



GLDC

Plan of Work and Budget 2018



RESEARCH
PROGRAM ON
Grain Legumes and
Dryland Cereals



CGIAR Research Program on Grain Legumes and Dryland Cereals

The CGIAR Research Program on Grain Legumes and Dryland Cereals (GLDC) Agri-food Systems is an international consortium led by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and CGIAR implementing partners including the International Institute for Tropical Agriculture (IITA), International Center for Agricultural Research in the Dry Areas (ICARDA), World Agroforestry Center (ICRAF), International Livestock Research Institute (ILRI), International Water Management Institute (IWMI), and Bioversity International. In addition to the CGIAR, GLDC is implemented by IRD and CIRAD from France and CSIRO from Australia who are joined by numerous, NGO, NARS, and private sector partners. This consortium strives to support beneficiaries in 13 priority countries in South Asia and Sub Saharan Africa with a mission of delivering improved rural livelihoods and nutrition by prioritizing demand-driven innovation to increase production and market opportunities along value chains.

<http://gldc.cgiar.org>

Contact us:

Peter S Carberry

Tel (O) +91 40 3071 3221

E-mail p.carberry@cgiar.org

For more information: gldc.cgiar.org

Table of Contents

1. Expected Key Results.....	1
1.1 Adjustments/ Changes to Your Theories of Change.....	1
1.2 Expected CRP Progress towards Intermediate Outcomes and SLOs.....	1
1.3 Obtaining Evidence on Relevant Outcomes and Impacts	3
1.4 Plans by CRP Flagships	3
1.5. Cross Cutting Dimensions	5
1.5.1 Gender, Youth and Capacity Development.....	5
1.5.2 Open Data and Intellectual Assets	8
2. Planning for CRP Effectiveness and Efficiency	10
2.1 CRP Staffing in 2018.....	10
2.2 Financial Plan for 2018, including use of W1/2.....	10
2.3 Collaboration and Integration.....	11
2.3.1 New Key External Partnerships	11
2.3.2 New Contribution to and from Platforms	16
2.3.3 New Cross-CRP Interactions.....	16
2.3.4 Expected Efforts on Country Coordination	16
2.4 Monitoring, Evaluation, and Learning.....	17
3. CRP Management.....	17
3.1 Management of Risks to Your CRP	17
3.2 CRP Management and Governance	17
TABLES.....	19
Table A: Planned Milestones	19
Table A2.....	22
Table B: Planned Studies for Relevant Outcomes and Impacts	25
Table C: Cross-cutting Aspect of Expected Outputs or Deliverables	27
Table E: CRP Planned Budget	27
Table G: New Internal (CGIAR) Collaborations among Programs and between the Program and Platforms.....	28
Table H: Planned Monitoring, Evaluation, and Learning Exercises.....	33

1. Expected Key Results

1.1 Adjustments/Changes to Your Theories of Change

Although barriers to capturing opportunities of dryland farming (i.e. non-adoption of germplasm and agricultural practices, poor diets, market failures, regulatory and trade policy constraints) vary in terms of intensity and scale, they all restrict dryland cereals and grain legumes in fulfilling their ecological and economic potential. Tackling barriers in isolation of each other, however, greatly underestimates their interconnectedness and the ‘wicked’ nature of the societal grand challenges in the African and Asian drylands.

Capturing opportunities depend on the ability of farmers and other actors to change agri-food system regimes. The institutional setting (social values, rules, norms, traditions and practices) within such regimes and prevailing organizations and processes (technologies, markets, policy-making and governance) often act as a “hidden hand” impeding agricultural progress. Crop improvement and farming systems research, therefore, are necessary but insufficient investments. Equally important are socio-economic sciences and the development practice of scaling partners to support the agency of actors to change agri-food system regimes.

The CRP was formally launched in Ethiopia from 14-16 February 2018. There have been no significant changes in the Theory of Change as it is only at the start of implementation. However, the Theory of Change for GLDC includes Flagship Program 2 for “Transforming Agri-food Systems”, which was approved to be included within the CRP but remains unfunded for W1/W2 allocations. Flagship 2 was not removed from the Theory of Change for two reasons; 1) It was approved and therefore the Flagship has numerous W3 and Bilateral projects mapped to it, and 2) GLDC will resubmit a new version of the Flagship Program 2 for consideration during 2018.

GLDC pursues two distinct impact pathways. In the first pathway *‘integrative solutions’*, the GLDC consortium will work towards increased protein availability from legumes and reduced risk of hunger season through diversifying crops and varieties. Further, improved feed and fodder for livestock-based protein will be an immediate benefit. Specific emphasis will be given to local consumption through processing to reduce drudgery, enhanced convenience and increased unit price for processed, cleaned and graded products.

Along the second impact pathway *‘scaling and sustaining’*, GLDC will implement five mechanisms for working with ‘change agents’ to address agri-food system-barriers and secure sustainable outcomes.

1. Informing the practical work of policy-makers, development NGOs and private sector actors;
2. Contributing to improved governance within agri-food systems;
3. Developing the capacity of change agents;
4. Strengthening the capacity of agri-food systems, e.g. through inclusive investments; and
5. Replicating successfully inculcated initiatives (e.g. through market signal crowding in further business and farmer investments).

Consideration of gender and youth as catalysts of agri-food system change throughout all FP activities contributes to impact acceleration.

1.2 Expected CRP Progress towards Intermediate Outcomes and SLOs

In 2018, the GLDC will work across five Flagship Programs focused on nine crops in 13 priority countries in South Asia and Sub Saharan Africa. Activity was mapped to 10 Sub-Intermediate Development Outcomes and over 60% of the funding was mapped to the first three listed below, which makes up some expected highlights for the GLDC this year. NOTE: Not all milestones will be reached in 2018, however, activities contributing towards them will begin in 2018.

- *Increased livelihood opportunities*
- *Increased capacity for innovation in partner development organizations and in poor and vulnerable communities*
- *Enhanced genetic gains*
- Improved capacity of women and young people to participate in decision-making
- Conducive agricultural policy environment
- Increased resilience of agro-ecosystems and communities, especially those including smallholders
- Reduced pre and post- harvest losses, incl. climate change
- Gender-equitable control of productive assets and resources
- Increased conservation and use of genetic resources
- Enhanced individual capacity in partner research organizations through training and exchange

Increased Livelihood Opportunities will receive about 16% of the full level of effort for the GLDC in 2018. The following milestones will be met towards this IDO:

- FP1: Diversity of farm household preferences vis-a-vis market demand by context outlined in view of research in GLDC
- FP3: Portfolios of household activities, enterprises and management practices that materially and equitably enhance livelihoods (as defined at sub- IDO level) while minimizing negative externalities
- FP3: At least two options per site per country to promote diversified, profitable and sustainable crop livestock systems discussed and agreed upon with local communities and researchers

Increased capacity for innovation in partner development organizations and in poor and vulnerable communities will receive about 18% level of effort from the GLDC contributing with the following milestones:

- FP1: Expanded foresight and ex-ante evaluation of GLDC research and technology options conducted and preliminary results shared on the potential poverty reduction impacts
- FP1: Scaling toolkit for Design, Execution, Monitoring, and Evaluation (DEME) content agreed to support improved horizontal and vertical scaling of GLDC commodities and management practices
- FP3: Map out areas suitable for crop diversification using GIS. Participatory field trials under smallholder conditions to evaluate the different cropping systems under different environments in different countries for farmers with landholdings less than 1 ha
- FP4: Complementary partners engaged to support scaling efforts based on country strategies.

Enhanced genetic gains will receive 31% of the full effort of the GLDC contributing to the below milestones:

- FP4/5: Organizing breeding teams around breeding product profiles
- FP4: Breeding lines from Phase I of the CRP being tested by NARS and CGIAR - 8 crops X 3 trait clusters X 2 regions advanced.
- FP4: Phase I genetic materials deployed in GLDC crop improvement by CGIAR centers - annually 8 crops X 3 trait clusters X 2 regions tested by NARS.
- FP4: Studies conducted to inform the seed systems strengthening areas for target cereals and legumes - at least 1 study per crop x agrifood systems x region.
- FP5: All GLDC trait discovery programs migrate data to IBP, BMS, GOBII to manage genotypic and phenotypic data (This will take multiple years).

- FP5: Germplasm reference sets, other germplasm sets, mapping populations assembled and traits prioritized for discovery research in 3 legumes and 3 cereals

1.3 Obtaining Evidence on Relevant Outcomes and Impacts

In 2018, four studies will take place in Nigeria, Malawi, Tanzania, and Ethiopia that will assess the adoption of several key GLDC crops (cowpea, soybean, chickpea, cowpea and groundnuts) and estimate the resulting impacts. Several of these studies will use DNA finger printing and cover approximately 80% of the relevant cropping area of the countries in question. In addition, uptake survey data for key GLDC crops (sorghum, pearl millet, groundnuts, cowpea, pigeonpea, and soybean) will be analyzed and reports generated in the five countries participating in the Drylands Development Program (DryDev). The data collected pertains to the area planted, yields, quantities consumed and sold, and amount lost to pests and disease. Finally, a study will be carried out in India that will assess the advantages and disadvantages of rice fallow versus rice-legume intercropping. Further details of these studies are presented in Table B below.

1.4 Plans by CRP Flagships

FP1 Priority setting and impact acceleration – The pre-proposal foresight and ex-ante impact analyses conducted in 2017 is guiding priorities across crops, countries, and the major technical lines of GLDC research. This involved: (a) yield gaps/constraints analysis to identify a set of potential research and technology options and to estimate the associated yield gains or yield loss reductions; (b) ex-ante impact evaluation to estimate potential economic benefits and rates of return; and (c) foresight analysis of production and demand for GLDC crops. In 2018, CoA1.1 will conduct an expanded ex-ante evaluation of the poverty impacts of GLDC research and technology options to guide further prioritization of GLDC research.

CoA1.2 will identify producer and end-user preferences, and will compare this information with the breeding product profile (or PCN) defined in FP4 to ensure alignment between end-user demand and breeding targets, as well as institutional and policy constraints limiting technology uptake and market access. Understanding the drivers of adoption and dis-adoption is crucial to facilitate scaling of GLDC innovations. This will be accomplished through a critical review of the drivers of adoption and impact, end-user demand, and transformative value chain interventions. Clarifying policy and institutional measures that either impede or encourage adoption, with emphasis on seed systems will be a focus of 2018.

CoA1.3 will conduct gender research (e.g. gender analysis of labor-saving technologies; identifying opportunities and constraints for enhancing gender equity in production and marketing of GLDC crops; etc.) to support GLDC in pursuit of integration, inclusion and equity among women and youth beneficiaries and stakeholders to strengthen the relevance.

To support technology development and adoption, 1.4 will analyze the policy and institutional environment and identify the enabling conditions for successful scaling. Focus on evaluation and synthesis of GLDC scaling approaches and associated adoption and impact evidence and to document lessons from key GLDC mapped scaling projects: TL3, HOPE II, Feed the Future initiatives, and DryDev. Jointly with CoA1.2, CoA1.4 will also undertake a critical review of the drivers of adoption and impact, end-user demand, and transformative value chain interventions. The work is expected to promote a deeper understanding of adoption drivers and bottlenecks with special focus on GLDC regions and technologies. The analysis of end-user demands as the other key part of the successful scaling will offer valuable insights into how to address this ever-changing part of the value-chain of GLDC crops and associated products. A synthesis of published evidence and lessons on the effectiveness and social, economic and environmental performance of value chain interventions in different agri-food system settings relevant to GLDC crops will offer entry points for future work.

FP2 Transforming Agri-Food Systems – FP2 plays a pivotal role in integrating research on crop improvement, input supply and farm practice activities of Flagships 3, 4 and 5 with the medium and long term prospects for GLDC crops identified in Flagship 1. It does this by supporting and learning about GLDC related change processes in agri-food systems with a view to understanding ways that the social, economic and environmental performance (impact) of these systems can be improved. In 2018 FP2 will serve in this coordinating role and create market demand through three specific activity clusters:

- **Creating Partnerships supporting the scaling of opportunities.**

FP 2 will mobilize a range support tools, approaches and expertise relevant to each partnership, including: systems diagnostic and stakeholder analysis tools, value chain and business development and modeling and analytical tools, innovation acceleration and entrepreneurial development skills.

- **Generating evidence, lessons and frameworks**

Lesson and evidence will be used to develop a simple but theory backed framework to guide public and private sector investment in GLDC value chains by highlighting what works, why and under what conditions.

- **Identifying R&D priorities and creating a mechanism to communicate these to GLDC research programs**

In collaboration with FP 1 use the FP2 interventions to generate demand signals for crop improvement and other relevant areas of research on crop productivity. Explore mechanisms in which better communication channels can be created between value chain interventions, agri-food system dynamics and GLDC crop R&D. FP 2 will provide FP 3, 4 and 5 priority crop traits and opportunities around seed and input systems arising from emerging and future market demands.

FP3 Integrated Farm and Household Management – Discussions during the launch of GLDC suggested that the flow be changed from Farm (CoA3.1), field (CoA3.2) and farming system (CoA3.3) to field (CoA3.2), Farm (CoA3.1), and farming system (CoA3.3). Some research questions were reworded, and new ones were added.

The two activities of CoA3.1 will aim at engaging partners in participatory way to lay the ground (mapping) for more actions taking into consideration gender and social differentiation. Thus, maps of suitable areas for GLDC crops will be produced and/or updated. Joint discussions will be held with key actors, allowing all categories to voice their concerns, to agree on the entry point options for gender sensitive participatory testing of the selected ones. In these discussions we will seek as much as possible joint decisions of husband and wife as well as between elder and youth to ensure that our interventions do not create new losers or exacerbated existing inequalities.

In the context of large scale use of inappropriate plant protection products (PPPs) associated with health issues, particularly for women and youth and environmental disasters (polluted water and loss of biodiversity), promoting the most efficient PPPs and reducing their amounts taking into consideration various needs relating to regions and socio-economic conditions will be pursued in CoA3.2. Such activities must be associated with the combination of the most resource use, efficient plants and nutrients that will all together help to enhance productivity and reducing the yield gap. Therefore, a milestone on water and nutrients management was added to the plan of 2018.

As CoA3.3 aims at improving livelihoods through GLDC-based farming systems, but also combined with other livelihood agricultural and non-agricultural options, this cluster will start its work by identifying the most relevant indicators to assess the efficiency of the farming systems. This cluster will also examine alternative activities through analyzing portfolios of activities and management practices. We will capitalize on data of past and on-going projects (DryDev, AfricaRising, HOPE I&II, etc.) for system indicators disaggregating them according to gender and social groups.

FP4 Variety and Hybrid Development – FP4 will build on Phase 1 of the CGIAR Research Program (CRP) legacy research outputs such as: a) advanced populations of new crop varieties developed under the CRP on Grain Legumes and the CRP on Dryland Cereals; b) Partnerships for research-to-delivery in Africa and Asia target countries, while also harnessing the new partnership with AGRA under CoA 4.4 implementation; and c) advisory teams formed for each CoA comprised of senior breeders and/or research leaders from GLDC partner institutes.

During the GLDC launch, in February 2018, participants agreed to leverage and or revive commodity breeding platforms to ease material movement and leverage of resources, human and infrastructure. In 2018, we will explore this further with Sub-Regional Agricultural Research Agencies such as ASARECA, CORAF/WE CARD and CCARDESA in Africa, as well as SAARC Agriculture Center for South Asia. These partnerships will be aligned around the principals of the EiB Platform to generate action items including: 1) Assembling breeding teams around breeding product profile, 2) shifting from pedigree selection to single-seed descent, and 3) Developing multi-environment testing network for yield assessment.

FP5 Pre-Breeding and Trait Discovery – FP5 focuses on exploiting the untapped genetic resources of wild relatives and landraces by developing and using cutting-edge tools and techniques for trait discovery and accelerating the rate of realized genetic gains in GLDC crops under mixed cereal-legume-tree-livestock systems of semi-arid and sub-humid regions of SSA and SA. Recent technological advances in genomics, breeding, and rapid achievement of homozygosity in major cereal crops provide excellent opportunities for accelerating genetic gains in GLDC crops, which goes along the need to shift away from pedigree selection to SSD and then to have fast advance of breeding populations in FP4. For this reason, in 2018 FP5 will focus on trait discovery, functional validation of traits and pre-breeding by exploiting natural and/or systematically induced variations for prioritized traits in combination with modern genomics, transgenics, phenomics, and breeding tools for accelerated, precise, cost-effective and efficient breeding of new varieties.

CoA5.1 (pre-breeding) will focus on advancing the prioritized traits for pre-breeding by use of already ongoing activities on exploring the natural diversity in wild/un-adapted germplasm. In addition to characterization and advancement already created transgenic events for traits (such as Bt) where natural diversity is not available. CoA5.2 (trait discovery) will focus on mapping and dissection of top priority trait(s) in each crop. The major focus areas will be marker development and deployment, genomic selection and markers based introgression of QTLs/genomic regions in elite lines. The major focus of CoA5.3 (Enabling technologies) will be continuing or new activities in area of genome editing, gain/loss of function gene validation platforms, mutant population and RGT (such as DH etc.). For this particular CoA, expertise and learning from private partners will be leveraged.

1.5. Cross Cutting Dimensions

1.5.1 Gender, Youth and Capacity Development

Gender in 2018: Gender research in FP1 will focus on strategic analysis to understand and test models for gainful participation of women in GLDC value chains. As a strategy for gender integration in FP1, gender research issues have been integrated into the Cluster of Activities especially CoA1.2 (e.g. gender- and age-disaggregated rates and drivers of adoption and participation in GLDC value chains) and CoA1.4 (e.g. enabling policies and institutions for technology scaling among men, women, and the youth as well as gender- and age-disaggregated evidence of the impact of GLDC technologies), whereas CoA1.3 itself undertakes strategic gender research to address overarching gender research questions. Methods of including scenarios for women in foresight modelling and ex-ante impact evaluations of GLDC technologies and accounting for gender preferences in priority setting will be mainstreamed in CoA 1.1. Making value chains and markets work for women and young people is a priority area of assessment under CoA1.2. The drivers of household decisions to adopt or dis-adopt

will be analysed while emphasizing intra-household dynamics of this decision-making process and ensure levels of disaggregation that allow specific gender questions to be answered. CoA 1.4 will focus on institutional and policy level factors that enable women and young people to participate and gain from innovations in the targeted agri-food systems at scale. Gender consideration will also come from taking into consideration “female-required traits” in the breeding product profiles.

Through FP3, the focus will be on designing and testing of innovations that lead to ‘closing gender gaps’ in legume and cereals production at the farm level. This will complement the FP3 efforts in closing yield gaps through improved agronomic and husbandry practices. Through the participatory action research PF3 will aim at joint decision making at household level where the voice of everyone is heard and needs are considered. Participatory action research will also be a channel to co-design, co-test with national partners thus capacitating them for scaling up. In engaging all key actors and drawing on findings from FP1, we are expecting to have a clear understanding of institutions, governance and decision-making processes at various scales (individual, household and community). This will help fine tuning the messages and their delivery systems and channels. In FP4, the focus will be on gender dynamics in seed systems, seed choice, replacement decisions, especially the opportunities there are for entrepreneurship for women in seed production. Focus will also be on gendered traits (consumption traits, processing traits or market traits) that determine product profiles of focus in the breeding programs.

Gender studies will be undertaken to frame the issues on how to increase profitable engagement of youth, women and other vulnerable groups in FP4 research and development agenda. This process will inform among others, and will be reflected in the breeding product profiles defined in FP4:

- The improvement in design of how to meaningfully engage women and other community members in participatory variety selection to improve targeting of preferred traits in modern varieties;
- Design of domestic consumption and processing by tackling cooking and processing traits such as increasing shelf-life of pearl millet flour, decortication in sorghum, hard-to-cook qualities in legumes, spinach from legume leaves, and high density of essential nutrients;
- Critical traits needed for breeding for ease of pre- and post-harvest handling including the use of crop debris to feed livestock and fuel for cooking, saving time for women and other farmers and;
- Leverage points for FP4 on A4NH and other complementary CRPs to mitigate agriculture-related diseases and deliver nutrition outcomes and increase household resilience;
- The design of interventions that will leverage on the youth demographic dividend of GLDC economies through targeted interventions that deepen engagement in agribusiness using ICT-augmented activities in seed production and related agri-innovations that attract youth to agriculture.

Youth in 2018: The focus will be on characterizing the youth of the drylands areas (with special focus on youth engagement). The gendered process of transition from youth to adulthood, the opportunity structure there is in the GLDC value chains and how this can be leveraged to support young people to find income/employment on and off the farm.

Capacity Development in 2018: The starting point for the 2018 work plan is the acknowledgement that all GLDC Flagships contribute in different ways to developing capacities of diverse stakeholders.

Developing well targeted interventions, which efficiently support diverse capacity development across the newly established CRP requires a number of preparatory steps:

- Capacity Development efforts will focus on learning how to work in a more integrated manner cross Flagship Programs. This is particularly important in the scope of breeding team integration to generate demand driven products.
- We will take stock of planned and ongoing capacity development activities based on the flagship work plans.
- Linked to the first activity we will focus our efforts to raise stronger awareness for the diversity of capacity development interventions.
- Develop Standard Operating Procedures for Flagships to engage the Crosscutting Capacity Development team to maximize formal and informal training opportunity.
- The stock taking will form the basis for a capacity development needs assessment. We will discuss in particular the impact pathways of flagships and projects with the Flagship leaders, project managers, and partners.

We will identify critical capacity gaps in the impact pathways.

- The next step will be the development of an operational plan for filling the identified capacity gaps. This includes an assessment of opportunities and constraints for capacity development.

The plan will operationalize the general GLDC strategy for capacity development.

- The GLDC capacity development task force will start building up an infrastructure for effective knowledge sharing. For example, an e-learning platform is already in planning and additional instruments will be identified based on the operational plan.

These 2018 activities will form the basis for efficient and effective capacity development interventions over the whole CRP period. In addition, each Flagship Program will initiate capacity development activities especially in the field of developing future research leaders, developing partnering capacities, and organizational development.

More specifically, much of the capacity development is embedded within FPs1, 3, 4 and 5 and include training of Ph.D. students and postdocs conducting their research within GLDC and being jointly supervised by GLDC researchers and partner institutions.

In FP1, training involves using methods and tools (e.g. foresight modeling tools and datasets and ex-ante impact evaluation methods) designed with partners. Capacity development of GLDC researchers and partners will be achieved during the process of CRP-wide, impact-focused learning and specific training on gender analysis. Capacity building partnerships will be forged with platforms such as the CGIAR Collaborative Platform for Gender Research and advanced research institutes such as MSU, Virginia Tech, and CSIRO in different cutting-edge areas such as gender analysis methodologies, innovative approaches to measuring the adoption and the impacts on poverty reduction, and approaches to the science of scaling.

FP3 in its activities on farming system modelling and impact studies will through collaboration with Universities like Wageningen and SLU capacitate future generation of scientists (MSc and Ph.D.) as a way to generate information at scale cost-effectively on system performance and efficiency. Joint implementation of FP3 by national partners (scientists and extension agents) will strengthen them to take responsibility of the scaling activities.

FP4 will make strong efforts to harness existing and develop new partnership with AGRA and sub-regional Agricultural Research Agencies such as ASARECA, CORAF and CCARDESA in Africa, as well as SAARC Agriculture Center for South Asia. In 2018, these partnerships will be central in particular for developing new research approaches.

During 2018, FP5 will be involved in training students, organizing seminars/workshops/trainings with ensured gender participation, in addition to institutional capacity development of NARS partners.

FP5 will focus on both human and infrastructure capacity development to train early career scientists who can support research on GLDC crops. Short exchange visits and trainings for specific technologies will be conducted with partners. Scientific workshops, short training courses, studentships, seminars, exchange visits, networking with NARS, ARIs etc., will be a high priority to train future agri-technocrats. At least 20 high quality publications, 2 courses/workshops and 6 trained students are expected during the 2018.

Gender Capacity Development: Through a partnership with Cornell/Makerere Universities' program on "Gender Responsive Researchers Equipped for Agricultural Transformation (GREAT)" and TLIII, research teams from the national programs will be equipped with skills and practical experience for gender analysis in legume systems in 2018. Through a partnership with AWARD, a fellowship will be designed to equip selected women leaders with leadership skills in science and agriculture and mentoring of potential pipeline of women leaders. A postdoctoral fellowship will be discussed to focus on 'institutional constraints that impact gender integration into agricultural research'. The postdoc will be facilitated to gain from the CGIAR system wide Gender Research Integrated Training (GRIT) offered through Pennsylvania State University. Through interactions with FP leadership, adhoc gender analysis events will be organized for national partners/project teams to enhance the quality of the results attained by the teams as need arises.

1.5.2 Open Data and Intellectual Assets:

GLDC is committed to the effective and efficient management of intellectual assets (IA) throughout its life cycle to disseminate effectively research outputs and maximize their impact. All GLDC outputs will be managed as International Public Goods (IPGs) consistent with the CGIAR Principles in the Management of Intellectual Assets (CGIAR IA Principles) and their Implementation Guidelines, as GLDC aims to increase the productivity, profitability, resilience, and marketability of critical and nutritious grain legumes and cereals grown within the semi-arid and sub-humid dryland agro-ecologies of SSA and SA.

As part of overseeing the implementation of the CRP, GLDC will initiate during the first quarter of the 2018 execution of Program Participant Agreements (PPA) with various CGIAR and other partners who endorsed the GLDC proposal and agreed to support. All the significant issues for CRP implementation and the likely challenges from an IA management perspective will prominently be included like the incorporation of IA management into the project lifecycle, dissemination of CRP outputs, etc. in these Agreements.

Leading GLDC partners are complicit with the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and all CRP-related germplasm exchanges will be strictly under the Standard Material Transfer Agreements (SMTAs) and with periodical reporting to the Governing Body of the Treaty on such access details. GLDC recognizes the national sovereignty of countries over their biological resources, including the genetic resources, affirmed by the Convention on Biological Diversity (CBD) and the principles of access and fair and equitable benefit sharing of genetic resources as stated in the Nagoya Protocol. GLDC also recognizes the indispensable role of farmers in conserving and improving genetic resources.

Many modern breeding tools, technologies, products and inventions are under proprietary control. Therefore, patent and proprietary issues and the related Freedom to Operate will be an important part of GLDC for ensuring that institutions can access and use technologies under appropriate agreements. GLDC endeavors to manage issues of intellectual property (IP) with integrity, fairness, equity, responsibility, and accountability in all Flagship Programs wherever it operates. All IP issues will be managed through various agreements to support access of especially germplasm by partners national to regional. Incorporation of any third party IAs in GLDC activities will be strictly under the CGIAR IA Principles which allows global accessibility of the products/services resulting from the use of such IAs for commercialization, research and development.

Linkages with the private seed sector are very critical to the transfer and commercialization of technologies from lab to land, as the private sector is closely associated with farmers and end users, and can play a vital role in understanding customer needs and priorities. Examples of partnerships with the private sector will be explored and assessed to be adopted to the different circumstances.

There are examples of innovative IP management within GLDC, as with the multi-stakeholder public-private partnership of the Hybrid Parents Research Consortia (HPRC) and the Agribusiness and Innovation Platform (AIP). These constitute GLDC expertise in managing germplasm and in private-sector partnerships for the use of cutting-edge technology for rapid delivery of high impact.

In 2018, GLDC will adhere to the CGIAR Open Access and Data Management Policy and be guided by the CGIAR Big Data Platform for timely and widespread dissemination of the results of its R4D activities. GLDC will leverage the existing primary databases and platforms of its various participating Centers. The main database for experimental planning, analysis and reporting will be “Dataverse”. In addition, GLDC will use other specialized and shared databases such as the Breeding Management System (BMS), Grin-Global, aWhere, ESRI webGIS platform to make available its results to the global research and development community.

In 2018, GLDC will give more emphasis on strengthening data ecosystems for GLDC. This will include developing workflows and solutions to make sure most data objects are compliant to FAIR principles and integrate with Big Data platform. All generated data sets will be monitored to the highest quality and curated before bringing them to open access and public sharing. We will also integrate research datasets with geospatial maps to generate user interactive visualization. Efforts to integrate research publications with open access data will be made to ensure data is reusable, and citable with enhanced availability to ensure the wider impact of research. To bring awareness among researchers, data support packs on best practices, standard protocols and how to make CGIAR core metadata schema compliant will be discussed with scientists across CRP through trainings and workshops. Three “data hackathons” will be hosted at different locations in 2018 organized to generate high quality data and maximize the impact, enhance the effectiveness and efficiency of research and increase the visibility and recognition. To make sure data is collected with common metadata standards with high quality, digital means of data capture will be devised and strengthened.

Online interactive dashboards of databases will be made available through a data dedicated website to provide more insight into data activities. Advanced BI based dashboards will also be developed to provide an overview of protected or unpublished data efforts to donors and various other stakeholders.

These plans for open data and intellectual property are consistent with the GLDC proposal without any major changes for 2018.

2. Planning for CRP Effectiveness and Efficiency

2.1 CRP Staffing in 2018

CRP-GLDC has selected the option not to report on staffing at this time. The CRP is still finalizing staffing nominations with partner centers according to programming priorities for 2018. We will complete section 2.1 and have data available after personnel negotiations with Centers.

2.2 Financial Plan for 2018, including use of W1/2

Innovation Fund GLDC had proposed a \$1 million innovation fund that would target NARS and NGO partners of the CRP. Due to reductions in budget (and accounting for 15% contingency) the remaining budget for this fund is \$430k for 2018.

Agricultural research for development (R4D) in the GLDC involves activities along the entire value chains of the target crops. It includes efforts in crop improvement, crop management, seed systems, postharvest technologies, processing, health/nutrition, input- and output-market access and marketing. The strengths and expertise necessary to address these are distributed across a large number and range of partners in the target regions for the CRPs. Consequently, the active engagement of these partners is critical to deliver the planned outputs and outcomes of the CRP. With the increasing scope of agricultural R4D in the CRP, it becomes necessary to judiciously allocate partner budgets to activities for which strengths and/or expertise are not present within the centers receiving W1/2 funding. The Innovation Fund is reserved for Non-CGIAR partners to leverage expertise and formalize engagement where mutually beneficial.

It is proposed to start implementing competitive and commissioned grants towards partnership funding in the second half of 2018 to seek expertise not present within the core group of GLDC partners.

Sponsorship of Relevant Events GLDC receives several requests for event sponsorship from our partner institutions. The CRP finds it important to support a community of practice and exchange of technology at technical events when they are directly related to one or more of the Flagship Programs. One example of sponsorship will be a Gold Level sponsorship and support for NARS participants to the International Food Legumes Research Conference in Marrakesh, Morocco from 6-8 May 2018. GLDC is making \$100,000 available in 2018 for event sponsorship and supporting travel of Non-CGIAR partners. This funding will be taken proportionally from the budgets of Flagship 1, 3, 4 and 5.

FP1 Priority setting and impact acceleration FP1's W1-2 budget for 2018 is only \$670,000 and this allocation will be used to conduct highly strategic activities informing GLDC priorities for maximum impact such as ex-ante evaluation of the poverty impacts of GLDC research options and technologies; gender- and age-disaggregated analyses of technology adoption drivers and end-user preferences and market demands; and identifying the enabling conditions and constraints for scaling. Such work also adds value by facilitating the integrative function of FP1 across flagships. W1-2 funds will also be used to consolidate and advance adoption and impact assessment research that is planned under bilateral/W3 projects. FP1 will use the limited budgets in 2018 to leverage additional resources (e.g. joint bilateral projects) and staff (e.g. CIM integrated experts through GIZ for scaling research under CoA1.4) and to advance science quality by establishing and supporting collaboration with other CRPs (e.g. PIM, LIVESTOCK, etc.) and communities of practice such as the CGIAR Collaborative Platform for Gender Research.

FP2 Transforming Agri-Food Systems While FP2 is a critical Flagship required under the Theory of Change for the GLDC there is no W1-2 funding allocated in 2018. The GLDC has rewritten the proposal to communicate FP2's unique value add to the full CRP with plans to resubmit to the

Systems Management Board at the earliest opportunity. Nevertheless, FP2 was approved as part of the CRP and partner centers have mapped W3/bilateral projects to the flagship. For 2018 there is a total of \$7,839,000 mapped to the objectives of the flagship.

FP3 Integrated Farm and Household Management FP3's W1-2 budget for 2018 is about \$1.52 million (with 85% budget at \$1.29). The most strategic investment that will set the foundation for other activities of FP3 will be to generate the indicators of farming system performance. Modelling using data of past and on-going projects will require a full time post-doc posted at Wageningen University. The rest of the funds will go to finance activities that add value to on-going projects. Therefore, co-location with these projects will be a way to make a good use of the limited funds. Such approach in prolonging the actions of on-going projects is the best way to be able to generate data on longer term than the short lifespan of a project. FP3 will also engage in leveraging additional resources through the development of new proposals.

FP4 Variety and Hybrid Development Implementation budgets have been aligned following three principles to maximize impact of available W1/2 resources.

- Leverage existing bilateral and or W3 investments.
- Catalytic areas essential to attract additional funding.
 - a. Assembling breeding team
 - b. Rapid generation advance
- Critical but under invested areas including strategic research to delivery activities.

The mapping exercise revealed increasing funding streams and interest for scaling out efforts and less on strategic activities specifically for actual breeding processes. Considering this trend FP4 has focused W1/2 investment. FP4 will invest in areas to attract counterpart funding by strengthening efficiency of delivery systems, but with back-end looping of funds-deployment to support breeding and early generation population development.

FP5 Pre-Breeding and Trait Discovery In 2018, a total of \$840,000 of w1/w2 funds has been allocated to FP5 and these funds will be used to leverage ongoing bilateral/w3 projects in priority focus areas to deliver on FP5. The w1/w2 will support critical focus areas such as pre-breeding activities of priority traits, including transgenic, marker development through mapping and dissection of priority traits, proof of concept of genomic selection, developing prioritized set of genomic/genetic/molecular resources, tools and technologies, especially by leveraging the expertise from the private sector. A small amount of W1/2 investment will support/sponsor conferences, workshops, trainings, etc. for capacity building keeping in mind the gender, youth, regions, and partners.

2.3 Collaboration and Integration

2.3.1 New Key External Partnerships

GLDC was launched in February 2018 together with over 50 strategic partners. This is a new partnership, although some of these partners had interacted with previous Phase I CRPs and with the writing team for the last two years during the proposal development phase. Key (tier 1) partners include ICRISAT (Lead Center), ICARDA, ICRAF and IITA; GLDC also draws on the expertise of Bioversity International, ILRI and IWMI. GLDC has strategically involved three key partners within the leadership team of the CRP who have mapped their activities to the CRP; these institutes are CIRAD and IRD (France) and CSIRO (Australia). In addition, there will be flagship specific partnerships (see table below). All flagship programs will establish collaboration with key external partners that will be identified and selected based on identified gaps in competencies and experiences. This will build on existing partnerships with sister CRPs and W3/bilateral projects. Other partners represent International Universities, NGOs, private sector, Sub Regional Organizations and NARS from our priority countries (see tables below).

Sample of External Partnerships

FP	Stage of research*	Name of partner	Partner type*	Main area of partnership
1	Phase 1: Discovery/Proof of concept	Virginia Polytechnic and State University	Academic and Research	Priority setting and Impact assessment
1	Phase 1: Discovery/Proof of concept	Michigan State University	Academic and Research	Impact assessment
1	Phase 1: Discovery/Proof of concept	Penn State University	Academic and Research	Gender analysis
1	Phase 1: Discovery/Proof of concept	German Advisory Service on Agricultural Research for Development (BEAF)	Bilateral and Donor governments	Science of scaling
1	Phase 1: Discovery/Proof of concept	AGRA/CRS	Development organizations (NGOs, networks and regional organizations)	Science of scaling
3	Phase 1: Discovery/Proof of concept	Scotland's Rural College (SRUC)	Academic and Research	Science of scaling
3	Phase 1: Discovery/Proof of concept	Wageningen University	Academic and Research	Farming system modelling
3	Phase 1: Discovery/Proof of concept	CORAF/WECARD-WAAPP	Academic and Research	Mechanization
3	Phase 1: Discovery/Proof of concept	NARS	Academic and Research	Scaling up
4	Phase 2: Piloting	USAID Innovation Labs	Academic and Research	Variety development Graduate Training of staff
4	Phase 2: Piloting	RUFORUM	Academic and Research	Variety development Graduate Training of staff
4	Phase 2: Piloting	ASARECA, CORAF	NARES/NARS (National agricultural research and extension systems or National agricultural research systems)	Leverage their program to anchor FP4 breeding programs operations
4	Phase 3/4: Scaling up and scaling out	AGRA	Development organizations (NGOs, networks and regional	Scaling out and the science of delivery studies

			organizations)	
4	Phase 3/4: Scaling up and scaling out	Seed Co	Private Sector	Roll out of new varieties through its vast network in Africa
5	Phase 1: Discovery/Proof of concept	Michigan State University	Academic and Research	Impact assessment
5	Phase 1: Discovery/Proof of concept	1. Penn State University	Academic and Research	Gender analysis
5	Phase 1: Discovery/Proof of concept	German Advisory Service on Agricultural Research for Development (BEAF)	Bilateral and Donor governments	Science of scaling
5	Phase 1: Discovery/Proof of concept	3. AGRA/CRS	Development organizations (NGOs, networks and regional organizations)	Science of scaling

Institute	Mission	How their Expertise add value to CRP
FARA	<p>FARA serves as the technical arm of the Department of Rural Economy and Agriculture at the African Union.</p> <p>Enhanced contribution to increased productivity, commercialization and competitiveness of the ESA agricultural sector.</p>	<p>(1) Transforming actions in a gender-sensitive manner</p> <p>(2) Agricultural innovation system; and (3) Enabling AR4D investment</p>
West and Central African Council for Agricultural Research and Development (CORAF/ WECARD) (West/ Central Africa)	<p>Supporting national focal points as innovation platforms to encourage IAR4D paradigm. Strategic Plan commits to targets for Agricultural research</p> <p>And development:</p> <p>(1) Appropriate technologies and innovations developed.</p> <p>(2) Strategic decision making options for policy institutions and markets developed.</p> <p>(3) Sub-regional agricultural research system strengthened and coordinated.</p>	<p>Large contribution to total agriculture attributed to traditional grains. Their share in country's agriculture GDP growth: - Burkina Faso: 17.8% - Mali: 11.7% - Senegal: 11.7% - Niger: 11.3% - Nigeria: 7.1%</p> <p>Sorghum and millets are most important for expected growth in these countries. SRO is prioritizing the development of high yielding varieties more suitable as feed. Pulses and oilseeds contribution to agriculture GDP: - Niger: 16.4% - Senegal: 14.7% - Burkina Faso: 13.6% - Guinea: 13.0%</p>

	(4) Demand for agricultural information from target groups facilitated and met. Strategic Plan will contribute significantly to achieving the 6% target growth, food security and poverty reduction in the agricultural sector in WCA.	SRO is prioritizing new varieties of groundnut and soybean to improve yields in the face of climate change. Significant increase in the inter- and intra-regional market share of agricultural products.
Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESSA) (Southern Africa)	Regional Indicative Strategic Development Plan (RISDP) outlines conditions: poverty eradication, gender equality and development, recognize importance of S&T, environment and sustainable development, develop private sector through trade, economic liberalization and development, and sustainable food security.	(1) Increase cereal yield in kilograms per hectare from an average of 1,392 to 2,000 (world average) by 2022. (2) Double the adoption rate of proven technologies such as improved seed varieties, management of water and land. (3) Integrate the private sector in policy and strategy formulation in the SADC new development model to accelerate regional economic integration.
Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) (East and Southern Africa)	Enhanced contribution to increased productivity, commercialization and competitiveness of the ESA agricultural sector.	(1) Strengthened and integrated capacity for transforming (2) Enhanced support to development and scaling (3) Enhanced policy advocacy, market analysis (4) Access to reliable knowledge for informed decision and action
South Asian Association for Regional Cooperation (SAARC) (South Asia)	Develop science-based strategy for collective response to threat, challenges and opportunities and global shocks, based on ground realities of SAARC countries.	Meet the growth demand for cereals (1%) and pulses (1.7%) per annum; more than 1.6% projected growth of edible oil; demand for fruits, vegetables and livestock to rise by about 3% or more under high income scenario.
Dupont Pioneer	Is committed to increasing productivity and production of agriculture in an environmentally sustainable manner while helping farmers around the world become more successful. New levels of innovation and collaboration at the global and local levels are essential to reduce hunger and poverty, increase nutrition, and drive economic growth for millions worldwide.	<ul style="list-style-type: none"> • High throughput production facilities • Big Data management • Sorghum for feed and fodder • Enabling technologies such as high throughput Genotyping, genome editing, next generation transformation, doubled haploids etc. • For the production of drought, disease resistance and heat tolerant sorghum and pearl millet in GLDC Countries • Target Population Environments

		<p>(TPEs) & multi-location trials (MLTs)</p> <ul style="list-style-type: none"> • As members of HPRC they have access to improved parental lines and hybrids of ICRISAT crops. • By using their vast network they can develop and identify high yielding hybrids for different agroecology's of the globe
Advanta Seeds	<p>Dedicated to improving agricultural viability across the world.</p> <p>Advanta Seeds prides itself on the creation and acquisition of breakthrough products with a key focus on delivering excellent quality in every seed. Our focus are farmers around the world and innovating products for their benefits.</p>	<ol style="list-style-type: none"> 1. They can reach large numbers of small holder farmers with improved access to high yielding hybrids which aids in productivity increase and stabilizing the economy of small holders. 2. They help in strengthening seed systems and enhanced seed replacement rates with high yielding cultivars. 3. Adoption of improved varieties for farmer needs for GLDC crops. 4. Development of Elite hybrids with seed treatment options for excellent yield potential, drought tolerance and stability.

2.3.2 New Contribution to and from Platforms:

Beyond cropping systems diversification and sustainable intensification, enhanced linkages between GLDC and AFS CRPs are possible on: i) sharing of learning on cross-commodity pre-breeding and breeding tools, models and methods; and ii) development and sharing of methods, tools and data in relation to foresight, impact assessment, gender, value chain/market analysis. The four Global Integrating CRPs offer critical inputs into GLDC, especially taking responsibility for high level systems research on the agroecologies in which GLDC crops are grown. Likewise, GLDC will benefit from CGIAR-wide investments in the cross-cutting themes of gender and youth and capacity building and from the Coordinating Platforms on EiB and BigData (see table G). In fact, GLDC intends to be a demanding student and client of EiB, fully drawing on the great opportunities being offered by EiB in modernization crop improvement programs of GLDC crops where such investment has been lacking in the past.

2.3.3 New Cross-CRP Interactions

In 2018, GLDC will work together with the other Agri-food Systems CRPs and Global Integrating CRPs. Such cross-CRP collaboration is essential to realize farmer and agri-food system benefits from crop intensification and diversification, especially through companion cropping systems or to leverage opportunities for income and diet diversification through feed and fodder. Each CRP has agreed to these synergies to integrate their research as manifest in shared projects and through the communities of practice during the GLDC proposal writing phase (also see table G).

2.3.4 Expected Efforts on Country Coordination

The Country Coordination process proposed for the CRPs is fully endorsed and ICRISAT/GLDC will lead such coordination in India, Mali and Niger. CGIAR Country Coordination efforts will support cross-CRP support of national R4D strategies, including prioritization, strategic partnerships along value chains for coordinated investment and large-scale implementation in service of realizing the goals of the SRF and SDGs by 2030. Linkages to other CRPs are critical – GLDC crops are often companions to the enterprises supported by the other agri-food system CRPs and so there are two-way impacts and interactions that must be considered.

Most of the work in India is being conducted with bilateral funding from the government of India (Indian Council of Agricultural Research) that is mapped to the GLDC.

On January 31, 2018, ICRISAT/GLDC hosted a meeting with all CGIAR country coordinators represented in New Delhi. Several action items were proposed and accepted by the group. These include:

- 1) Real-time dashboard project. Main benefits of the dashboard at the India country level illustrated the number of projects implemented Center-wise. The dashboard also displays features to select multiple Centers to illustrate crossover within Indian States. This can lead to increased coordination of project planning if not already project collaborators.
 - a. Real-time Dashboard is cloud available. All partner Centers agreed to embrace the technology as a reporting tool. ICRISAT will provide a template with a balance between the granularity of data requests and ease of use. Partners will follow a template to directly populate tool.
- 2) Documentation of CGIAR system efforts in Orissa will be led by IRRI focused initially on rice fallows including geo-referencing the fallows. IRRI to communicate action taken by 14 February 2018.
- 3) ICRISAT to introduce dashboard to ICAR DG within the next three to four months and take this opportunity to seek expedited approvals of CGIAR partner projects.
 - a. Goal of the effort is to deliver a coordinated CGIAR response to Indian bilateral funded projects to ICAR in a manner that adds value and reduces parallel efforts.

- 4) This CGIAR India group will meet biannually. ICRISAT DG will Chair this meeting mid-year and again in December 2018. The December meeting can be a venue to discuss the upcoming annual reporting session with ICAR.
- IRRI recommends that one of these meetings can take place in Orissa.
 - Mid-year meeting will include a remote demo of online dashboard.

2.4 Monitoring, Evaluation, and Learning

GLDC management structure is aligned to the Results-Based Management (RBM) framework adopted by the CGIAR System and the program is supported by a Performance Indicator Matrix submitted at the proposal stage. Every year and especially in the first year the program will conduct learning exercise to support the newly established flagship team. A team of key experts from partner institutions will be established during the first year. A Monitoring, Evaluation, Impact Assessment and Learning (MEIAL) process will ensure delivery of core activities aligned with (1) communication of the impact of research in contributing to solving development challenges, (2) implementation of agile learning about effective ways to design and deliver research impact at scale through strategic partnerships, (3) demonstration of accountability, benefits and value for money of investment in research, and (4) supporting evidence based decisions about how and where best to target public spending. This is achieved through the diverse partnership and the contribution from each institution starting from the investment done by IITA in terms of outcome and indicator tracking (e.g. workbook), ICRISAT in terms of field data collection tools (e.g. MEASURE), ICARDA in terms of online planning and reporting systems (e.g. MEL), ICRAF in terms of methodology for Impact Assessment and scaling. Details for planned actions are presented in Table H.

3. CRP Management

3.1 Management of Risks to Your CRP

The GLDC Director is a 20% role undertaken by the ICRISAT Deputy Director General-Research (DDG-R), who will be supported by a full-time Program Manager – Ms. Neena Jacob has joined in the latter role after a competitive recruitment process. GLDC management will be reviewed after 12 months operation to ensure the governance structure supports good decisions made in a transparent, fair and efficient manner to position GLDC for success.

GLDC continues to operate with Flagship Program 2 as an approved (and critical) part of the CRP. In 2018, there is about \$7.5 million in W3/bilateral funding mapped to FP2, which requires oversight towards the common goals of the CRP or we risk numerous disjointed projects with potential to duplicate efforts. All of these mapped projects have little incentive to engage in the administrative burden without a fully functional flagship supported with W1 and W2 funding.

In 2018, political instability and conflicts may affect the implementation e.g. possible administration change in Ethiopia. One way to manage the risk is to include ‘spill over’ countries in the target region to ensure operations can continue if one country experiences a period of instability.

3.2 CRP Management and Governance

The entire governance structure of the GLDC is new for 2018 as the CRP was launched from February 14-16 this year. The CRP GLDC seeks guidance and approval from the 12-member Independent Advisory Committee (ISC), which includes seven non-CGIAR members and five *ex officio* CGIAR members. One of the *ex officio* members is the lead center Director General. The ISC carries fiduciary and legal responsibility for the implementation of the CRP. In early 2018 nominations for the IAC are still being finalized. A preliminary GLDC-IAC meeting took place on 14 February 2018 seeking guidance for filling the remaining membership seats (particularly looking for gender balance). There will be a full IAC meeting in mid-2018 after a full committee has been comprised.

CRP Director reports to the lead center Director General and will chair the Research Management Committee (RMC) who has implementation responsibility for the CRP. The RMC is comprised of 14 members, which include the five flagship program leaders, a senior gender specialist, capacity development specialist, monitoring-evaluation and learning specialist, and three center focal points and the CRP Director. In addition, there will be four non-CGIAR partners within the RMC. The group will be responsible for establishing, executing and monitoring CRP research, strategy, work plans, and budgets.

TABLES

Table A: Planned Milestones

FP	Mapped and contributing to Sub-IDO	2022 CRP outcomes for each FP	2018 Budget	
			W1/2	W3/bilateral
1	Increased livelihood opportunities	Outcome 1. Improved targeting and responsiveness of research to market and household demands in the face of climate change for greater technology adoption, food and nutrition security, resilience, and poverty reduction	205,340	
1	Increased livelihood opportunities	Outcome 2. Market and household demand identified and trade-offs assessed for more inclusive value chains that improve income and nutrition status in target regions	339,078	1,805,537
1	Improved capacity of women and young people to participate in decision-making	Outcome 3. Inclusive and equitable technologies and innovation systems established for accelerated and broadened impact across the agrifood system	90,421	2,888,860
1	Conducive agricultural policy environment	Outcome 4. Strong project design, execution, monitoring and evaluation systems and tools consistently applied in GLDC scaling projects, with demonstrable progress on enhanced adoption and impact	158,771	129,403
2	Reduced market barriers	FP2.O1: Multi-dimensional impacts of innovative agricultural value chain options are transparent to governance actors and provide incentives for adapting the enabling environment.	0	2,238,245
2	Increased value capture by producers	FP2.O2: Actors in GDLC priority agricultural value chains developed innovative value chain options and are empowered to develop independently sustainable business models.	0	1,119,122
2	Reduced pre and post-harvest losses, incl. climate change	FP2.O3: Governance mechanisms are revised and harmonized in a way that encourages improved agrifood system strategies adapted to specific social-	0	1,119,122

		ecological		
2	Increased capacity of beneficiaries to adopt research outputs	FP2.O3: Governance mechanisms are revised and harmonized in a way that encourages improved agrifood system strategies adapted to specific social-ecological	0	578,920
2	Conducive agricultural policy environment	FP2.O1: Multi-dimensional impacts of innovative agricultural value chain options are transparent to governance actors and provide incentives for adapting the enabling environment.	0	2,238,245
2	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	FP2.O3: Governance mechanisms are revised and harmonized in a way that encourages improved agrifood system strategies adapted to specific social-ecological	0	1,119,122
3	Increased resilience of agro-ecosystems and communities, especially those including smallholders	FP3.O1. Cropping systems sustainably intensified and diversified	384,572	3,901,330
3	Reduced pre and post-harvest losses, incl. climate change	FP3.O2. Pest and diseases controlled safely and with reduced agro-chemical inputs	343,535	3,484,997
3	Closed yield gaps through improved agronomic and animal husbandry practices	FP3.O2. Soil-crop-water and nutrient interactions enhanced	171,767	1,742,498
3	Increased livelihood opportunities	FP3.O3. Tested, adapted and validated options applied for sustainable intensification and livelihood diversification by farmers	621,811	6,307,995
4	Enhanced genetic gains	FP4.O1. New varieties & allied innovations improving productivity & production potential, agribusiness opportunity & stabilize food	1,278,727	9,940,094

		supply.		
4	Increased capacity for innovation in partner research organizations	FP4.O1. New varieties & allied innovations improving productivity & production potential, agribusiness opportunity & stabilize food supply.	319,681	1,472,385
4	Increased capacity for innovation in partner development organizations and in poor and vulnerable communities	FP4.O2. Robust and responsive global to national breeding systems produce and deliver novel varieties and allied innovations at appropriate scale and scope	575,427	9,475,787
4	Gender-equitable control of productive assets and resources	FP4.O2. Robust and responsive global to national breeding systems produce and deliver novel varieties and allied innovations at appropriate scale and scope	143,857	675,524
5	Increased conservation and use of genetic resources	FP5.O1. Prebreeding products through use of genebanks and other sources and modern tools to increase genetic diversity in breeding programs globally	148,652	1,374,037
5	Enhanced genetic gains	FP5.O2. Trait discovery and development based on genomics and phenomics to generate new markers to support trait integration through use of modern enabling technologies and forward breeding	594,608	5,496,148
5	Enhanced individual capacity in partner research organizations through training and exchange	FP5.O3. National researchers able to apply the acquired skills in other pre-breeding programs. Development of enabling technologies platforms to be used for rapid trait discovery, trait validation, trait development, and trait introgression	247,753	2,290,062
			5,624,000	50,984,659

*Contributing budget to 2022 Outcome does not include Flagship 2 W3/Bilateral funding.

Table A2: Planned milestones by flagship and assessment of risk to achievement. [Please include the planned milestone mapped to 2022 CRP outcomes with the mean of verification and indicate for each milestone the related assessment to risk achievement]

FP	2022 CRP outcomes for each FP	Milestones *	Means of verification	Assessment of risk to achievement** (L/M/H)
1	Outcome 1. Improved targeting and responsiveness of research to market and household demands in the face of climate change for greater technology adoption, food and nutrition security, resilience, and poverty reduction	Expanded foresight and ex-ante evaluation of GLDC research and technology options conducted and preliminary results shared on the potential poverty reduction impacts	Preliminary foresight and ex-ante impact evaluation results that will be shared with GLDC researchers and stakeholders at the annual review and planning meeting to seek feedback and further inputs	medium
1	Outcome 2. Market and household demand identified and trade-offs assessed for more inclusive value chains that improve income and nutrition status in target regions	Diversity of farm household preferences vis-a-vis market demand by context outlined in view of research in GLDC	At least one paper by region outlining household typologies and market demands	Medium
1	Outcome 3. Inclusive and equitable technologies and innovation systems established for accelerated and broadened impact across the agrifood system	Inclusive and equitable innovation system for accelerating impacts for women and young people designed and piloted underlying design principles proven	Innovation systems for empowering women and youth design reports sex disaggregated and gender relevant datasets policy brief [paper] on gender and social analysis informing intervention design	Medium
1	Outcome 4. Strong project design, execution, monitoring and evaluation systems and tools consistently applied in GLDC scaling projects, with demonstrable progress on enhanced adoption and impact	Joint systematic review with CoA 1.2	Review protocol	Medium
1	Outcome 4. Strong project design, execution, monitoring and evaluation systems and tools consistently applied in GLDC scaling projects, with demonstrable progress on enhanced adoption and impact	Evaluation designed and implementation underway to evaluate current GLDC scaling approaches & associated impact evidence	Evaluation design reports	Low
1	Outcome 4. Strong project design, execution, monitoring and evaluation systems and tools consistently applied in	Scaling toolkit for Design, Execution, Monitoring, and Evaluation (DEME) content agreed to support improved	Scaling toolkit framework	High

	GLDC scaling projects, with demonstrable progress on enhanced adoption and impact	horizontal and vertical scaling of GLDC commodities and management practices		
2	FP2.O1: Multi-Dimensional impacts of innovative agricultural value chain options are transparent to governance actors and provide incentives for adapting the enabling environment	Tools are developed and open accessible to assess multidimensional value chain outcome preferences of stakeholders in agrifood systems. At least 50 NARS partners in eight target countries are trained in applying tools.	Publication, Reports, technical documents, reports of partner institutions	Medium
2	FP2.O2: Actors in GLDC priority agricultural value chains developed innovative value chain options and are empowered to develop independently sustainable business models.	Dryland cereals and legumes postharvest and commercial technologies available in the market and linked to seed systems in FP3.	Publication, Reports, technical documents	Medium
2	FP2.O3: Governance mechanisms are revised and harmonized in a way that encourages improved agrifood system strategies adapted to specific social-ecological	Analytical decision support tools developed for analyzing institutional frameworks related to GLDC value chains. At least 50 NARS partners in eight target countries are trained in applying tools.	Publication, Reports, technical documents, reports of partner institutions	Medium
3	FP3.O1. Cropping systems sustainably intensified and diversified	Map out areas suitable for crop diversification using GIS. Participatory field trials under smallholder conditions to evaluate the different cropping systems under different environments in different countries for farmers with landholdings less than 1 ha	a) Maps, b) reports on field trials, c) publications	Medium
3	FP3.O1. Cropping systems sustainably intensified and diversified	At least two options per site per country to promote diversified, profitable and sustainable crop livestock systems discussed and agreed upon with local communities and researchers	a) Research reports, b) economic evaluation reports, c) field days and farmer exchange visits	Medium
3	FP3.O2. Pest and diseases controlled safely and with reduced agro-chemical inputs	Pest and diseases management components for the target pests in different regions fine-tuned	Publication, Reports	Medium
3	FP3.O2. Pest and diseases controlled safely and with reduced agro-chemical inputs	Pest and diseases management components for the target pests in different regions evaluated	Publication, Reports	Medium
3	FP3.O2. Soil-crop-water and nutrient interactions enhanced	Efficiency of nutrients and water improved	Publication, Reports	Medium

3	FP3.O3. Tested, adapted and validated options applied for sustainable intensification and livelihood diversification by farmers	Portfolios of household activities, enterprises and management practices that materially and equitably enhance livelihoods (as defined at sub- IDO level) while minimizing negative externalities.	Publication, Reports, technical document	High
4	FP4.O1. New varieties & allied innovations improving productivity & production potential, agribusiness opportunity & stabilize food supply.	Breeding lines from Phase I of the CRP being tested by NARS and CGIAR - 9 crops X 3 trait clusters X 2 regions advanced.	Publication, Reports, technical document	Low
4	FP4.O1. New varieties & allied innovations improving productivity & production potential, agribusiness opportunity & stabilize food supply.	Phase I genetic materials deployed in GLDC crop improvement by CGIAR centers - annually 9 crops X 3 trait clusters X 2 regions tested by NARS.	Publication, Reports, technical document	Low
4	FP4.O1. New varieties & allied innovations improving productivity & production potential, agribusiness opportunity & stabilize food supply.	Breeding lines from Phase I enter the National performance trials (NPT) or release - 9 crops X 3 trait clusters-3-4 lines per trait X 2 regions entered in NPT.	Reports on release of lines with identified input from CGIAR; Publication, Reports by the CGIAR and Partner	Medium
4	FP4.O1. New varieties & allied innovations improving productivity & production potential, agribusiness opportunity & stabilize food supply.	Nursery management strengthened to support early generation seed availability for evaluations - 9 crops X 2 priority trait clusters (1° & 2°)-20 lines per trait X 2 regions supplied.	Publication, Reports, technical document	Low
4	FP4.O2. Robust and responsive global to national breeding systems produce and deliver novel varieties and allied innovations at appropriate scale and scope	Studies conducted to inform the seed systems strengthening areas for target cereals and legumes - at least 1 study per crop x agrifood systems x region.	Publication, Reports, technical document	Low
4	FP4.O2. Robust and responsive global to national breeding systems produce and deliver novel varieties and allied innovations at appropriate scale and scope	Complementary partners engaged to support scaling efforts based on country strategies.	Publication, Reports by the CGIAR and Partner	Medium
4	FP4.O2. Robust and responsive global to national breeding systems produce and deliver novel varieties and allied innovations at appropriate scale and scope	Gender studies and opportunities for youth in agriculture conducted. At least 2 interventions per region studied- 2 in Africa and 2 in Asia.	Reports on gender analysis. This will also include research and training reports (with gender disaggregation), b) training manuals, fact sheets and other IEC material, c) number of female and youth farmers trained	Low

5	FP5.O1. Prebreeding products through use of genebanks and other sources and modern tools to increase genetic diversity in breeding programs globally	Prioritization of 2 traits in one crop for pre-breeding and identification of germplasm and cultivars to initiate pre-breeding	4 Publications/ reports/ technical bulletins	Low
5	FP5.O2. Trait discovery and development based on genomics and phenomics to generate new markers to support trait integration through use of modern enabling technologies and forward breeding	Germplasm reference sets, other germplasm sets, mapping populations assembled and traits prioritized for discovery research in 3 legumes and 3 cereals	4 publications / reports/ technical bulletins	Low
5	FP5.O3. National researchers able to apply the acquired skills in other pre-breeding programs. Development of enabling technologies platforms to be used for rapid trait discovery, trait validation, trait development, and trait introgression	All GLDC trait discovery programs migrate data to IBP, BMS, GOBII to manage genotypic and phenotypic data.	1 publications, and 2 fully functional databases	Low

Table B: Planned Studies for Relevant Outcomes and Impacts

Planned topic of study	Geographic scope	Relevant to Sub-IDO, or SRF target if appropriate	Comments
Adoption and impacts of improved cowpea varieties in Nigeria (IITA)	Nigeria	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Although this activity is conducted under the Tropical Legumes III project, it needs some W1/W2 funding for staff time and travels to share/communicate the results at professional meetings.
Adoption and impacts of improved soybean varieties and agronomic practices in Malawi (IITA)	Malawi	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	This activity is conducted under the Feed the Future Malawi Improved Seed Systems and Technologies (MISST) project, but it needs some W1/W2 funding for staff time and travels to share/communicate the results at professional meetings.
Impact Assessment of N2Africa project	Ghana, Nigeria, Tanzania, Uganda	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Putting Nitrogen Fixation to Work for Smallholder Farmers in Africa (N2Africa) Phase II (BMGF Grant No. OPP1020032)
Analysis of advantages and	India	Sub-IDO: Closed yield gaps	The study will focus on the

disadvantages of rice fallow vs rice legumes (ICARDA)		through improved agronomic and animal husbandry practices	comparative analysis of rice fallows versus rice legumes in India and opportunities for expanding legume area into fallow lands.
Adoption and impacts of groundnuts in Tanzania and Nigeria (ICRISAT)	Tanzania and Nigeria	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Cross-section with DNA fingerprinting for variety identification covering about 80% of cropping area; n≈ 1500.
Adoption and impacts of chickpea in Ethiopia (ICRISAT)	Ethiopia	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Cross-section with DNA fingerprinting for variety identification covering about 80% of cropping area; n≈ 1500.
Uptake of improved varieties of cowpea and pigeon pea among households in the Drylands Development Program's (DryDev) catchment area (ICRAF)	Kenya	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Data capture on amount harvested, consumed, and sold, as well as lost to pest and disease (n=558)
Uptake of improved varieties of sorghum and groundnuts among households in DryDev's catchment area (ICRAF)	Ethiopia	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Data capture on amount harvested, consumed, and sold, as well as lost to pest and disease (n=519)
Uptake of improved varieties of sorghum, pearl millet, groundnuts, cow peas, and soy bean among households in DryDev's catchment area (ICRAF)	Mali	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Data capture on amount harvested, consumed, and sold, as well as lost to pest and disease (n=480)
Uptake of improved varieties of pearl millet, groundnuts, and cow peas in DryDev's catchment area (ICRAF)	Niger	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Data capture on amount harvested, consumed, and sold, as well as lost to pest and disease (n=516)
Uptake of improved varieties of sorghum, pearl millet, groundnuts, and cow peas among households in DryDev's catchment area (ICRAF)	Burkina Faso	Closed yield gaps (sub-IDO), increased incomes (IDO), and reduced poverty (SLO) through adoption of improved varieties and agronomic practices	Data capture on amount harvested, consumed, and sold, as well as lost to pest and disease (n=394)

Table C: Cross-cutting Aspect of Expected Outputs or Deliverables

Cross-cutting	Number (%) scored 2 (Principal)	Number (%) scored 1 (significant)	Number (%) scored 0	Total overall number of outputs
Gender	7%	56%	37%	253
Youth	5%	48%	47%	
CapDev	70%	23%	7%	

Table E: CRP Planned Budget

	Planned budget 2018					Comments on major changes
	2017 Carry forward W1/2	W1/2	W3/bilateral	Center Own fund	Total	
FP1	-	793,609	5,270,828	-	5,964,438	Spending W1/2 is to 85% is represented by 1 st and 2 nd level priorities
FP2	-	-	7,839,000	-	7,839,000	FP2 did not receive W1/2 funding in 2018. This also impacts the funding mapped to the project. For example, CSIRO and others were planning to map more to the FP.
FP3	-	1,521,685	15,436,821	-	16,958,505	Spending W1/2 is to 85% is represented by 1 st and 2 nd level priorities
FP4	-	2,317,692	21,477,974	-	23,795,666	Spending W1/2 is to 85% is represented by 1 st level priorities
FP5	-	991,013	8,899,036	-	9,890,049	Spending W1/2 is to 85% is represented by 1 st level priorities
Strategic Competitive Research grant	-	506,000	-	-	506,000	This innovation fund will be planned at 85%, for a total of \$430k.
CRP Management & Support Cost	-	1,780,000	-	-	1,780,000	Includes FP and CoA Leader Salary Contributions
CRP Total	-	7,909,999	58,823,658.60	-	66,733,657	

*Budget expressed at 100% spending levels. For operational purposes the GLDC is currently planning to spend 85% of this budget (equally distributed across line items) until further guidance is received from Systems Management Office

Table G: New Internal (CGIAR) Collaborations among Programs and between the Program and Platforms

CGIAR PLATFORMS		
Name of CRP or Platform	Brief description of collaboration (give and take among CRPs) and value added*	Relevant FP
Genebank Platform Genebank at Patancheru and three regional genebanks in Africa provide expertise in establishing community genebanks and germplasm related issues, providing appropriate germplasm lines, mini core collections of the ICRISAT Mandate crops.	<p>Provided Benefits: - Phenotyping platforms and results; SOPs for nursery research and seed health maintenance. - Collections of novel diversity of GLDC crops; use of existing and new GLDC germplasm collections; phenotypic characterization</p> <p>Received Benefits: - Maintenance of germplasm reserves, receipt of high-quality seeds for use in breeding programs. - Maintenance of germplasm reserves and high-quality seeds for use in pre-breeding.</p> <ul style="list-style-type: none"> • Identification of elite germplasm lines and trait-based phenotyping and field-based phenotyping germplasm mini core collections • Identification of promising germplasm for agronomic, nutritional and for resistance to biotic and abiotic stresses • Establishing community genebanks for easy access to quality seed • ICRISAT Regional Genebanks at Niamey, Niger, Bulawayo, Zimbabwe and Nairobi, Kenya will play crucial role in supplying the well characterized germplasm in the region as well in dissemination of germplasm through evaluation and farmers' participatory research. • Resequencing, evaluation and characterization and identification of germplasm with superior and/or novel traits • Testing and identifying of germplasm and using molecular markers for drought and/or heat tolerance • Identification of diverse sources of resistance to thorough evaluation of mini core collections as well as sampling procedures like "Focused Identification of Germplasm Strategy" (FIGS). • Gene banks will provide FP4 with novel sources of germplasm to develop new materials. They will also provide quick deployable varieties especially when the germplasm as found superior to new bred and commercialized material. This process will improve effectiveness of FP4 breeding programs. • The Gene banks, while working with FP4 and FP5, will gain access to new material developed by breeding programs. The Gene banks will also benefit from commercialization of their sourced accessions in new geographies, thereby delivering on a core aim of germplasm conservation. 	<p>FP4</p> <p>FP4</p> <p>FP4</p> <p>FP4</p> <p>FP5</p> <p>FP5</p> <p>FP5</p>

EiB Platform	<p>Provided Benefits: Feed-back on phenotyping capacities/needs and current developments; High Throughput phenotyping tools/ approaches (e.g., LeasyScan) from GLDC to enrich the GG module. Genomics data for use in analyses pipelines such as Genomic Open Source Breeding Informatics Initiative (GOBII)</p> <p>Received Benefits: New phenotyping tools/technologies. - Customization of tools for data analysis pipeline, and SOP for effective use of genotypic /sequencing/marker information; in knowledge on breeding design simulation, cross prediction, use of high-density genomics data for genomic selection, gene-to-phenotype models etc. (and provides) The platform will provide FP4 with opportunity to test and access modern genetics, tools and approaches for improving breeding efficiency of FP4 crops. These include applied molecular tools for breeding, biometrical genetics, bioinformatics and phenotypic tools.</p> <p>The Platform while working with FP4 and FP5 will gain access to:</p> <ul style="list-style-type: none"> • A pool of scientist for training needed to maximize impact delivery. • Genetic resources of various crops and in which to develop modern breeding tools. 	FP4 &5
Big Data Platform	<p>Big Data platform will help to create environment for greater data and knowledge sharing of GLDC program and reduce the barriers in access and reuse the most valuable and critical data. Such data ecosystem will increase recognition of the GLDC research data with help of Big Data platform at global level by developing partnerships, bringing together big data practitioners from various institutions. Big Data platform will further empower researchers to strengthen data analytical capacity, developing practical big data tools and services in a coordinated way, and it addresses critical gaps, both organizational and technical, expanding the horizon of CGIAR research. Scientists work in a common data analytics environment. Support from platform will also help to expand and enhance OA/OD support pack to help in adopting interoperable data management standards and agri-semantics for all GLDC datasets and make all GLDC datasets 100% compliance to OA-OD policy. Meaningful integration of CGIAR data sets will be achieved through semantic data management standards. Plan is to implement APIs to allow data querying from multiple data bases from multiple languages for an integrated database. Such systematic approach will aggregate CGIAR wide data from those hard drives to online data repositories seamlessly. Under platform we are working for Greater data and knowledge sharing across CGIAR by reducing barriers to information access and reuse, the Platform will democratize information availability and use, to help farmers and policymakers take reliable, informed decisions. New data products will also be developed from start to finish abiding by OA principles, and be maintained in a regularly updated IP portfolio (information products such as publications, databases, analysis tools (e.g. big data models), and web services)</p> <p>We are sure that this platform will develop pathways for further development and dissemination of intellectual assets.</p>	FP2, 3, 4, &5
CGIAR Collaborative	GLDC provides the research platform and staff to carryout field work and takes strategic gender research tools and methods to advance science	FP1

Platform for Gender Research	<p>quality and capacity strengthening outputs.</p> <p>FP4 will benefit from the CGIAR Collaborative Platform on Gender Research working with the gender and breeding working to gain deeper understanding of farmer preferences differentiated by gender, region and culture, and how that influences adoption and use of improved varieties. FP4 will benefit from other CRPs that are also part of this broad platform. This will improve effectiveness and targeting of FP4 breeding programs. The CGIAR Collaborative Platform on Gender Research, while working with FP4, will gain access to geographies where participatory breeding is occurring to undertake its research. Joint funding of some of the activities will increase value for money and efficiencies to both CRPs.</p>	FP4
CGIAR PROGRAMS		
Name of CRP	Brief description of collaboration (give and take among CRPs) and value added*	Relevant FP
LIVESTOCK	<p>Foresight modeling and ex-ante analysis of the livestock feed benefits of GLDC technologies to inform priority setting discussions and decisions. GLDC will GIVE crop-related datasets and expertise in ex-ante analysis. Foresight modeling and ex-ante analysis of the livestock feed benefits of GLDC technologies to inform priority setting discussions and decisions. GLDC will TAKE livestock- and feed-related datasets and tools. Publications represent the value added from this collaboration. Crop-livestock smallholder farms of the semi-arid and sub-humid drylands of SSA and SA are the target systems for GLDC and a priority focus for LIVESTOCK. Based on feed supply and demand scenarios assessed by LIVESTOCK, GLDC will develop varieties and hybrids with dual-purpose use in food and feed/fodder that will be tested in animal feed trials by LIVESTOCK. Consequent priorities include stay green introgression and promotion of new dual-purpose sorghum varieties; phenotyping varieties for fodder/stover value of the residue; understanding the nutritional limitations of sorghum and pearl millet forages; and the nutritional characteristics of legume fodder. Jointly targeting farming system options for responding to the demand for livestock products in SSA and SA is clearly a shared priority for both CRPs.</p> <p>Assessment of fodder quality traits in agro-ecologies (FP5) growing dual purpose sorghum; and development of a platform for mainstreaming fodder quality traits in product development pipelines for target ecologies. CRP on Fish and Livestock will provide expertise to assess the fodder quality traits in current breeding populations from several ecologies and help develop a platform for mainstreaming this trait in breeding pipeline (which will also include extensive consultation with crop improvement programs and further targeted trainings).</p> <p>Improved forages are a part of the discussion with the Crop Prioritization Group, with the aim to ensure long term viability of selection and breeding efforts. Likely food feed crops will be addressed through the crop improvement CRPs. The concrete activity for 2018 is participation in Breeding Program Assessment Tools (BPAT) which is a major effort focusing mainly on forage breeding in CIAT but connecting with genetic work in ILRI.</p>	1,2,4, 5

PIM	Foresight modeling and ex-ante analysis to inform priority setting discussions and decisions. GLDC will GIVE crop-related datasets and expertise in ex-ante analysis. Foresight modeling and ex-ante analysis to inform priority setting discussions and decisions. GLDC will TAKE foresight modeling tools and applications. Publications represent the value added from this collaboration.	1
WLE	GLDC will work with WLE at the interface of farms and landscapes; the former focusing on farm-level interventions and the latter on landscape-level interventions. Collaboration will include research on technologies for improved water-use efficiency in GLDC farming systems; interactions of cropping systems and land and water management practices; enhancing the role of agricultural water management including soil moisture and irrigation; developing the means for sustainable intensification of legume and cereal crops and crop-livestock systems; and understanding of water flow management through modelling and monitoring.	3
A4NH	<p>There are three areas of collaboration with A4NH. Firstly, an existing priority is biofortification which will build on the superior ability of some of the target crops of GLDC to accumulate high levels of iron and zinc. The competitive advantage is the track record of the relevant CGIAR Centers in the improvement of these crops through breeding and the track record of the HarvestPlus program. The collaboration will deliver biofortified pearl millet and sorghum with enhanced levels of iron and zinc in India and West and Central Africa. The second area is in food safety, specifically, aflatoxin mitigation. This effort evaluates the use of farm-level mitigation technologies and practices that reduce aflatoxin in the produce and exposure of consumers. The third area of likely connection is through the GLDC FP2 research on functional agri-food systems, where food processing and other value chain interventions will be tested.</p> <p>FP4 aims to develop resilient nutrient dense varieties of its nine-crop portfolio. Accordingly, A4NH is a critical for scaling out GLDC varieties generate via FP4. In partnership activities that reduce agricultural related diseases such as exposure to Aflatoxins, as well as promotion of nutrient dense crop varieties, especially in areas where both programs are co-located. Joint research outputs such as technologies, reports, publications will be generated. FP4 will contribute to GLDC's efforts to deliver gender-equitable health and nutritional benefits to the poor.</p>	2,3,4
CCAFS	A central tenet shared by CCAFS and GLDC is the imperative for smallholders to better manage risks, particularly risks exacerbated by climate variability and change. In common with GLDC, CCAFS has much of its research targeted to the dryland agroecologies of SSA and SA. Most GLDC crops tolerate adverse climatic conditions, high temperatures and drought. GLDC will deliver to CCAFS varieties/hybrids (FP4) and climate smart practices (FP3) to CCAFS climate-smart villages (CSVs). While GLDC will undertake research to support decision-making under uncertainty on farms (FP3) and in value chains (FP2), it will largely defer to and follow the lead of CCAFS in developing and delivering climate-risk management tools and information for the drylands.	2,3,4

MAIZE	<p>Maize constitutes a major cropping system where GLDC crops are grown as companion crops, especially legumes, in SSA and SA, which provide possibilities for diversification and sustainable intensification of maize-based cropping systems. The mutual benefits of the two CRPs include insights on smallholder preferences and benefits to improve the match of technologies for various intercropping and rotation systems involving the target crops of each program. It is critical that the breeding priorities for GLDC crops are informed by MAIZE systems demands. Collaborative efforts will be supported by joint resource mobilization.</p> <p>In sub humid ecologies, especially in Africa, FP4 will benefit from the Maize CRP being a major crop in such ecologies. Work on TPE's for both FP4 crops and Maize as well as management of multi-host pests and diseases in increase synergies for research and uptake of technologies. This way, FP4 will expand opportunities for increasing resilience of farming households.</p>	3,5
RICE	<p>Rice fallows offer opportunities for the expansion of pulses in SA, especially early-maturing pulse varieties such as short-duration chickpea and lentil. At present, ongoing breeding and adaptation research exists for chickpea, lentil and groundnut in rice fallows (India, Myanmar). Opportunities for joint fundraising to focus and test rice-legume sustainable intensification in SA will be sought. It is critical that the breeding priorities for GLDC crops are informed by RICE systems demands.</p>	4,5
RTB	<p>Sorghum, millets and legumes occur in the cereal-root crop mixed systems in SSA and legumes have an increasing presence in rotations involving root crops in South Asia, specifically India. GLDC plans to work with RTB in co-developing and testing options for sustainable intensification, with an initial focus on India. It is critical that the breeding priorities for GLDC crops match RTB systems requirements.</p> <p>GLDC will actively cooperate with RTB with the join MEL framework supported by the used of the MEL platform. The tool used by the two CRPs ensure proper planning, monitoring, evaluation and learning activities. In 2018 the plan is to complete several integrations including the interoperability assessment with MARLO in order to provide the System Office a common set of harvestable elements. The existing MEL visual dashboard for CGIAR indicators can support the System Office avoiding the re-development existing features. IITA will also play a key role between the two CRPs since it is one of other Centers (CIP, ICARDA) adopting MEL at institutional level thus providing a different learning perspective.</p>	1,4,5
WHEAT	<p>Collaboration with the WHEAT program will be sought to out-scale sustainable intensification and diversification options with legumes for natural resource management, environmental benefits, risk management, improved nutrition and diet diversity. Legumes provide an option to intensifying the prevalent rice-wheat rotation in SA for increased incomes, improved resource use and better soil health.</p>	3

Table H: Planned Monitoring, Evaluation, and Learning Exercises:

Planned studies/learning exercises in 2018	Comments
Establishment of the GLDC M&E Community of Practice with CGIAR and non-CGIAR Partners	GLDC officially launched on February 2018 will need a dedicated team for M&E. This will be composed by CGIAR, first tier non-CGIAR and national partners. The analysis of existing framework and practices, harmonization and flexibility are the key to ensure a smooth start-up of this group considering that differently from other CRPs, GLDC had one year break from Phase I to Phase II. The same approach should be applied when FP2 will be approved an initiate its work tentatively in 2019.
Develop a work plan for 1 st phase implementation harmonization among tools and system	The team will initiate the process to map and develop interoperable protocols with existing systems in the CGIAR (e.g. MARLO, BIGDATA-CERES) and within each Center (e.g. MEASURE, EPRINTS, CKAN). Thanks for preparatory work in 2017, bilaterally funded tool (MEL) already provides interoperable protocols with 15 existing systems and international standards.
Capacity Development and Joint learning exercises	It is recognized that partners have different level of RBM implementation thus several capacity developments, learning and reflection exercises are planned during 2018. While a decentralized team will be created through existing resources from partners, individual and small group remote support will be provided. Knowledge generated will be shared among focal point in an annual meeting planned in the last quarter of 2018.
Identify a common set of performance indicators that all projects can report on at the CRP level.	These common indicators will be beyond the 9 CGIAR selected ones, which will enable the CRP to assess its performance in other key areas of interest.
Ensure real time data visualization based on conceptualized indicator framework	Participating centers such as IITA developed a detailed framework (e.g. Indicator workbook) to monitor their impact. Such approach is under adoption by other MEL users such as ICARDA and CIP. ICRISAT launched the MEASURE tool in the end of 2017 to enable real-time field data collection with visualization to improve accuracy and feed monitoring systems such as MEL/MARLO. 2018 will be dedicated to develop a series of actionable visual tool to support management in collaboration with other CRP (RTB and LIVESTOCK). Having already several partners adopting MEL for their entire portfolio, ensure detailed analysis of information that will deliver easy to use visual tool.