# **Annex 2 – Flagship Report Template**

**Flagship annual report - 2019**

**FP4 – Variety and Hybrid Development**

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# Progress by flagship

[Please provide brief summary narratives about how each individual CRP Flagship progressed towards the agreed ‘Program outcomes’, introducing Milestones Table to the reader, highlighting (i) major pieces of work and innovations and (ii) any major course corrections. Where relevant, indicate cross-flagship linkages and how one FP built on or worked with another to get results. (max 800 words).

The two Flagship 4 outcomes to deliver improved genetics of GLDC crops are (1) new varieties and allied innovations improving productivity and production, agribusiness and stabilize food supply, and (2) robust and responsive global to national breeding systems produce and deliver novel varieties and allied innovations at appropriate scale and scope. Through these outcomes, the Flagship seeks to contribute to Program level outcomes on expanded, resilient, and inclusive production, value chain, trading, and consumption of nutritious grain legumes and dryland cereals in target countries; and improved capacity and inclusivity of agri-food system stakeholders to collaboratively develop innovations hat respond to the needs of the women, men, and youth in GLDC-based livelihoods and value chains.

Host-resistance or tolerance to diseases and pests, biofortification, and climate resilience are the focus traits targeted to combine into a single cultivar to deliver crop Product Profiles. The simultaneous improvement of both production and market traits through partnership with NARS under Flagship 4 resulted in commercialization of 26 GLDC crop cultivars of chickpea (6), lentil (5), groundnut (8), pigeonpea (2), sorghum (1), pearl millet (3), and finger millet (1) in Africa and Asia. The commercialized GLDC crop cultivars like drought, cold and heat tolerance in groundnut, chickpea and pearl millet, respectively contributes to reduced risk of climate change effects. GLDC cultivars, high oleic groundnut, cream seed coat pigeonpea, and large seed size of chickpea meets the industry needs, while machine harvestable chickpea and lentil drive new employment opportunities to the youth. Enhanced grain nutritional quality traits of lentil and groundnut, and biofortified pearl millet cultivars contribute to the nutrition security. Improved host-resistance and tolerance of GLDC crop cultivars to diseases and pests reduces the input cost and results in environmental sustainability, examples include red podded pigeonpea cultivars in Kenya that offer tolerance to pod borers, Fusarium wilt resistant chickpea in India and Ethiopia, downy mildew resistant pearl millet in India, and foliar fungal disease resistance and aphid tolerant groundnut cultivars in Tanzania and Mozambique. Fodder quality is a key trait for some GLDC crop Product Profiles and a multi-cut fodder sorghum hybrid is release in India, and fodder quality is used as selection criteria for GLDC crop Product Profiles.

Speed breeding protocols are deployed in chickpea, lentil and groundnut to enhance the rate of genetic gain by increasing the number of cycles per year. In groundnut cost-effective semi-controlled conditions resulted in 3.5 cycles per year to develop high oleic varieties in a record 8-years of time from hybridization to commercialization., while in lentils and chickpea fully controlled conditions produced 6 cycles per year. Mutli-location testing received impetus from Flagship 4 to characterize the Target Population of Environments (TPEs) to deliver Products in target agro-ecologies. Early generation selection used high-throughput SNP platform in cowpea, groundnut, soybean, chickpea, pigeon pea, sorghum and pearl millet, and more advanced seed-chip technique is used in groundnut and chickpea for SNP genotyping to reduce cost and enhance operational efficiency.

The Flagship 4 collaborated with Flagship 1 team to identify evidence gaps in the narration of the GLDC crops towards their contribution to the diets and nutrition, and soil and environmental sustainability. Flagship 4 team contributed to the prioritization of FP 1 activities to generate evidence for GLDC narration, and to provide markets feedback on GLDC crops to guide the design of crop Product Profiles. The Flagship 4 team collaborated with the Flagship 5 team to develop and validate SNP panel for quality control (QC), which can be used of hybridity confirmation and line fingerprinting. The HTPG platform enabled early generation selection in groundnut, cowpea, soybean, sorghum, pearl millet and pigeon pea. QC is a key process prioritized for GLDC crop breeding modernization. The collaboration between FP4 and FP3 team established the value proposition of improve soybean varieties as inter-crops and/or crop rotation for sustainable soils and thus environmental sustainability in Malawi.

The Flagship 4 established Crop Network Group (CNG) for soybean, sorghum and millets, groundnut and cowpea in Africa; CNG is a multi-stakeholder platform for crop Product design, development, testing, advancement and delivery. Partnership with private sectors, like food industry, seed industry and service providers for genotyping tools and developing imaging technologies has been instrumental for Flagship 4. The successful model of hybrid parent research consortium (HPRC) to deliver the cultivars of sorghum in ESA The GLDC crop breeding team are able to take services from private service providers like INTERTEK for SNP-genotyping. As part of the modernization of the crop-breeding program, developing drone-based imaging technologies for selection decisions was prioritized and a private service provider, HIPHEN was contacted to develop tools for GLDC crops.

The Flagship 4 did not have a major course correction. Near Infrared Reflectance Spectroscopy (NIRS) and X-Ray Fluorescence (XRF) are routinely used for assessing grain quality of the GLDC crop breeding programs and gains were made to improve the nutritional quality, going forward GLDC together with Harvestplus plans to develop standard operating procedure and facilitate capacity building in targeting biofortificaion in GLDC crop breeding programs. However improved phenotyping facilities are required for diseases, and for nutrient-use efficiency screening. Precision experimental field plots with uniform soil nutrition and land leveling is another major requirement to enhance the efficiency of on-station evaluation trials.

# Variance from Planned Program for this year

(a) Have any promising research areas been significantly expanded? If so, for each example, please explain clearly where the demand came from (promising research results, demand from partners etc.). Where has the money for expansion come from? (max. 150 words)

(b) Have any research lines been dropped or significantly cut back? (Please note that cutting research lines which do not seem to be delivering is seen by Funders and System Organization as a sign of good management, not of failure.) If so, please give specific examples and brief reasons. If funding was reallocated to other work, where did the money go? (max. 150 words)

(c) Have any Flagships or specific research areas changed direction? If so, please describe how, and the reason. (max. 150 words)

1. GLDC crop breeding modernization has been identified as priority to realize enhanced rate of genetic gain by CRP and activities were supported by CRP GLDC to support this. Additional investment was made in Africa across five GLDC crops to improve the breeding and testing processes, and operational efficiency and the initiative is supported by AVISA grant from BMGF and CtEH initiative.
2. No.
3. No changes were made for the Flagship 4’s research area during the reporting period.

# PARTNESHIPS: ACHIEVEMENT AND CHALLENGES

### Highlights of External Partnerships

[Please summarize any interesting highlights, value added and points to improve/ learning points from this year (e.g. on private sector partnerships), and make reference to partnerships reported at the cluster level] (max. 150 words)

The consultation meeting of Hybrid Parents Research Consortium (HPRC) for sorghum, pearl millet and pigeonpea was represented by 35 private sector organizations in Asia, and the successful model is replicated in ESA. The private sector becomes member of the consortium through a fee to access the elite parents from CG. HPRC, pioneered by ICRISAT is a successful model to deliver hybrids GLDC crops, wherein parent material is accessed from the CG by private sector to develop hybrids. In ESA region, Crop Network Groups (CNGs) enhanced engagement with private seed companies and food industries, particularly with ADVANTA Seed Company and Neilsen Seeds. Partnership with private service providers is useful, for example, SNP-genotyping services by INTERTEK. To develop drone-based imaging indices for GLDC crops, HIPHEN, a start-up from INRA-Avignon working mostly for breeding companies to assist them in the generation of indices for breeding plots, has been contacted.

Cross-CGIAR Partnerships

[Please summarize general points on highlights, value added and points to improve/ learning points from this year and make reference to collaborations reported at the cluster level.] Any points you can include on added value of new structures (e.g. Platforms, CRPs) would be very useful.] (max. 150 words)

Resource persons were drawn from seven CGIAR centers/platforms, viz., CIMMYT, ICARDA, CIAT, ICRAF, ICRISAT, IITA, and Excellence in Breeding (EiB) for the second training course to share new technologies and best practices in crop breeding. The course, conducted by FP4 during 10-18 Oct 2019 at Arusha, Tanzania was designed to meet the knowledge gaps of ‘Practicing Plant Breeders’ and crafted to enhance operational efficiencies and rate of genetic gain for a unit cost. The trainees are GLDC crop breeders (12 women and 14 men) from 14 countries of Africa and Asia. Collaboration with International Livestock Research Institute (ILRI) to improve the fodder value of crop residue, the single most important feed resources in most of the GLDC target countries resulted in selection decisions based on fodder quality. About 10,000 samples were assessed for fodder quality parameters, and enabled streamlining of fodder trait in breeding pipeline of GLDC crop Product profiles. The FP4 also engages with EiB to develop tools for using drone-generates images to assist breeding.

# Table 1: MILESTONEs TABLE 2019

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

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

Use outcomes from 2016 proposal (or latest version) and milestones from 2019 POWB.]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Col. 1 | Col. 2 | col. 2a | Column 3 | Column 4 | Column 5 | Column 6 EXPLANATION | Column 7 Links to evidence |
| FP | FP outcomes 2022 | Sub-IDOs | Summary narrative on progress against each FP outcome this year. | Milestone | 2019 milestones status (drop down: complete, extended, cancelled or changed) | Provide evidence for completed milestones (refer back to means of verification, and link to evidence wherever possible) or explanation for extended, cancelled or changed.  Max 50 words/milestone |  |
| Taken from proposal | Taken from POWB/ proposal |  | To be filled at reporting  (prefilled from previous year, for updating) | Taken from POWB (to allow for changes) | to be filled at reporting  (prefilled from previous year, for updating) | to be filled at reporting |  |

# Table 2: Evidence on Progress towards SRF targets (Sphere of interest)

Instructions:

Please complete this table with any available high-quality evidence on progress that was published or made available in 2019. Do not hesitate to state, “no new evidence available this year”, in column 2 if necessary, since we are trying to demonstrate evidence gaps and the need for additional funding for this area.

For examples of how this information can be phrased and referenced, please see Annex Table A [here](https://www.cgiar.org/wp/wp-content/uploads/2018/10/CGIAR-2017-Performance-Report-ANNEXES.pdf) in the previous CGIAR Annual Performance Report. Please provide information on all relevant SRF targets for a single study or innovation, to the extent possible. Example: please see in the 2017 report Annex Table A how findings from a single rice review have been allocated between targets for adoption, poverty and yield increases. Insofar as possible, please also disaggregate the effect of different innovations (e.g. in the above example NERICA rice could potentially be separated from another group of CGIAR rice varieties).

If the adoption or impact data comes from a relevant innovation or contribution of the CGIAR prior to the CRP start-up (e.g. varieties released before the CRP start-up, which for most CRPs would be approximately 2012), then please support statements with published references, as shown in the 2017 Annual Report Annex Table A above. Nearly all adoption or impact studies fall into the above category. There are (as yet) a few cases (two in 2017) in which the estimated figures for at-scale adoption or impact result from an innovation released within the CRP period, for example some biofortification numbers in 2017. If this is the case, then the statement must be supported by a link to an Outcome/ Impact Case Report **Maturity Level 3** (or if not, with unique identifier from any appropriate repository or publisher website).

|  |  |  |
| --- | --- | --- |
| **SLO Target (2022)** | **Brief summary of new evidence of CGIAR contribution**  [Put N/A if the specific SRF target is not applicable to your FP. Put “No new evidence in 2019” if the target is potentially relevant, but there is no new evidence available**.** *Spell out all acronyms.]*  *Maximum 150 words per entry.* | **Expected additional contribution before end of 2022** (if not already fully covered).  ***Optional narrative. Evidence not required.***  *Max. 100 words* |
| **1.1.** 100 million more farm households have adopted improved varieties, breeds, trees, and/or management practices |  | The ongoing adoption studies will be completed and documented in 2020. |
| **1.2.** 30 million people, of which 50% are women, assisted to exit poverty |  |  |
| **2.1.** Improve the rate of yield increase for major food staples from current <1% to 1.2-1.5% per year |  |  |
| **2.2.** 30 million more people, of which 50% are women, meeting minimum dietary energy requirements |  |  |
| **2.3.** 150 million more people, of which 50% are women, without deficiencies in one or more essential micronutrients | Biofortified pearl millet and lentil varieties are commercialized in India with elevated Fe and Zn content. High oleic groundnut varieties offer consumer health benefits and as they contribute to reduced cardio-vascular diseases. |  |
| **3.1.** 5% increase in water and nutrient efficiency in agroecosystems |  |  |
| **3.2.** Reduction in ‘agriculturally’-related greenhouse gas emissions by 5% |  |  |
| **3.3.** 55 M ha degraded land area restored |  |  |
| **3.4.** 2.5 M ha forest saved from deforestation |  |  |

# Table 3: Condensed list of policy contributions in this reporting year (Sphere of Influence)

[Please list policy contributions here. (Please see the [indicator guidance](https://drive.google.com/file/d/1GYLsseeZOOXF9zXNtpUtE1xeh2gx3Vw2/view) for indicator #I1 number of policies which also includes an explanation of what is covered under the term ‘policy’.)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Column 1** | Column 2A | Column 2 | Column 3 | Column 4a | Column 4b | Column 4c | Column 4d | Column 4e |
| Title of policy, legal instrument, investment or curriculum to which CGIAR contributed (max 30 words)  *Spell out acronyms in every row* | Description of policy, legal instrument, investment or curriculum to which CGIAR contributed (30 words). See guidance for what to cover. | Level of Maturity | Link to sub-IDOs (max. 2) | CGIAR cross-cutting marker score | | | | Link to OICR (obligatory if Level of Maturity is 2 or 3) or link to evidence (e.g. PDF generated from MIS) |
| gender | youth | capdev | Climate Change |  |
|  |  |  |  |  |  |  |  |  |

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

Please complete the table below and report the supporting document in MEL unless you have already an external link to be provided.

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

Table 5: List of Outcome Cases submitted by CoA Leaders

|  |  |  |  |
| --- | --- | --- | --- |
| **Column 1** | **Col 2 a** | **Column 2** | **Column 3** |
| **Title of Outcome/ Impact Case Report (OICR)** | **Link** to full OICR. | **Maturity level** drop down for:  1, 2, or 3 | **Indicate if this is:** (drop down)   * new outcome * updated Case- same level of maturity * updated Case- new level of maturity |
|  |  |  |  |