# **Cluster of Activities Report Template**

**Cluster annual report - 2019**

**3.3 – Integrated Farm and Household Management**

Authors: **Shalander Kumar and Katrien Descheemaeker** (with inputs from all activity leaders)

# MAIN ACHIEVEMENTS

This section provides a synthesis of main progress and achievements in implementing the annual Plan of Work. Fill this section considering the content of the GLDC POWB 2019 (<http://crp-gldc.icrisat.org/GLDC_POWB-Final.pdf> ). In particular, review the list Outputs (Annex 1) and complete the missing information in MEL. Output related information is essential to inform indicators on Number of innovation and Milestones achievement.

Use the two sections below to highlight key findings with gender, youth, capacity development and climate change relevance.

MAX 1500 characters

**Assessment across scales and dimensions:**

* A comprehensive framework for farming systems sustainability assessment with five domains and 115 indicators was developed and implemented/validated in one location in India (Nalgonda) for different functional farm types. Two Masters students one from India and one from SLU were trained on sustainability assessment and submitted their thesis. A good progress has been made on the development of online open access tool for farming system sustainability assessment. <http://oar.icrisat.org/11246/>
* A multi-dimensional scenario analysis was undertaken to explore the near-future effects of different scenarios of agriculture, value chain and policy developments in the economic, productivity, environmental and food security dimensions of SI in southern Mali <https://bscmsc.pps.wur.nl/assessment-potential-future-sustain-ability-smallholder-farming-old-cotton-basin-mali>
* A remote sensing based model has been calibrated for millet yield estimated allowing to account for parkland effects (R²=0.70) using data from 2017 and 2018 for Senegal.
* Useful information generated on impact of abiotic stresses assessed for millet-sorghum based farming systems in Burkina Faso, Mali and Niger. Biotic stresses assessed for lentil and chickpea. Farmers’ coping strategies documented for both biotic and abiotic stresses.

**Evaluating trade-offs and co-designing farming systems for enhanced resilience and income:**

* Harnessed multiple data sources for integration of analytical methods and modelling to develop spatially and temporally targeted agronomic packages, recommendations for crop traits and interventions considering climate risk.  Across SA and SSA, new methodologies for combining and applying of data collected at scales of plot, farm, watershed to region were developed, for example bias correction of satellite derived weather parameters (e.g. CHIRPS) using measured station data; derivation of soil parameterization for plot level simulation from landscape datasets (e.g. Afsis); on-farm yields from farmer plots, trials, crop cutting, remote sensing.  The central integrator has been to use of crop-soil-climate models to integrate these data sources with spatial and temporal variation being simulated to produce maps of crop performance. These outputs are being used to enable breeders to target crop traits and design product profiles, enable agronomists and extension to develop agronomic packages for sustainable intensification considering climate, soils and sustainability.
* 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) identified interesting relationships between tree species and natural enemy communities, including predatory arthropods, parasitoids and vertebrates such as insectivorous birds and bats. This brings novel insights for managing tree-crop agroforestry systems and related functional biodiversity for improving resilience of agroecosystems in the Sahel.
* Multi-location trials for designing suitable cropping 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 160 farmers’ field in Mali (100), and Burkina Faso (60) have shown promising results.
* Using the integrated systems modelling frameworks and the farm household (500 HHs) data from 9 districts, farm household typologies developed and parametrization completed and basic whole farm models were run successfully for 3 districts (Tirupati, Nalgonda, Nanded) in India and 2 regions in Niger to support the upscaling of climate resilient agriculture in semi-arid regions. Capacity building of extension agencies on systems modelling tools continued.
* The cropping system modelling tools continued assessment to integrate them into the breeding programs as a decision making support tool on optimization of GxExM for target population of environments. Within this activity we focused on a case-study of sorghum crop improvement program of ICRISAT-IIMR, Hyderabad <http://dx.doi.org/10.1071/FP13355>; <https://maps.csita.cz/>
* A synthesis on utility of agri-food systems approach looked at the Impact Pathways and Intervention Strategies for sustainable diets <https://doi:10.3390/agriculture9090185>. For the first time in India we initiated application of innovative tools such as system dynamics modelling for value chain analysis. We developed initial System dynamics model for sorghum-dairy value chain analysis with micro level data from SAT villages in India and with regional scope covering all major sorghum growing regions in India. A news story on this was published in a National daily: <https://www.thehindu.com/news/national/telangana/dynamic-modelling-to-help-improve-farm-output/article30462219.ece>
* A special session on ‘Understanding food systems transitions to achieve nutritional outcomes’ was organized at the annual conference of the Agricultural Economic Research Association. <https://www.cgiar.org/news-events/news/understanding-food-systems-transitions-is-key-to-achieve-nutritional-outcomes/>
* Farmers in ESA were found to put more value on short term benefits of legumes including food and income than long term benefits such as natural resource management. Hence the multifunctional nature of legumes, promoted by aid agencies and national governments do not fully align with the goals of small holder farmers’ legume legumes as a means to generate income and promote nutrition may be the main mechanisms for framing transfer programmes and reduce emphasis on long term goals. <https://doi.org/10.1080/14735903.2019.1609166>

**knowledge for targeting gender and nutrition under GLDC farming systems**

* Gender study in Burkina Faso across the five ALS and examined the potential challenges and opportunities to adopt and benefit from recommended packages considering the implications of intersectional and social differentiations on farmers’ choices to grow cowpea. <https://hdl.handle.net/20.500.11766/10722>
* A study in Ethiopia analyzed factors that can substantially promote or hinder the adoption of improved lentil and chickpea varieties and their differential consequence on men, women and youth with special focus on access to information, agricultural inputs and credit. <https://hdl.handle.net/20.500.11766/10721>
* Field level study in tribal region of India points to low levels of nutrition knowledge, awareness and practices related to food and nutrition and a high prevalence of food taboos and myths. Knowledge, Attitudes and Practices (KAP) surveys reveal misconceptions that may be the potential barriers to consumption behavior change. A holistic package of nutrition education through messaging and other methods is designed to lay the foundations of nutritional knowledge and attitudes.

# Outcome cases and policy influenced (proposed)

Revise and complete the suggested list of outcome cases and policies to be documented

|  |  |  |
| --- | --- | --- |
| **Title of Outcome/ Impact Case Report (OICR) (30 words)** | **Description****(up to 80 words)** | **Geographic scope****(Specify if regional, national, sub-national and provide list of regions/countries)** |
| Based on GLDC work, TPE 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). | ICRISAT\_India, ICRISAT\_Mali, UQ\_Australia, IIMR\_India, CULS\_Czech Republic, CIRAD\_Mali, INRA\_Senegal, IER\_Mali |
| 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. Two Masters students one from India and one from SLU were trained on sustainability assessment and submitted their thesis. A good progress has been made on the development of online open access tool for farming system sustainability assessment. | A comprehensive framework for farming systems sustainability assessment with five domains and 115 indicators has been developed and piloted on different functional farm types. The development of online open access Dashboard tool for farming system sustainability assessment is in advanced stage and would be a global public good. | ICRISAT, WUR, SLU, ICARDA |

|  |  |  |  |
| --- | --- | --- | --- |
| **Name and description of policies modified in design****or implementation, informed by CGIAR research (20-50 words, ideally around 30 words)** | **Type****(policies/ strategies / laws/ regulations/ budgets/ investments/ curricula)** | **Whose policy is this?****The primary organization(s) either designing/promulgating the policy, law, investment (e.g. national government) etc. and/or within which it is operating.** | **Geographic scope****(Specify if regional, national, sub-national and provide list of regions/countries)** |
|  |  |  |  |
|  |  |  |  |

# MAIN ACHIEVEMENTS WITH GENDER RELEVANCE

When possible, make reference to outputs reported, milestones completed, outcome cases or policy influence reported

MAX 1500 characters

* Nutri-food basket project which enrolled the adolescent girl provided a very good opportunity for them to network and participate in community based activity resulting in improved mobility and awareness on nutrition.
* The studies are looking at the challenges, and opportunities, and benefits that recommended packages present for men, women and youth engaged in the integrated farming systems; and explore variations within and across distinct agricultural livelihood types.

# MAIN ACHIEVEMENTS WITH Youth RELEVANCE

When possible, make reference to innovations reported, milestones completed, outcome cases or policy influence reported

MAX 1500 characters

* Young boys (70%) in tribal region of Telangana were found to have more awareness about nutrition and health compared to young girls (15%) as the boys had greater access to smart phone.
* Systems modelling tools validated in south Asia and West Africa are being established as decision support tools for the youth/young farmers to evaluate returns/cash flows from the integrated farming systems and various alternative technology options.

# MAIN ACHIEVEMENTS WITH CAPACITY DEVELOPMENT RELEVANCE

When possible, make reference to innovations reported, milestones completed, outcome cases or policy influence reported

MAX 1500 characters

|  |  |
| --- | --- |
| Capacity building  | Numbers |
| International Training Workshop on Integrative value chain analytics supporting food systems transformation and whole farm modeling, Organized by ICRISAT, CSIRO, ICAR, ILRI and CRP-GLDC on 27-31 May 2019 | Women: 5; Men: 20 |
| Training workshop on systems modelling for NARS in India, Sept 5-6, 2019 | Women: 1; Men: 4 |
| One day hands on training about CLEM CSIRO, Australia on 18 October, 2019 | Men 4 |
| Masters students guided one from India and one from SLU were trained on sustainability assessment and submitted their thesis.  | Women 2 |
| One Master students capacity built on Agri-food systems assessment | Woman 1 |
| Masters students and Ph.D. Student on crop-livestock systems, WUR | Masters students: 1; Ph.D. Student: 1 |
| Masters students and Ph.D. Student on Biotic stress management in Chick pea, ICARDA | Masters students: 1; Ph.D. Student: 2 |
| Ph.D. Student start working on Biomass fluxes in Burkina Faso, WUR | Ph.D. Student: 1 |
| Ph.D. Student on Agro-ecosystems yield monitoring and socioeconomic characterization- CIRAD | Ph.D. Student: 1 |
| Three Masters students of Agricultural Economics from the University of Zimbabwe supervised | Men 3 |
| Two master students from Mali and 1 PhD student from Burkina Faso | Woman 1; Man 1 |
| Multi-stakeholders’ platforms established in Niger and Burkina Faso on Crop-livestock systems and sustainable intensification and organized IP meeting March 2019 | Women 8; Men 25 |
| One day training on additional data collection for estimation of sustainability index have been conducted on December, 2019 | Men: 8 |
| Four-days training on application of R software August, 2019 (2 day) and November, 2019 (2 day).  | Women 4; Men 11 |

# MAIN ACHIEVEMENTS WITH CLIMATE CHANGE RELEVANCE

When possible, make reference to innovations reported, milestones completed, outcome cases or policy influence reported

MAX 1500 characters

* We developed and piloted systems modelling frameworks (crop modelling, and whole farm bio-economic modelling) to support the upscaling of climate smart agriculture in semi-arid India as well as Niger in west Africa. We have also initiated building capacity of extension system on systems modelling tools.
* Our activity on harnessing multiple data sources for integration of analytical methods and modelling to develop spatially and temporally targeted agronomic packages, recommendations for crop traits and interventions particularly target minimizing climate risk.  These outputs are being used to enable breeders to target crop traits and design product profiles, enable agronomists and extension to develop agronomic packages for sustainable intensification considering climate, soils and sustainability.

# MAIN GAPS AND CHALLENGES

Describe the main challenges/bottlenecks encountered and the deviation from your annual plan of work.

Please list any relevant review or study on foresight, monitoring and evaluation that has been realized in the last 12 months at the project/cluster level and that has potentially not been implemented under cluster 1-4: Enabling environments and scaling to accelerate impact (Use Annex 2 to provide this list). Provide results from these evaluations and learning processes, if any.

MAX 1500

A main challenge for the work in West Africa is the precarious security situation in Niger, Burkina Faso, Nigeria and Mali in particular. These countries suffer from regular terrorist attacks, which severely restrict the safe movement of researchers and the execution of project activities.

Current literature on sustainability criteria and indicators is targeting mostly goals/ expectations, rather than concrete solutions. There is a need for transitional research and development that involves quantifiable and easy to measure indicators/methods.

* There is a notable underrepresentation of sustainable intensification (SI) in economics and social sciences compared to agricultural, biological and environmental sciences. Moving to a holistic/integrated assessment will require a stronger assessment of the social and economic dimension of SI. Likewise, the current literature emphasizes the farm scale, with less attention for the landscape, community and value chain level.
* Understanding the impact/cost of non-action in terms of improved technologies, innovation systems, gender mainstreaming and lack of information access.
* Implications of mechanization in relation to feminization of agriculture and its impact on nutrition and empowerment.
* How to assess the impact of the nutrition knowledge tools on the key knowledge indicators?
* Tools and decision support systems to make an ex-ante impact assessment of recommended GLDC interventions to evaluate their impact of household cash flows are not available which would be key for informed decision by agricultural extension system, development actors and farmers for promoting large scale adoption of SI interventions and impacts.

# MEASURES TAKEN AND ADJUSTMENTS PROPOSED

Describe action taken to address challenges/bottlenecks

Provide an update on your theory of change if this is part of the adjustments proposed

MAX 1500 characters

* To adjust to security situation, we work with local partners and identify the field locations based on due diligence. However, it does affect the field work and restrict researchers’ movement in the field.
* Integrating complementary scientific approaches, including the social and economic scientific domains, sectors’ knowledge and perceptions on farming systems sustainability
* Promoting and validating tools for ex-ante assessments that include scales beyond the farm
* Assessments considering nutrition knowledge baseline
* As suggested by IAC, we have initiated a cross-cutting activity on ‘Identifying opportunities from the muddle around sorghum utilization options for improving nutritional security and resilience of smallholders’ households in SAT’.

# PARTNESHIPS: ACHIEVEMENT AND CHALLENGES

Please list up to three important partnerships for 2019, using the following table.

|  |  |  |
| --- | --- | --- |
| **Brief description of partnership aims (30 words)** | **List of key partners in partnership (one or more partners). Do not use acronyms.**  | **Main area of partnership (may choose multiple),** **Research/Delivery/Policy/Capacity Development/Other, please specify**  |
| 1. Collaborative work on framework for sustainable intensification and sustainability assessment 2. Systems modelling and capacity building through workshops3. Contextualizing research, capacity building, linking with farmer communities | ICRISAT, ICARDA, Wageningen University, Swedish University of Agricultural SciencesCommonwealth Scientific and Industrial Research Organization (CSIRO)National agricultural research institutes (NARS) in Burkina Faso (INERA), Mali (IER), Niger (INRAN), India (ICAR), Tunisia, Syria and Sudan | Research for developmentResearch and Capacity developmentResearch and Capacity development |
| Innovation in the application of integrative data analysis. The central integrator has been to use of crop-soil-climate models to integrate these data sources with spatial and temporal variation being simulated to produce maps of crop performance. | 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)  | Research and Capacity development |

Please include collaborations with one or more CRPs or Platforms – or in some cases with other Centers, if these are not already core partners for your CRP.

|  |  |  |
| --- | --- | --- |
| **Name(s) of collaborating CRP(s), Platform(s) or Center(s)** | **Brief description of the collaboration**  | **Optional: Value added, in a few words**e.g. scientific or efficiency benefits |
| GLDC and PIM | Through ICRISAT and ILRI partnership synergy is created by integrating GLDC work on whole farm modelling and fodder production potential into PIM activity of Cattle value chain competitive assessment in West Africa. | On the supply side, we use an integrated whole farm model with a livestock model as part of it, to generate scenarios of animal yields associated with increasing access and quality of feed/ fodder. This will help assess the impact of increased fodder yields as crop residues/ cultivated fodder on animal yields, consequently market value and income from livestock. |

Key partnerships developed and promoted for achieving cluster’s outputs and outcomes are mentioned here:

* Collaborative work on framework for sustainable intensification and sustainability assessment: ICRISAT, ICARDA, Wageningen University, Swedish University of Agricultural Sciences
* Systems modelling and capacity building through workshops: ICRISAT, ICAR and Commonwealth Scientific and Industrial Research Organization (CSIRO)
* Contextualizing research, capacity building, linking with farmer communities: National agricultural research institutes (NARS) in Burkina Faso (INERA), Mali (IER), Niger (INRAN), India (ICAR), Tunisia, Syria and Sudan
* Innovation in the application of integrative data analysis. The central integrator has been to use of crop-soil-climate models to integrate these data sources with spatial and temporal variation being simulated to produce maps of crop performance: 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)
* GLDC and PIM partnership through ICRISAT and ILRI has enabled synergy by integrating GLDC work on whole farm modelling and fodder production potential into PIM activity of Cattle value chain competitive assessment in West Africa.

However long term commitment and flexible scope for sharing resources with partners would be the key achieve impactful partnerships.

# FUND RAISING

Give a narrative summary on the financial status and health of the cluster (all windows).

Provide an update on fund raising efforts.

MAX 1500 characters

Besides initially mapped projects, some new funding was leveraged through the following bilateral projects:

* Next phase of funding obtained for McKnight Foundation for a collaborative project in Burkina Faso (CIRAD, INERA, WUR, AMSP) on “Feeding the soil and the animals to feed the people (3F)”, with co-financing from WUR for one West-African PhD student.
* Funding from LYSA (French Space Agency) and RAMSES2 (UE-Leap Agrin)
* RAMSES2 (UE-Leap Agrin funding)
* SustainSAHEL (UE-H2020 funding)
* ICAR-W3 funding: Integrating systems analysis and modelling tools to identify interventions that enhance farming systems resilience and nutrition sensitive agricultural value chains in semiarid regions of India (about $800k) 2019-2023

# Overall the financial health is good. We are making efforts to develop greater collaboration with large civil society organizations and private sector to leverage CRP funds for big impacts.