# **Annex 2 – Flagship Report Template**

**Flagship annual report - 2019**

**FP3 – Integrated farm and household management**

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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).

CoA3.1 addressed the issue of biotic stresses through reducing agro-chemical inputs in controlling pest and diseases by tailoring their management options for better efficacy (Table 5). Thus, five strains each of *Streptomyces* and *Bacillus* were evaluated as bio-control agents against *Fusarium* wilt and PGP agents in chickpea under both greenhouse and field conditions and they reduced the disease incidence. In addition, the spatial and temporal distribution of emerging diseases of chickpea and pigeonpea in India was assessed and risk areas mapped. In a large-scale application of biocontrol agents in Benin and Burkina Faso, adults of *Therophilus javanus* were recovered from parasitized *Maruca vitrata* caterpillars collected from cowpea pods 3 years after the release and the borer populations remains reduced by 86.3%.

For the abiotic stresses under the same outcome but looking at achieving efficacy of resource use and validating soil management options, sweet sorghum bagasse was found to decompose fast and its compost prepared with microbes successfully promoted plant growth and significantly enhanced yields. Plant growth promotion products like AMF inoculation proved to be effective on striga infection and yield of sole-cropped maize and maize-bean intercrops in Uganda. Furthermore, five indigenous *Bradyrhizobium* strains were evaluated on soybean and showed promising results with decreasing striga population and increasing biomass and grain yields in Mozambique.

CoA3.2 outcome for 2019 is about sustainably intensified and diversified cropping systems with 6 milestones (Table 5) which have been addressed through developing crop production systems and decision support tools. Thus, large screening of crop varieties for intercropping was conducted in various agro-ecologies. Main activities involved 32 soybean varieties from across Africa evaluated in Mozambique, cowpea varieties evaluated in Malawi, best fit groundnut and pigeon pea varieties in Malawi and India, and cowpea varieties intercropped with local sorghum in Burkina Faso. To create awareness and promote technologies, 236soybean and 185 cowpea demonstration plots on varieties and inputs were established on farmers’ fields. Thirty–six percent of the farmers who hosted the soybean demos were women, whereas women constitute 39% of those who hosted the cowpea demonstration plots. ‘Optimal’ doubled up legume systems were established to train 98 master trainers (28 females) in Malawi. Tested intercrop options included 2:1 maize-cowpea versus 1:1 in Mozambique, groundnut and pigeon pea in India, sorghum with native evergreen woody shrubs in Burkina Faso for which production, radiation and WUE (increased by 44%) and farmers’ opinions were evaluated. In total, 2,500 farmers and extension agents (46% women) were trained in Mozambique and Malawi, extension materials were developed, and 110,000 people are benefitting from the doubled-up legume systems in Malawi.

Decision support tools were developed through completing surveys for farm-household livelihood typologies, innovation adoptions, and assessing the impacts of legume-based technological interventions on production and livelihood in Burkina Faso and Ethiopia. Model specification and data collection are completed, and empirical parameterization is on-going for agent-based modelof community-landscape dynamics. Additionally, nutrient flows are being modelled to generate a “map” to guide stakeholders’ for effective nutrient cycles.

To capacitate farmers in applying tested, adapted and validated options for sustainable intensification and livelihood diversification, CoA 3.3 attempted to develop suite of systems modelling tools/framework for co-designing resilient farming systems. Under assessment across scales and dimensions, a comprehensive framework for farming systems sustainability with five domains and 115 indicators was developed. A multi-dimensional analysis was undertaken to explore the near-future effects of different scenarios on food security dimensions of SI in southern Mali. A remote sensing-based model has been calibrated for millet yield estimate allowing to account for parkland effects (R²=0.70) in Senegal.

Activities about evaluating trade-offs and co-designing farming systems for enhanced resilience and income include the development of a range of new methodologies for combining data collected at different scales as well as correcting bias of satellite derived weather parameters (e.g. CHIRPS) using measured station data; deriving soil parameterization for plot level simulation from landscape datasets (e.g. AfSIS), etc. The central integrator has been to use of crop-soil-climate models. A large farmers field survey assessing the effect of trees at a micro-landscape scale (up to 250 m radius buffer) on the natural regulation of the millet head miner (MHM) was conducted with promising findings. Finally, multi-location trials for designing suitable farming systems for increased resilience and nutrition considering 14 GLDC crop varieties (4 sorghums, 4 millets, 2 peanuts, 4 cowpea) and vegetable crops along with mineral fertilizer assessed on farmers’ fields in Mali (100), and Burkina Faso (60).

Whole farm models were run successfully for 3 districts in India and 2 regions in Niger to support the upscaling of climate resilient agriculture. The cropping system modelling tools are run to help the breeding programs (FP4 & 5) on optimization of GxExM. System dynamics model for sorghum-dairy value chain analysis with micro level data was developed in India (cross cutting MPAB). Farmers in ESA were found to put more value on short term benefits of legumes, thus disagreeing views of aid agencies and national governments looking at long term (FP1 priorities setting).

About knowledge for targeting gender and nutrition under GLDC farming systems, gender-oriented adoption studies were conducted in Burkina Faso for cowpea and in Ethiopia for lentil and chickpea varieties. On nutrition side, KAP surveys revealed misconceptions that may be the potential barriers to consumption behavior change. Therefore, a holistic package of nutrition education was designed to lay the foundations for nutritional knowledge and attitudes.

# 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)

Two main areas have been expanded with in CoA3.3. GLDC helped leverage bilateral project funding (ESA- MSU and Africa Rising; WCA - ATSAP and TAAT; SA – ICAR, SDC, Mahalanobis National Crop Forecast Centre (MNCFC), India) and the communities of practice (AGMIP, Big Data for Agriculture Innovation) in the application of integrative data analysis.

Through ICRISAT and ILRI partnership synergy, GLDC work on whole farm modelling and fodder production potential is being integrated into PIM activity of Cattle value chain competitive assessment in West Africa. We’ve used an integrated whole farm model with a livestock model as part of it, to generate scenarios of animal performance associated with increasing access to quality of feed/ fodder. This will help assess the impact of increased fodder yields as crop residues/ cultivated fodder on animal performance, and ultimately on market value and income from livestock.

(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)

N/A

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

From the last annual meeting in December 2019, it was recommended during the group work to refocus our efforts in evaluating the already existing products promoted by various actors/industry instead of trying to produce our own bio-fertilizers and bio-control agents of pests given the time constraints.

# 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)

* Partnership with national agricultural research institutes in West Africa (INERA for Burkina Faso, ISRA for Senegal) for developing research approaches on the control of pests and diseases.
* Collaborative work on the framework for sustainable intensification and sustainability assessment involving ICRISAT, ICARDA, Wageningen University, Swedish University of Agricultural Sciences
* Joint Commonwealth Scientific and Industrial Research Organization (CSIRO) and ICRISAT Systems modelling and capacity building through workshops.
* Collaboration with national agricultural research institutes (NARS) in Burkina Faso (INERA), Mali (IER), Niger (INRAN), India (ICAR), Tunisia, Syria and Sudan to contextualize research, capacitate stakeholders, partner with farmer communities.
* GLDC helped leverage bilateral project funding (ESA- MSU and Africa Rising; WCA - ATSAP and TAAT; SA – ICAR, SDC, Mahalanobis National Crop Forecast Centre (MNCFC), India) and the communities of practice (AGMIP, Big Data for Agriculture Intensification). This was done through crop-soil-climate models to integrate data with spatial and temporal variation.
* GLDC-PIM whole modelling work jointly conducted by ICRISAT and ILRI

### 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)

GLDC-PIM for whole farm modelling work in West Africa using scenarios of access to quality of feed/ fodder to project livestock performance, market value and potential income for the farmer. The quality feed is expected to come from GLDC work either as crop residues or cultivated fodder.

# 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 |  |
| 3 | FP3.O1. Pest and diseases controlled safely and with reduced agro-chemical inputs | Reduced production risk |  | Efficacy of selected pest and diseases management options | Extended | 1, 2 and 6 |  |
| 3 | FP3.O1. Pest and diseases controlled safely and with reduced agro-chemical inputs | Reduced production risk |  | Efficacy of resource and soil management options confirmed at pilot scale | Extended | 1, 2 and 6 |  |
| 3 | FP3.O2. Cropping systems sustainably intensified and diversified | Increased resilience of agro-ecosystems and communities, especially those including smallholders |  | 3,000 farmers are trained in the use of crop mixes and sequences in which they have jointly identified with researcher for better water and soil management | Complete | Research and training of farmers, extension agents and students on legume systems and crop mixes for better water and soil management for increased productivity | <https://mel.cgiar.org/reporting/report/id/6969/del_id/14401>  <https://mel.cgiar.org/reporting/report/id/6933/del_id/19917>  <https://doi.org/10.1080/14735903.2019.1609166>  <https://doi.org/10.1017/S0014479719000280> |
| 3 | FP3.O2. Cropping systems sustainably intensified and diversified | Increased resilience of agro-ecosystems and communities, especially those including smallholders |  | 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 | Complete | At least two intercropping systems tested in India, Mozambique, Malawi, Uganda, Burkina Faso, Senegal | <https://pub.epsilon.slu.se/16308/7/muoni_t_190903.pdf>  <https://pub.epsilon.slu.se/16153/7/mukangango_m_190517.pdf>  <https://doi.org/10.1007/s10457-019-00455-8>  <https://mel.cgiar.org/reporting/report/id/6969/del_id/14401>  <https://mel.cgiar.org/reporting/report/id/6933/del_id/19917>  <https://mel.cgiar.org/reporting/report/type/crp/id/6959/del_id/19893>  <https://mel.cgiar.org/reporting/outputsreport/id/7620>  <https://mel.cgiar.org/reporting/report/id/6938/del_id/15091>  <https://mel.cgiar.org/reporting/report/id/7621/del_id/15092> |
| 3 | FP3.O2. Cropping systems sustainably intensified and diversified | Increased resilience of agro-ecosystems and communities, especially those including smallholders |  | Ex-post impacts of innovation practices on crop production efficiency and household livelihoods measured | Complete | Surveys have been completed for impacts of legume-based technological interventions on smallholder production and livelihood performance in Burkina Faso and Ethiopia | <https://hdl.handle.net/20.500.11766/8815>  <https://hdl.handle.net/20.500.11766/8901>  <https://hdl.handle.net/20.500.11766/9551>  <https://dx.doi.org/20.500.11766/9512> |
| 3 | FP3.O2. Cropping systems sustainably intensified and diversified | Increased resilience of agro-ecosystems and communities, especially those including smallholders |  | Farm-household typologies characterized and participatory field trials under smallholder conditions in different cropping systems evaluated for common and type-specific determinants of adoptions of innovations, intensification and diversification options | Complete | Surveys have been completed for farm-household livelihood typologies in Burkina Faso and Ethiopia | <https://mel.cgiar.org/reporting/download/report_file_id/13676>  <https://mel.cgiar.org/reporting/download/report_file_id/13677>  <https://hdl.handle.net/20.500.11766/9512>  <https://hdl.handle.net/20.500.11766/9551>  <https://mel.cgiar.org/reporting/report/id/7380/del_id/15062> |
| 3 | FP3.O2. Cropping systems sustainably intensified and diversified | Increased resilience of agro-ecosystems and communities, especially those including smallholders |  | 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 | Extended | 1, 2 and 6 |  |
| 3 | FP3.O2. Cropping systems sustainably intensified and diversified | Increased resilience of agro-ecosystems and communities, especially those including smallholders |  | Methods developed to document the land area the target sites that use crop mixtures and sequences as a means to minimize crop damage in project sites without increasing pesticide use | Extended | 1, 2 and 6 |  |
| 3 | FP3.O3. Tested, adapted and validated options applied for sustainable intensification and livelihood diversification by farmers | Increased resilience of agro-ecosystems and communities, especially those including smallholders |  | Suite of systems modelling tools/framework for co-designing resilient farming systems in GLDC regions | Complete | A comprehensive framework for farming systems sustainability with five domains and 115 indicators in India. A multi-dimensional analysis was undertaken to explore the near-future effects of different scenarios on food security dimensions of SI in southern Mali. A remote sensing-based model has been calibrated for millet yield estimated allowing to account for parkland effects (R²=0.70) in Senegal. | <http://oar.icrisat.org/11246/>  <https://bscmsc.pps.wur.nl/assessment-potential-future-sustain-ability-smallholder-farming-old-cotton-basin-mali> |
| 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 | About 110,000 people have been reached with the double up legumes | An important screening work of legume crop varieties has been undertaken in CoA3.2 for intercropping. This was complemented by demonstration plots that served to train master trainers of which 29% were females. All these actions have led to 110,000 benefitting from the doubled-up legume systems. |
| **1.2.** 30 million people, of which 50% are women, assisted to exit poverty | No new evidence available this year |  |
| **2.1.** Improve the rate of yield increase for major food staples from current <1% to 1.2-1.5% per year | No new evidence available this year |  |
| **2.2.** 30 million more people, of which 50% are women, meeting minimum dietary energy requirements | No new evidence available this year |  |
| **2.3.** 150 million more people, of which 50% are women, without deficiencies in one or more essential micronutrients | No new evidence available this year |  |
| **3.1.** 5% increase in water and nutrient efficiency in agroecosystems | No new evidence available this year |  |
| **3.2.** Reduction in ‘agriculturally’-related greenhouse gas emissions by 5% | No new evidence available this year |  |
| **3.3.** 55 M ha degraded land area restored | No new evidence available this year |  |
| **3.4.** 2.5 M ha forest saved from deforestation | No new evidence available this year |  |

# 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 |
| Biocontrol of pests and diseases | Phyoto-pathology | Up scaling | West Africa, India |
| PGP | Microbiology | On-farm testing | National and regional |
| Legume screening for intercropping | Agronomy | On-farm testing | National and regional |
| Intercrops | Agronomy | On-farm testing | National and regional |
| Farming system sustainability assessment  <http://oar.icrisat.org/11246/> | Framework | Complete | Global |
| A multi-dimensional scenario analysis  <https://bscmsc.pps.wur.nl/assessment-potential-future-sustain-ability-smallholder-farming-old-cotton-basin-mali> | Analysis tool | Complete | Global |
| Cropping system modelling tools  <http://dx.doi.org/10.1071/FP13355>; <https://maps.csita.cz/> | Analysis tool | Complete | Global |
|  |  |  |  |

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 |
| PE analysis and cropping systems modelling incorporated as an integral part of crop improvement programs in ICRISAT  Characterization of the main bio-geo-physical properties of the main crop production systems. Quantification of the main production constraints. In-silico evaluation of the technologies and optimization of GxM for E. Analyses conducted according to the BPAD recommendations and breeding programs demand. Demand defined based on the collaboration with the crop improvement teams (NARES and ICRISAT). | <https://www.icrisat.org/simulating-postrainy-sorghum-yield-response-to-on-station-n-management-in-india/>  Jarolímek\_Kholova, et al 2019. Economics and Informatics 11 (1): 49-53.  Hajjarpoor\_Kholova et al (2018). FCR.  <http://dx.doi.org/10.1071/FP13355>  <https://maps.csita.cz/>  <https://www.icrisat.org/identifying-climate-smart-sorghum-lines-for-mali/> | 2 | updated Case- new level of maturity |
| Comprehensive framework for sustainability assessment  Development and piloting of a comprehensive framework for farming systems sustainability assessment with five domains and 115 indicators in SA and SSA was developed and the same was implemented and validated in one location in India (Nalgonda) for different functional farm types. A good progress has been made on the development of online open access tool for farming system sustainability assessment and would be a global public good. | Some relevant links are here:   * <http://oar.icrisat.org/11246/> * <https://bscmsc.pps.wur.nl/assessment-potential-future-sustain-ability-smallholder-farming-old-cotton-basin-mali>   We have shared the framework with the stakeholders and NARS, however the major output is yet to be published. | 2 | updated Case- new level of maturity |
|  |  |  |  |