeding schemes	Increased rates of genetic gain	2. The pipelines presented in breeding programs were discussed and broad definitions	1. Breeding program optimization specialist hired.	2. Extended	2. The delayed hiring of a Module 2 lead to spend time with breeding programs documenting their breeding pipelines has resulted in an extension of component 2.

		through use of best practices, optimization of breeding strategy and more effective use of resources (time, finances).	agreed during the EiB annual meeting in November 2018. A schema for capturing breeding schemes has been drafted. Completion of this process will follow hiring of the Module 2 leader and completion of the first round of improvement plan submissions.	2. Members begin to document trait and core breeding pipelines in Toolbox. Broad recommendations for breeders to consider when making key breeding decisions to be developed and posted to the toolbox and be presented to breeding teams & discussed during regional visits. 3. In collaboration with Modules 3 & 4, use cases of successful/failed implementation of predictive tools providing value towards breeding for product profiles documented. 4. Recommendations for strategic and structural division of resources (and activities) between pre-breeding and		

			core breeding activities will be developed. This will include a clear description of the distinction between these activities. These will be posted to the toolbox, presented to senior management during a specific meeting targeting senior management and also to breeding teams during regional visits.		
3: Genotyping/seque ncing tools and services	Efficient and effective application of genomic technology, including better targeted genotypic data in breeding supports larger, more cost-effective	Adoption of low-density genotyping platform for FB and QC is progressing well for various AFS and on track to achieve 2022 milestone. Mid density platform for GS application expected to start in 2019. Logistic support and training for various AFS teams are showing positive results but further engagement is needed to improve data quality and adoption for outsourced services.	1. Use cases and implementation guidelines for MAS, GS and QC applications in forward breeding; tissue sampling systems, and LIMS documented in the Toolbox; capacity enhancement through the development of courses and workshops.	Extended (Partially completed).	1. Use case documents extended, to be uploaded by individual contributors in 2019. Documents on sampling logistics and job submissions completed (EiB toolbox). MAS / Forward breeding introduction and training to be submitted in 2019. 2. Cost benefit analysis pending, absence of breeding optimization lead. Development of trait stage-gate as additional milestone. 3. Continued to 2019. 4. Low density genotyping contract renewed, with up to 50% cost reduction on jobs with 50+ markers. Mid density service contract pending, expected by mid-2019. 5. More than 5 (independent and joint) training workshops provides to AFS breeding teams in Asia and Africa.

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programs and is mainstreamed within AFS networks, in order to accelerate the rate of genetic gain delivered in farmers' fields.	Joint effort with Module 1 to develop trait stage gate protocols is expected to minimize deployment cost of molecular tools and strengthen collaboration in various crops.	2. For developing the optimization tools in Module 1, cost/benefit analyses of MAS and GS workflows are conducted for all EiB-supported breeding teams and documented. 3. Implementation plans developed and executed for all green-light MAS and GS applications. 4. Contracts that provide access to cost-effective genotyping/sequencing services and tissue/seed sampling systems. 5. Logistics support to effectively utilize genotyping/sequencing services provided to AFS breeding teams so they are able to avail of low cost genotyping/sequencing options.		

4: Phenotyping tools and services	Lower-cost, better targeted phenotypic data supports larger, more cost-effective programs.	Two engineer specialists were hired; Procedures to identify current status and opportunities to increase plot throughput/ reduce cost through high-throughput phenotyping, mechanization and automation were developed. Year to date 19 stations have been visited. Recommendation and best practices shared to all of them. Those should be incorporated into improvement plans. 1st Qualitative analysis workshop was conducted in one of the regions proposed. A cloud-based phenotyping platform project was initiated (scope definition) as well as the protocol for phenotypic data collection with drone.	1. Process Engineering/Automation/ Mechanization Specialist hired. 2. Identify gaps and address needs and best approaches to increase plot throughput/reduce costs through high-throughput phenotyping, mechanization, automation. 3. Identify existing best practices and equipment in use by various programs. 4. Take stock of current use of laboratories, their capabilities and costs; prioritize needs 5. Community of practice for high-throughput phenotyping and NIRS established.	1. Completed 2. Extended 3. Extended 4. Extended	1. Two engineers hired 2. Procedures defined and 19 stations have been visited. Still pending are visits to AfricaRice, ICARDA and some satellite stations. We are on track to finish by July 2019. 3. The list of best practices depends on visits. By July 2019, it would be expected to finish the current status analysis visits. After that, we will complete the list of best practices. 4. The strategy to define the list of labs by conducting regional workshops and surveying attendees. Three priorities regions have been defined: Asia, East + southern Africa, and West Africa. In 2018, we conducted the Asia workshop. In 2019, it is in the work plan to conduct the pending workshops. 5. The community of practice was dependent on the Toolbox development. It will be implemented in 2019 now that the Toolbox is available on-line.

| 5: Bioinformatics, biometrics and data management | Bioinformatics tools that support automation, data integration and decision making are fully integrated for use in AFS breeding networks. | Module 5 made significant progress in period 1 regarding interoperability of systems, data analytics and capacity development. In the area of interoperability, a common architecture was defined to align functionality and define data exchanges between various systems being developed for CGIAR breeding programs. As a funded project BrAPI made significant advances in stabilizing the API definitions and providing validation to ensure consistent implementation and facilitate development of interoperability. The Enterprise Breeding System project made substantial advancements initiating a software development project to fully integrate several key systems. Substantial progress was made in the area of data analytics with the development and launch of the EiB | 1. Breeding use cases reprioritized based on landscape analysis: sample tracking for genotyping and field data collection apps.
 2. (i) Core Systems are certified BrAPI v1 compliant; (ii) Workflow implemented for the case studies identified in Year 1; (iii) Implementation of connectivity across the different tools/systems.
 3. Exposure to and adoption of appropriate databases and software in member breeding programs.
 4. (i) Report on the current landscape of databases, bioinformatics capabilities/software, and biometric capabilities/software; (ii) Documented gap analysis for the | 1 and 2 (i)/(ii)/(iii) have been delayed. 3-7 Completed. | 1. Prioritization of Breeding Use cases remains as Sample Tracking and Field Data Collection Apps
 2. (i) BMS, B4R, Cassavabase, and GOBii all have some relevant BrAPI calls implemented, and many more implementations are available in other projects in the wider BrAPI community.
    (ii) The sample tracking use case has been mapped and included in the annual report
    (iii) Implementation has been delayed until 2019
 3. Through a variety of workshops hosted by Module 5 and projects developing systems, breeding programs are aware of the systems currently available.
 https://btiscience.org/explore-bti/news/post/transforming-breeding-through-integrated-data-management-and-analysis/
 https://btiscience.org/explore-bti/news/post/gobii-eib-cross-project-workshop-showcases-integrated-breeding-resources-and-tools-to-african-partners/

 4. (i) The report has been made available to the platform lead and will be made widely available in 2019.
 (ii) The ability to connect phenotype and genotype remains a significant challenge for CGIAR breeding programs. To address this a working group developed logic for implementation of sample tracking. A document of the sample tracking logic was distributed.
 (iii) Updates occur through Expert Advisory Group meetings, Community of Practice meetings, and the annual contributors meetings. Links to pages describing each of the primary systems has been loaded to the EiB toolbox.
 (iv) In the initial stages, module 5 is focused on deployment, adoption, and integration of existing systems that are under active development. Once core breeding functionalities are met module 5 will evaluate the need to develop/acquire new systems for lower priority functionality. |

| | | Galaxy instance. For the first time researchers across the CGIAR can easily access and run state of the art analytical pipelines through a web interface (http://galaxy-demo.excellenceinbreeding.org). The EiB Module 5 CoPs got off to start with wide participation from across the CGIAR. Under the current structure the CoPs are self-organizing and actively in engaged in planning/participating in workshops, hackathons and sabbaticals. In 2018 the CoPs ran 3 hackathons, 3 workshops, and 7 sabbaticals. Positive feedback was received from all events, particularly for the sabbaticals which have enable researchers to acquire new skills and establish collaborations across CGIAR centers. | Year 1-2 case studies; (iii) Existing databases and tools assessed and updated; (iv) Development or acquisition of new database and tools.

5. (i) Identify key analyses and data required for selection candidate advancement and parental selection; (ii) Catalogue existing analysis tools and pipelines; (iii) Initiate open-source collaboration on breeding optimization suite.

6. Strategy to manage and integrate meta-data.

7. (i) CoP for statisticians and bioinformatics leaders; (ii) Annual Bioinformatics and Biometrics "Hackathon"; (iii) Core operational | | 5. (i) Appropriate analysis techniques vary depending on experimental designs and the objectives of trials. Rather than listing specific analysis or criteria that may or may not be relevant for a specific use case, module 5 has focus on providing training through 7 sabbaticals and 3 short courses. (ii) The use of various statistical and analytical packages varies widely across the CGIAR. Some key is software and analysis pipelines are listed in the EiB toolbox with links to software descriptions and download pages.
A Galaxy Server was set up with most widely used tools: http://galaxy-demo.excellenceinbreeding.org
(iii) Module 2 is leading this.
6. Module 5 is focused on ensuring compatible data models and terminology. This is enforced the development and implementation of properly defined API Calls. This is accomplished through BrAPI which is compliant with Crop Ontology, MIAPPE, and is exploring GA4GH for genomic data.
https://app.swaggerhub.com/apis/PlantBreedingAPI/BrAPI/1.3
7. (i) The CoPs have been formed and meet regularly via web conference calls. Frequently attended conferences are also used as an opportunity for in person meetings with the last meeting occurring 1/14/19 at PAG in San Diego, CA. (ii) The first biometrics hackathon was held in February 5-8 2018 and hosted at IRRI. The hackathon produced serval tools, many of which are included the EiB Galaxy instance https://github.com/venice-juanillas/EIB-hackathon
(iii) Core operational guidelines will be addressed through the formation of working groups tasked with providing recommendations and guidelines. In 2018 working groups centered on sample tracking and UUIDs. Outputs of these working groups are included in the annual report and shared with the CoP.
(iv) Completed: https://app.swaggerhub.com/apis/PlantBreedingAPI/BrAPI/1.3 |

			guidelines for bioinformatics and biometrics defined; (iv) Common BrAPI defined; (v) Capacity development strategy for bioinformatics and software adoption developed; (vi) Support capacity building and the evaluation of new bioinformatics and biometrics tools and approaches in collaboration with distinct user groups and use cases prioritized in Modules 2-4; (vii) Execute training workshops for biometricians in CGIAR target countries to expand the number of resource persons.		(v) To build capacity Module 5 supports workshops, hackathons, sabbaticals, and an online seminar series. To date there have been 3 workshops, 3 hackathons, 7 sabbaticals (sabbatical reports can be found in appendix 5.4), and a monthly seminar series currently hosted by the GOBii project (http://cbsugobii05.biohpc.cornell.edu:6084/pages/viewpage.action?pageId=9339229) (vi) Working groups have been formed with the CoPs to address these needs. In 2018 working groups centered on sample tracking and UUIDs. In addition a galaxy platform was developed to share bioinformatics and biometrics tools. (vii) To date there have been 3 workshops, 3 hackathons, 7 sabbaticals
Toolbox	Best practice information made available to	1. An online content management site and system has been developed within the EiB portal. This "toolbox" has	1. Toolbox establishes a common infrastructure and frameworks for	1- 3,5 Complete, 4, 6 Extended.	The Toolbox can now be accessed by members via http://excellenceinbreeding.org/. Extended activities relate to more content needed for evaluation, staffing delays and the time demands from improvement plan engagement

	EiB members in V1.2 of the Toolbox and a Beta version of course building tool available for testing in V1.2 of the Toolbox.	initially been populated with a selection resources from EiB and external members. 2. A domain within the EiB portal has been developed allowing EiB members to register themselves and access EiB internal resources including a space where their product profiles, improvement plans etc. will be recorded. 3. Primary content review was conducted lead by Module leaders engaging with relevant CoPs from their subject matter areas. 4. Discussions of potential review rights, processes and procedures has been conducted. Infrastructure for reviews has not yet been implemented. We require more content in the toolbox which will be prioritized post improvement plan development. 5, Best practice knowledge has been provided by the team	documentation of best practices, tools, workflows and resources with link to user review system. 2. Restricted domain developed in the Toolbox for members documenting their breeding programs and progress. 3. Communication with CoPs from relevant modules for upload of, and feedback to content. 4. Draft review guidelines and infrastructure developed. 5. Development of best practice documentation for e-learning based on materials used at regional workshops 6. Identification of and links to relevant external e-modules and courses.		

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		working on the learning management system at CIMMYT. The digital infrastructure developed within the LMS embeds best practices and this will be used for EiB e-learning content development and implementation. 6, A list of e-learning and training resources of potential value to EiB have been identified. We will fully evaluate the content and where of high value provide links in the toolbox after alignment with prioritized capacity needs identified through program BPAT and improvement plans.			

Notes:

Column 3: Please use this text (max. 100 words) to explain how the set of milestones contribute to the outcome. Also mention any important setbacks or changes of direction. For each outcome, outline highlights of progress, setbacks and changes of direction this year, and briefly explain how the set of milestones have contributed to current progress/direction.]

Column 5: Not all milestones in the original proposals were intended to be updated yearly.   If this is the case for a particular milestone, please insert the most recent information about progress here (this will be automatically done in the Management Information Systems)

Column 6: Include links or references for supporting evidence, provision of a permanent reference or link to any relevant open accessible document.

Table 6: Numbers of peer-reviewed publications from current reporting period

N/A

Table 7: Participants in CapDev Activities

Number of trainees	Female	Male
In short-term programs facilitated by Platform	35	207
In long-term programs facilitated by CRP	N/A	N/A

Table 8: Key external partnerships

[Please list up to five important partnerships for 2018 for each module, using the following table.,. Please provide a full list of current partners as supporting evidence: see Evidence F: Full List of Current External Partners]

Lead Module	Brief description of partnership aims	List of key partners in partnership. Do not use acronyms.	Main area of partnership
Module 1	To develop an economic trait assessment of two product profiles.	CGIAR-EiB, AbacusBio, National Partners, 1000minds.	Delivery Economic Trait Assessment.
Module 3	Research.	INTERTEK.	Research.
Module 4	Provide colleagues from ICRISAT the opportunity to observe the state of the art breeding operations.	ICRISAT and CORTEVA.	Capacity Development.
Module 5	Development of analytical tools, software, and capacity development.	Cornell University.	Research/Delivery/ Capacity Development.
Module 5	Development of phenotyping software.	DArT.	Research/Delivery.

Table 9: Internal Cross-CGIAR Collaborations

[Please include collaborations with one or more CRPs or other Platforms or Centers.]

Lead Module	Brief description of the collaboration	Name(s) of collaborating Platform(s), Platform(s) or Center(s)	Optional: Value added, in a few words e.g. scientific or efficiency benefits
Module 1	Development of Gender-relevant Product Profiles.	Gender in Breeding Initiative (CIP).	Improved Product Design.
Module 1	Collaboration of Process to lead to increased variety turnover.	Demand Lead Breeding (CIAT, Syngenta Foundation, University of Queensland).	Increased Scale of EiB Module 1 impact through access to the broader NARs audience.
Module 4	Development of Cost analysis template.	IRRI	Tool to facilitate plot cost benchmarking for tracking future improvements.
Module 5	Module 5 Communities of Practice.	ALL CGIAR Breeding Programs	Increased collaboration, sharing of resources/best practices and capacity building.
Module 5	Development of the B4R breeding management system.	IRRI, CIMMYT	Development of a common breeding management system.

Table 10: Monitoring, Evaluation, Learning and Impact Assessment (MELIA)

Studies/learning exercises planned for this year (from POWB)	Status	Type of study or activity	Links and comments
Automatically filled by MIS with plans. Please add any others that were not in the POWB but were carried out this year			
N/A	N/A	N/A	N/A

Table 11: Update on Actions Taken in Response to Relevant Evaluations

Put N/A if there are no relevant evaluations for your Platform.

Name of the evaluation	Recommendation number (from evaluation)	Text of recommendation	Status of response to this recommendation	Concrete actions taken for this recommendation. (one row per action)	By whom (per action)	When (per action)	Comments
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 12: Examples of W1/2 Use in this reporting period (2018)

N/A

Table 13: Platform Financial Report

[Please fill in the table based on the status of the Platform financials.]

	Planned budget 2018			Actual expenditure 2018*			Difference			Comments
	W1/2	W3/bilateral	Total	W1/2	W3/bilateral	Total	W1/2	W3/bilateral	Total	
Module 1	578	1,517	2,095	370	740	1,110	208	777	985	
Module 2	367	437	804	377	159	536	(10)	278	268	
Module 3	408	253	661	340	94	433	68	160	228	
Module 4	360	494	854	316	178	494	43	317	360	
Module 5	598	437	1,035	421	159	580	177	278	455	
Platform Management & Support Cost	264	271	535	262	-	262	1	271	272	
Platform Total	2,574	3,410	5,985	2,087	1,329	3,416	487	2,081	2,569	

*Total Expenditures from CIMMYT Audited Financial Statements.

Part C: Additional evidence to be submitted through Management Information Systems or as indicated

Evidence A: Full list of policy contributions in reporting year (Common Reporting Indicator I1)

N/A

Evidence B: List of Platform Innovations in reporting year (Common Reporting Indicator C1)

For every innovation listed in the summary table. If none, no need to fill this in.

Please report Platform innovations in the MIS, following updated guidance → see indicator guidance #C1 [add link] with the following information included.

1. Title of innovation: Toolbox
2. Reporting year: 2018
3. Description of the Innovation:

   Online open repository of tools, services and learning knowledge identified or developed by EiB.

4. Innovation Type:

   Research and Communication Methodologies and Tools

5. Stage of innovation: 2
6. Description of Stage reached:

   Version 1 was developed and made available online with 29 entries. Upload and search functionality is complete. Currently the Toolbox supports training activities. Future stages include incorporation of forums and a content development/validation system, integration with CIMMYT learning management system.

7. Lead Organization/ entity: Excellence in Breeding Platform
8. Top five contributing partners/ entities to this stage:
9. Geographic scope: only for innovations in stage 3 (AV)* or stage 4 (USE)*:
10. Evidence for innovation: publications, links.

    www.excellenceinbreeding.org/toolbox

1. Title of innovation: Product replacement strategy tool
2. Reporting year: 2018
3. Description of the Innovation:

   Online tool designed to record standardized information about product profiles targeted by breeding programs, including market variety to be replaced, agro-ecological zone targeted

basic and key traits needed for desired impact, the composition of the cross-functional design team and a commitment delivery.

4. Innovation Type: Research and Communication Methodologies and Tools
5. Stage of innovation: 2
6. Description of Stage reached:

Several implementations in Google Forms were developed and trialed in workshops during 2018, leading to a final implementation in the EiB Toolbox that was released for use in January 2019.

7. Lead Organization/ entity: Excellence in Breeding Platform
8. Top five contributing partners/ entities to this stage
9. Geographic scope: only for innovations in stage 3 (AV)* or stage 4 (USE)*
10. Evidence for innovation: publications, links:

http://www.excellenceinbreeding.org/toolbox/tools/product-replacement-strategy-guide

1. Title of innovation: improvement plan template
2. Reporting year: 2018
3. Description of the Innovation

Template to capture breeding program improvement plans including BPAT assessment needs, objectives and tasks, with timeline, cost and those responsible for implementation. This template was developed and introduced at the EiB contributor's meeting, and is distributed to breeding programs for use in 2019.

4. Innovation Type: Research and Communication Methodologies and Tools
5. Stage of innovation:
6. Description of Stage reached:

Version 1 of the template was created in 2018, with Version 3 going into use in 2019.

7. Lead Organization/ entity: Excellence in Breeding Platform
8. Top five contributing partners/ entities to this stage

EiB contributor community.

9. Geographic scope: only for innovations in stage 3 (AV)* or stage 4 (USE)*
10. Evidence for innovation: publications, links.

1. Title of innovation: NARS baseline metrics form
2. Reporting year: 2018
3. Description of the Innovation:

Standard online form to assess the size and scope of NARS breeding programs participating in EiB.

4. Innovation Type:
Research and Communication Methodologies and Tools
5. Stage of innovation: 2
6. Description of Stage reached
7. Lead Organization/ entity

Excellence in Breeding Platform

8. Top five contributing partners/ entities to this stage
9. Geographic scope: only for innovations in stage 3 (AV)* or stage 4 (USE)*
10. Evidence for innovation: publications, links.

http://www.excellenceinbreeding.org/toolbox/form/narssmes

Evidence C: Outcomes and milestones

Please refer to Table 5: Summary of status of Planned Outcomes and Milestones (Sphere of Influence-Control).

1. Module

2. Module outcome for 2022

3. Progress against Module outcome

4. Milestone

5. 2018 milestones status: complete, extended, cancelled or changed

6. Evidence for completed milestones or explanation for extended, cancelled or changed.

7. For milestones that are extended, cancelled or changed, choose ONE main reason (dropdown) – see list below*

8. CGIAR Cross-Cutting Markers scores for Gender/Youth/CapDev/Climate change (the first three are not new, but previously were tagged to deliverables and outputs, which are no longer reported at system level. Climate change is new this year). Add a short (1-2 sentence) narrative justification for each cross-cutting score (in MIS)

Note for #7.: If you selected Extended, Cancelled, or Changed, please select one **predominant** reason from the following drop-down list:
- 1. Research/science - inherent risk in unknown cutting-edge research or science
- 2. Financial - funding delayed and/or cut
- 3. Partnership - partners were not able to deliver a key piece on time
- 4. Internal resources - key staff, infrastructure or equipment was not available at the time needed
- 5. Weather - for example, drought or heavy rain affecting field trials
- 6. External environment (political, economic, legal, market) - e.g. conflict, economic/market changes
- 7. Other, please state: _____

Evidence D Full list of publications published in reporting period

→ see indicator guidance #C4: Peer-reviewed publications.

N/A

Evidence E: Altmetrics (Common Reporting Indicator #I2)

Altmetrics reporting is optional for Platforms without access to a subscription.   Please refer to the Altmetric indicator guidance for how to report this indicator. The data should be automatically collected but it needs to be checked and 'curated' by the Platform, as described in the guidance.

N/A

Evidence F: Full List of Current External Partners

For each current partner (one to one) the following pieces of information should be submitted to an MIS:

Please refer to Table 8: Key external partnerships above.
- Name of partner organization
- [Organization type -automatically assigned by MIS]
- Country headquarters of partner organization (where HQ is based, not the partner office)

Evidence G: Participants in Capacity Development Activities in the current reporting period (2018) (Common Reporting Indicator C3)

Please list capdev activities and participants, following updated guidance. Please note that the guidance for this indicator is being revised, as a major constraint for this indicator for 2017 reporting was getting harmonized data from data pulled from existing Center systems. The System Management Office will notify CRPs and Platforms as soon as the guidance is updated.

Please refer to Table 7: Participants in CapDev Activities above.

Note on Common Reporting Indicator on Projected uptake (I3/4)

This indicator is being introduced on a pilot basis.   It is not likely to be relevant to Platforms. The System Management Office will be in touch separately about this if necessary.

N/A