Consortium

CALL FOR EXPRESSIONS OF INTEREST
for CGIAR Coordinating Platforms

GENERAL INFORMATION

CGIAR Center: ICARDA, CIMMYT				
Role: (PI, CoI, etc.)	**Name:**	**Organization:**	**Division/Department:**	**% contribution**
PI	Chandra Biradar	ICARDA	Geoinformatics Unit	75
CoI	Quang Bao Le	CRP-DS c/o ICARDA	CRP-DS PMU	50
CoI	Richard Thomas	CRP-DS c/o ICARDA	CRP-DS PMU	10
CoI	Enrico Bonaiuti	CRP-DS c/o ICARDA	CRP-DS PMU	25
CoI	Bruno Gerard	CIMMYT	Global Conservation Agriculture Program	10
CoI	Anita Regmi	Bioversity	Development Impact Unit	10

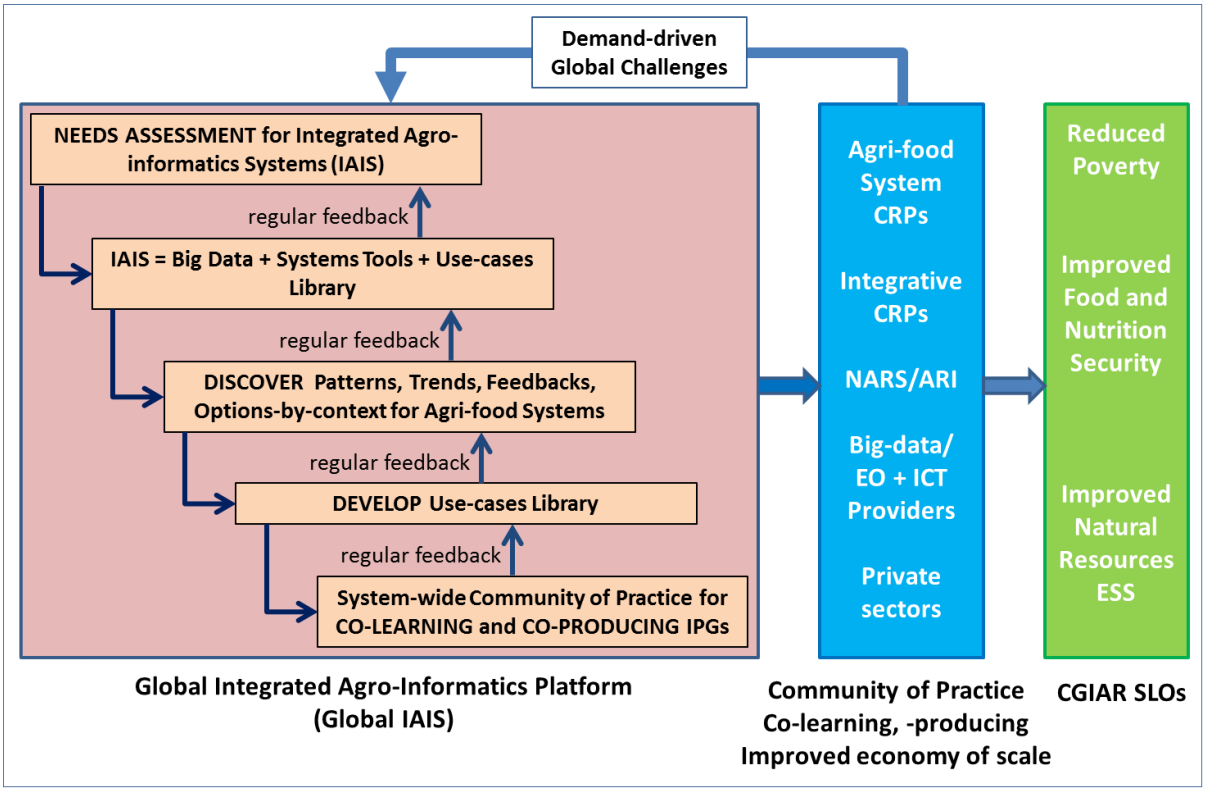
Proposed CGIAR Partners (please delete or add lines as appropriate) Note we have listed potential partners that we know could contribute to this. However many are involved in their own separate proposals and so the final listing will depend on the decisions taken by the CO to establish one or more or combined platforms that will serve the entire CGIAR.				
Role: (PI, CoI, etc.)	**Name:**	**Organisation:**	**Division/ Department:**	**% contribution:**
	Lisa Maria Rebelo / Salman Siddiqui	IWMI	Remote Sensing & GIS and Data Management	tbd
	Anita Regmi / Hannes Gaisberger	Bioversity	Development Impact Unit	tbd
	Michael Peters /	CIAT	Tropical Forages Program	tbd
	Tunrio Alabi	ITTA	Research Database and Geospatial Unit	
	Andy Nelson/ Alice Laborte/Tri Setiyono	IRRI	Market Research and Crop Modeeling	tbd
	Jan de Leeuw	ICRAF	Ecosystem Services and Drylands Systems	tbd
	Jawoo Koo	IFPRI	Environment and Production Technology Division	tbd
	Reinhard Simon/ Victor Mares	CIP	Research Support Unit	tbd
	Shalander K/Gumma MK/Pierre Sibiry	ICRISAT	Resilient Dryland Systems	tbd
	Glen Hyman	CIAT	Decision and Policy Analysis Unit	tbd
	Catherine Pfeifer	ILRI	Livestock Systems & Environment	tbd
	Shwu Jiau Teoh	World Fish Center	Natural Resources Management	tbd
	Kai Sonder	CIMMYT	GIS Unit/ Socio-Economics Program	tbd

Coordinating Program title [limit 150 characters]:	**Socio-ecological Informatics Platform for Global Agri-food Systems Sustainability**

Objectives addressed (please indicate which objective(s) you plan to address in your proposal)

Overall objective: To advance the development and use of an agri-food system informatics (hereafter referred as agro-informatics) platform that promotes geo-informatics, interdisciplinary interoperability of multidimensional data coupled with systems models/tools across CRPs needed for managing sustainable transitions of agri-food systems at national, regional and global scales. Figure 1 below illustrates the proposed impact pathway.

Figure 1. Demand-driven Global Intergrated Agro-informatics System for supporting CRPII Portfolio to achive SLOs.



Specific objective 1: To identify *needs* and *gaps* of information about contextual drivers, risks, framing variables, and performances of major global agri-food systems in order to respond to, adapt to and influence global change;

Specific objective 2: To identify the characteristics of an adequate global agro-informatics systems for effectively *providing* input data for, *prioritization of interventions* as well as *synthesizing* outputs from CRPs;

Specific objective 3: To *discover* global patterns of spatio-temporal trends and impacts (likely *beyond* the scopes of individual CRPs) and iteratively *feedback* these findings to individual CRPs in order to achieve the global challenges as well as contributing to global development;

Specific objective 4: To develop robust *use-cases* of *complementary* data *and* systems tools for supporting national and international policy decisions on agri-food system management;

Specific objective 5: To facilitate system-wide co-learning activities towards co-producing international public goods (IPGs) on global agro-informatics.

Proposed Program Partners		
Name:	**Organization:**	**Input into program (funds, advice, facilities, etc.) and whether proposed (+) or secured (∗):**
Steffen Fritz/ Guenther Fischer // Michael Oberstener*	IIASA, Austria	IIASA global datasets (e.g. global cropland extent dataset, global field size datasets Harmonized World Soil Database, Global Forest Database, Global Agro-ecological Zones, Databases of various climate scenarios and globally techno-social scenarios), global and regional systems models (e.g., Environmental Policy Intergated Model - EPIC, global model to assess competition for land use between agriculture, bioenergy, and forestry - GlOBIOM), Global network of volunteers improving the quality of global land-use and land cover datasets (Geo-Wiki) and a customizable validation and accuracy assessment tools.
Jeffrey Herrick*	USDA, USA	Standardized rangeland assessment protocol with a focus on resilience, Land-Potential Knowledge System (LandPKS), Mobile Apps and Cloud Computing for developing global system that collects, integrates and shares local and scientific knowledge to increase sustainability and productivity, Connect to network of long-term research sites in dryland.
Geert Sterk*	Utrecht University, The Netherlands	Spatio-temporal assessment of land degradation, Landscape functions and services.
Ramakrishna Nemani/Sangram Ganguly*+	Director of Ecological Forecasting Laboratory, NASA, USA	Developing tools and techniques for producing ecological nowcasts and forecasts using satellite and climate data through a modeling framework called the Terrestrial Observation and Prediction System (TOPS). Collaborative computing in the Earth sciences. Building the NASA Earth Exchange, a collaborative computing platform for providing direct access to data, models, analysis tools, and scientific results through a supercomputing platform that fosters knowledge sharing, collaboration, and innovation.
Xiangming Xiao*	Director Earth Observation Modelling, OU	Applications of remote sensing and GIS in ecosystems science and natural resources; land use and cover changes; ecosystem service assessment; biogeochemistry of terrestrial ecosystems; ecosystem modeling at large spatial scales; integrated impact assessment of climate change; ecology and epidemiology of infectious diseases.
Randall Hanson+	USGS, USA	Impact of climate change on the water and natural resources, regional flow modeling and framework analysis and related decision support tools, assisting with development of the Farm Process for MODFLOW, and climate variability analysis and water supply issues and applications of new modelling methods.
Vara Prasad*	Director, Sustainable Intensification Innovation Lab, KSU, USA	Future Innovation Lab for Collaborative Research on Sustainable Intensification (SIIL). Understanding responses of food grains to changing environments (temperature, water and climate change factors) and developing crop management strategies for efficient use of inputs. International research programs in Africa and Asia focusing on soil, water, nutrient and crop management practices, and stress tolerance for improving crop productivity.
Christopher Conrad*	DLR, and UV, Germany	Sustainable Land Management, Economic and Ecological Restructuring of Land and Water Use in central Asia.

Felix Rembold[+]	MARS group, JRC, Italy	Natural resource monitoring and change analysis, crop yield forecasting. Food security assessment .
John S Latham[+]	FAO	Global land cover assessment, promoting sustainable land resources management and agricultural production .
Susan Crespo*	ESRI	Agriculture Industry Manager. Leading ESRI's GIS platform to support global solutions for agriculture and food security
Lloyd A. Treinish[+] / Vikas Manoria	IBM, Big Data	Big Data and Analytics technology and supercomputing for Smarter Planet, issues related to weather, water, energy, climate and sustainability. Deep Thunder advanced modelling for weather-sensitive decision making and precision agriculture.
Tyler Erickson[+]	Google, GEE	Developer and advocate on the Google Earth Engine geospatial analysis platform. Utilization of the capabilities of Earth Engine and related geospatial tools, geospatial analysis, visualization, and the design of geospatial data systems. Big data and vertical water initiative of the Google Earth Engine.

Composition, expertise and experience of program team, including any previous collaborations [limit 1 page]

This proposed platform team builds on an active community of practice (COP) on Integrated Systems Analysis and Modeling of CRP-Dryland Systems, the associated Geoinformatics Unit at ICARDA and the Agro-geoinformatics group at CIMMYT and Development Impact Unit at Bioversity, which have worked across CGIAR centers with strong co-operation with non-CGIAR organizations in Earth Observation and global environmental systems.

The new platform is designed to be a cost-effective flexible unit that can harmonize data analysis and linkages with large data sets. We initially propose a platform that is integrated into the proposed DCLAS, WHEAT and MAIZE CRPs, as tier 1 CRPs. WHEAT CRP II confirmed it will contribute $500,000 p.a. to the setting up of the proposed platform. **The partnership is open to other CRPs** who can join the platform during the course of operation.

The team recognizes that collaboration and co-learning with non-CGIAR partners on integrated agro-informatics is essential to success with respect to the sustainability of the platform itself and its services to CGIAR centers and partners. Thus, more CoPs from non-CGIAR organizations will be included where appropriate, to ensure a broad coverage of relevant topics using existing expertise inside and outside the CGIAR.

ICARDA will be the lead center of the platform. It can tap on its strengths of its recognized capacity in agro-geoinformatics and system modelling, as the lead center of the CRP Dryland Systems and as a major partner in the new DCLAS CRP. CIMMYT will be a co-lead center building on its existing capacities. Along with CGIAR and international program partners, we are also proposing to establish partnerships with advanced NARS, ARIs, local academics and institutions as co-learning, feedback and dissemination mechanism. Further details on partnerships will be considered during the preparation of the full proposal.

The lead team members include:

Chandrashekhar Biradar is a principal agro-ecosystems scientist who heads Geospatial Science, Technology and Application (GeSTA) research for ICARDA and the CRP-DS. He received a Ph.D. in remote sensing and environmental sciences from the Indian Institute of Remote Sensing and University of Pune (India). He served as a research scientist and professor at the institute for the study of Earth Oceans and Space EOS, University of New Hampshire and Earth Observation and Modelling Facility at the University of Oklahoma, USA. Over the last 18 years, he has produced the first satellite sensor and innovative methods serving global croplands of

the world, including the mapping, ex-post and ex-ante assessments of agro-ecological dynamics in the face of climate change. He will coordinate the joint work on improving the inter-operability of the integrated agro-informatics systems (objective 2), discovering global patterns of spatio-temporal trends of food production/security, environmental services and livelihoods in connection to research activities of joint CRPs (objective 3), use-case library development (objective 4) and global co-learning (objective 5) .

Quang Bao Le has more than 15 years on integrated systems research applied for agro-ecological and livelihood systems using big data and ICT from local to global scales. He holds a doctorate in integrative geography from the University of Bonn and has worked as postdoctoral and senior researcher in the Center for Development Research (Germany) and ETH Zurich (Switzerland). He currently acts as the Agricultural Livelihood Systems Expert in the CRP - Dryland Systems, where he initiated and coordinates the Integrated Systems Analysis and Modeling Group (iSAMG), a global community of practice. Dr. Le will coordinate the joint development and practice of systems approach in agro-informatics systems (objective 1), the coupling between big data and simulation models (objective 2), the development of use-case library (objective 4) and facilitate the global co-learning (objective 5).

Richard Thomas directs the CGIAR Research Program on Dryland Systems and scientifically coordinates the Global Economics of Land Degradation (ELD) Initiative. Over the past 25 years he served as leader of many global systems-based research initiatives such as the Drylands Threatened Ecosystem program (UNU), Natural Resources Management Programme (ICARDA) CGIAR's Task Force on Integrated Natural Resources Management (membership). Dr. Thomas will take the strategic leadership of the proposed platform ensuring strong integration across CRPs and with other global research imitative (e.g., Global ELD) toward achieving the three SLOs mandated by CGIAR.

Enrico Bonaiuti is the CRP Dryland Systems Research Program Coordinator. He holds an M.Sc. in Agricultural Sciences from the University of Florence and an M.Sc. in Marketing and Economics from the University of Milan (Italy). Enrico served previously as Monitoring and Evaluation Specialist for international agricultural development programs supported by the US and Italian governments. He is well-recognized for his development of the CRP-DS and CGIAR platform on Monitoring, Evaluation and Learning (MEL) (http://mel.cgiar.org) that is currently practiced by many CRPs. On the proposed platform, Enrico will contribute substantially to the effective governance of the platform and ensure the interconnection of the platform to all CRPs through the MEL system (across 5 objectives)

Bruno Gerard is a Director of the Global Conservation Agriculture Program at the International Maize and Wheat Improvement Center (CIMMYT). He coordinated the System-wide Livestock Program (SLP) at ILRI. Dr. Gerard earned a doctorate in Agricultural Science from the University of Hohenheim (Germany). He has researched into agricultural systems analysis and decision-support systems for integrated soil fertility management, crop-livestock interactions that applies Earth Observation big data and ICT.

Outline of activities proposed, including how these address the objectives of the program [5 pages]

Objective 1: Identify need for and gaps in information about contextual drivers, risks, framing variables and performances of major global agri-food systems.

***Justification*:** The central question guiding the elaboration of this activity cluster is: *What do we need to observe in the agri-food systems, and at what scales, in order to respond and adapt to global change and enhance global sustainability*? Although major investments are being made to build global monitoring and database systems, they still fall short of what is needed to answer this question. The existing big-data systems are general services rather than purpose driven that target information on drivers, risks, framing variables, performances of agri-food systems. Most of these global geo-databases are biased towards biophysical data that are insufficient to support multi- and inter-disciplinary approaches needed for improving agri-food systems. Cross-scale and data-tool interoperability are largely poor, limiting the robustness of the use of the available information resources. Data patterns of human (including different social groups) responses to agricultural development and subsequent environmental changes (including changes in national policies, agricultural technologies and practices) are generally lacking. Thus, there is an urgent need to establish a new global agro-informatics system in order to (1) encompass biophysical and socio-economic dimensions with respect to agri-food systems, their drivers and socio-ecological responses, (2) link data across scales, and (3) efficiently couple data with complementary systems models/tools. All of these are needed to support the diagnosis of systemic changes and develop integrative management strategies of agri-food systems in cost-effective and inclusive ways.

***Main activities*:** Detailed information needs and gaps will be identified in the following broad criteria describing agri-food systems:

- Geographic patterns and temporal trends of agri-food system drivers: including proximate and underlying, biophysical and socio-economic factors; historical and future (in different scenarios) trends of these drivers.
- Indicators of agri-food system performance: degrees of food productivity/availability, access, utilization, stability, and environmental impacts (land degradation, natural resource base involved) at different scales.
- Patterns of human responses to agricultural development and subsequent environmental changes, including changes in national policies, agricultural technologies and practices.
- Data on key components and processes, biophysical, ecological and social aspects, constituting performances of agri-food systems with scale-relevant aggregations.

Main activities of the agro-informatics system needs/gaps assessment include:

- Develop relevant tools for the assessment in consultation agro-informatics developers and users across CRPs (CGIAR centers and collaborating partners).
- Conduct the assessment surveys across CRP II portfolios.
- Analyze and evaluate the surveyed data by the platform coordinating team.
- Synthesize and consolidate the needs/gaps assessment through international workshops with the participation of stakeholders (CRPs - CGIAR scientists and partners, advanced research organizations and private sector related to agro-informatics).

Objective 2: identify the characteristics of an adequate global agro-informatics systems for effectively providing input data for synthesizing outputs from CRPs

***Justification*:** The core question shaping the standards needed for the new agro-informatics system is: *What are the characteristics of an adequate informatics system for efficiently*

supporting agri-food system research and creating global desirable impacts? While there are large numbers of datasets of thousands of data categories on agriculture, environment, population and development available on the Internet, most of them are not well-connected to each other. Even though many of these data sets are being coordinated globally through existing big-data initiatives managed mainly by international institutions, costs, timeliness and efficiencies are limiting wider exchanges needed for global integrative research on agri-food systems.

Poor interoperability characterizes current big-data schemes and in particular for following critical interfaces: *quantitative* vs. *qualitative* data, *place-based* vs. *flow-based* data (e.g. agroecology vs. value chains), *data* vs. *models/tools*, and *different disciplinary groups/institutes*. Furthermore, most of big-data schemes work as one-way, purpose-free service providers with a lack of timely updates from research projects. In order to address the global challenges of food, livelihood insecurity and environmental degradation, big-data + ICT schemes must be designed in a way to foster society's learning capacity by promoting *effective information feedback loops* at multiple scales.

Main activities*:** The proposed agro-informatics platform will enable nominated scientists from individual CRPs, together with their partners (communities, NARS and private sectors) to work together to develop the agro-informatics system **standards** and best practices so that diverse pieces of sub-systems can ***complement each other, resulting in amplified outcomes and impacts. Characteristics needed for robust and effective global agro-informatics systems will need research activities on standard development for enhancing:

- Interoperability between *quantitative* vs. *qualitative* datasets.
- Interoperability between *place-based* vs. *flow-based* datasets and modeling tools
- Interoperability between *geospatial data* vs. *modeling tools*
- Interoperability among data systems of different research programs (CRPs) and NARS
- Effective information feedback/exchange loops between data providers and users at different scales.

Main research activities include:

- Conduct assessments of current interoperability of current agro-informatics systems regarding the above aspects. The starting points will the Geoinformatics systems operated by the lead centers (ICARDA and CIMMYT) and collaborating partners.
- Conduct an analysis of interoperability standard requirements for interdisciplinary framework across the scales and options.
- Advance the development of standards system-wide interoperability and select integrated electronic systems that support data contents, models requirements and simulations.
- Participate in relevant professional association and across CRP work to inform the proposed standards and get feedbacks for verifying.

Objective 3: Global patterns of spatio-temporal trends and impacts for iterative feedbacks to individual CRPs

***Justification*:** Precise and timely information is one of the key factors in understanding current trends, patterns and status in food security from local to global scales. Recent advances in geoinformatics-big-data and cyberinfrastructure are transforming integrated agro-ecological and livelihood systems research by providing powerful **overarching-tools** to help "farming-stakeholders" (scientists, farmers, decision makers and system modelers and think-tanks) at various scales/levels (farms/household to landscapes/population). This is an indispensable

mechanism for making various decisions from smallest sampling frame on agricultural research trials to on-farm operations, to markets and consumers. The increased availability and application of very high resolution (at space-time) **Earth Observation (EO)** data, ranging from drones to satellites on a real-time basis helps to achieve 'precision-decision' making. Topics include choosing appropriate interventions matrices for the appropriate areas such as adaptive varieties, suitable agronomic practices, appropriate inputs, harvesting and marketing leading to increased net returns with decreased environmental impacts as well as improved economic impacts. The interventions at the right geographic hotspots, while measuring subsequent impacts and iterative feedback to system domains, will act as one of the key catalysts in integrating CRPs, cross cutting research domains (package of practices), integrated systems analysis and modeling, and community of practices (Citizen Science). This integration will contribute to global agro- and livelihood systems research. The proposed coordinating platform will enable researchers to effectively incorporate the constellation of biophysical, climatic, socio-economic, and institutional factors controlling the adoption of new innovations and technologies. As a result, these spatial data and knowledge base are critical to supporting 'systems' approach to agricultural research for sustainable development.

***Main activities*:**

- Conduct inventory of existing and latest geospatial datasets at local to global scales and across the CRPs, CSI community and collaborating international partners.
- Develop common data framework and interoperability standards and align the global products to improve the system research and interventions.
- Develop mechanisms for efficient uses of **Earth Observation (EO)** data and informatics for time-sensitive (near real time) precision decision tools for tracking of the major agricultural production and market systems.
- Develop mechanism and tools for suitability and similarity matrix and context to facilitate the outscaling of the interventions from local to large domains and vice versa.
- Develop precasting, nowcasting and forecasting using global open-access EO and climate data through a modeling framework to facilitate development of context scenarios and ex-ante assessments in individual CRPs.
- Develop and map global patterns of spatio-temporal trends and impacts relevant to the new agri-food systems CRPs and integrative CRPs. This includes not only the global mapping products, but a mechanism of information system management allowing robust updating new big data (e.g. EO and global statistics) availabilities in future.
- Use of global mapping products to improve systems research in CRPs, by providing data for constructing context scenarios that shape predictive or ex-ante assessments in individual CRPs.

Objective 4: Develop robust use-cases of complementary data and systems tools for supporting national and international policy decisions on agri-food system management

***Justification*:** Big data presents opportunities but also faces two major challenges for agro-informatics: (1) the complication of big data themselves and (2) the lack of guidelines satisfying diverse needs in big data applications. The first challenge is caused by various types and formats of social and ecological data, rapid data updates (e.g., EO), and inherently large data sizes (e.g., geospatial). Overcoming this challenge requires appropriate hardware and software for handling big data with improved data collecting, computing, storing and transferring capacities. The aims of this co-ordination platform is not to invent fundamental informatics,

but rather smartly use advances in hardware and software for handling big data efficiently and effectively to achieve the objectives of CGIAR. The second challenge deals with the absence of sufficient guidance to utilize big data resources for diverse users' needs and contexts, which are specific with respect to purpose, objective, application scales, institute's or group's capacity and many other factors. Today, system informatics deals with this complex challenge by following **use-case approach that** has not yet been applied in the CGIAR. A *typical use-case* is a sequence of limited steps that describes the interactions between a *typical* user (or *users group*) and the information system to accomplish a *typical* goal. To cope with diverse uses needed, the approach aims at establishing **use cases library** that consists of as many as possible typical use cases. Given a use case library, a specific user can find a typical use case that is similar to his/her need for rapid application with low cost. Recognized strengths of the approach are: (1) strong analytical perspective and complete analysis assurance, (2) simple and easy to understand and pick up, (3) widely recognised market standard, (4) encourage join work between users and system designers to develop typical use case library.

***Main activities*:** Activities will include three interrelated groups:

- **Multi-stakeholder use cases development process** across individual CRPs that consists of 4 standard steps: (1) joint identification of typical use cases, (2) identification of sequential steps for each typical use case needed to process inputs to produce expected outputs, (3) identification of elements within sequential steps (triggers, inputs, outputs), and (4) use case validation (correctness, completeness and relevance). Each individual CRP will be expected to offer and develop about 5-15 typical use cases using big data resources that advance the following analytic and systemic dimensions (from simple to complication):
  - timely conditional queries (e.g., query relevant portfolio of SLM options by defined social. policy, economic and ecological contexts,
  - pattern synthesis, (e.g., hotspots of land degradation and livelihood vulnerability for prioritization of restoration/conservational interventions, areas converged by high degrees of agricultural dependency, poverty and ecosystem service degradation),
  - relational analysis (e.g., socio-ecological causes of land degradation, intermediate and underlying determinants of farmers' adoption of innovations in agricultural technologies, market mechanism and),
  - prediction (interpolation, extrapolation over space and time) (e.g., global patterns of yield gaps based on sample data, global data of yield regulators and crop modeling, eco-efficiency of agricultural),
  - scenario development (e.g., context scenarios: plausible scenarios of key underlying drivers of agri-food systems such as population pressure, climate change, agro-ecological potentials, economic development status, demands in food and ecosystem services; intervention scenarios: portfolios of technical, policy and institutional options organized in time and actor types (linkages to PIM and other CRP flagships on scenarios will be developed).
- Develop tools for implementing and collating the use case studies that improve interoperability with respect to the critical interfaces described under Objective 2.
- Compile a **use cases library** of the CGIAR ago-informatics system based on the developed typical use case and **tested** for actual uses by private sectors, NARS and communities.

Objective 5: Facilitate system-wide co-learning activities towards co-producing international public goods (IPGs) on global agro-informatics.

***Justification*:** There is no doubt that big data agro-informatics systems is one of the effective instruments to address complex, deeply systemic problems such as chronic poverty, food insecurity, natural resources degradation and scarcity in a rapid changing world. However, agro-informatics is still in its earliest stages in the sense that pieces of knowledge are independently developed and scattered among diverse research/academic groups and organizations. Much of progresses in this new field has been done by non-CGIAR research bodies. At the same time, the CGIAR would need to benefit from the new growth in the science field in advanced research institutions, university and private sectors (e.g. IBM, Google, etc.) for developing new capacity of big data agro-informatics research in the CGIAR. National research/academic institutes are key stakeholders of the societal efforts toward achieving the ultimate development outcomes aspired to by the CGIAR, through contributions to methodologies and scientific personnel (via graduates/post-graduates). When dealing with sustainable transformations, science increasingly is, and will continue to be, involved in the challenge of dealing with normative and value-related issues. In many cases, scientists in national academia often do not have access to enough knowledge, power and practice to sufficiently analyze the problem. Cooperation with CGIAR, the largest global consortium in agricultural and natural resource management research-in-development, means having a major opportunity to contribute to and benefit from the development context that traditional academia are lacking.

Concerns have converged around the need to establish a globally open co-learning forum on development and practice of big data agro-informatics involving scientists from both CGIAR centers and non-CGIAR research/academic bodies to create a new knowledge source for spurring innovative systems research. We propose forming a **Global Co-learning Consortium** for Big Data Agro-informatics (GCCAI) that will provide a platform for bringing together scientists from various disciplines and developers with an interest to move towards the SLOs mandated by CGIAR.

***Main activities*:** The focus for the co-learning is how to advance the integrated systems approach for research-in-development towards all three SLOs. Activities performed by GCCAI include, but are not limited to, advances in:

- Continuous contribution to the development of the use case library.
- Critical and comprehensive reviews of the current stage of knowledge, common research needs/questions, and new trends in agro-informatics and big data applied to agricultural and natural resource management research and development,
- New ideas, developments and successful practices of concepts, frameworks, methodologies and tools on agro-informatics utilizing big data for addressing better common research questions.
- Innovative options for enhancing interdisciplinarity (especially between natural and social sciences) and trans-disciplinarities (i.e. equal footing, scientifically robust collaboration between science and public, private and policy sectors) in and through the use of big data agro-informatics. This includes, but is not limited to, progresses in joint developments of use cases that enhance the viability of inter- and trans-disciplinary processes.
- Demonstrative cases for added values, and/or cautions, of big data agro-informatics and towards achieving development outcomes.

- Sharing data, methods/tools towards co-producing collective scientific products as international public goods with co-authorships recognized.
- Strategies and options to strengthen systems thinking and practices in societal learning and decision-making systems.
- Leverages for increasing inclusive uses of big data resources and agro-informatics.

Expected outcomes and impact [1 page]

A new, well-interoperated global agro-informatics system is practiced by scientists, students, and developers from CGIAR centers and non-CGIAR institutes (including private sectors) for supporting their research and/or development progress toward achieving the CGIAR SLOs. By developing a central informatics system CRPs will benefit from economies of scale and reduced costs by the following:

- Precise and timely information of current trends, patterns and status in food security and its drivers from local to global scales for supporting decision-making at multiple scales (from farm to global levels). This includes the defined hotspots for prioritization in interventions, and geographic similarity domains for extrapolation of place-based results to enhance the impacts.
- Multi-scale data/information regarding options and conditional contexts that enhance the out- and up-scaling of place-based outcomes, and desirable systemic impacts of projects' interventions.
- User-friendly overarching-tools and use-cases library to help organize stakeholders (scientists, farmers, decision makers and system modelers and think-tanks) at various scales/levels (farms/household to landscapes/population) to accomplish complex tasks with time-bound, low cost and highly consensus.
- Recognized critical feedback loops at multiple scales that regulate the trade-offs or synergies in agri-food system performance as a new knowledge base for managing trade-offs.
- Recognized explicitly information feedback loops among CRPs resulting in synergies that should be enhanced to increase overall efficiency and co-benefits.
- Enhanced interdisciplinary and trans-disciplinary co-operation among CGIAR centers' teams, with advanced research institutes and private sector.

Through its research functions (beyond the scope of individual CPRs), the platform itself will produce International Public Goods accounting for a new strand of integrated agro-informatics systems including:

- Globally synthesized knowledge of future scenarios of major agri-food systems and co-produced win-win options to ensure that transitions of major agri-food systems are profitable and sustainable.
- System-based decision support tools, comprising well-cataloged big data, relevant systems tools and use-case library making use of the big data and tools that can help achieve resilient, productive, and inclusive agri-food and livelihood systems.
- System-based and inter- and trans-disciplinary guidelines for effective uses of the global integrated ago-informatics systems. The guidelines will be generic but structurally-explicit to aid integrated system projects and programs to systematize their multi-stakeholder discourses with much better outcomes. The guidelines will be functional-dynamic along the stakeholders discourse: in each step, relevant participatory forms, extents, stakeholders and suitable methods/tools will be identified and implemented.

Briefly explain how you plan to manage the program [1 page]

The proposed platform can operate either as a stand-alone entity within the CGIAR or form part of a larger platform on Big Data and ICT by linking to other possible initiatives submitted by the centers. The description below is for a stand-alone platform.

The Platform operates through five Work Packages (WP) aligned to the five objectives within and beyond each of the approved CRPII mandates. The WPs are led by CG Centers and non-CG Partners with world wide experience in this field. Each WP develops a work plan together with specific ToR for their Leader in the first 30 days after the approval of this proposal. They ensure that the program is properly planned and implemented in accordance with the program mission and vision. The Platform aims to promote interdisciplinary interoperability of multidimensional data coupled with systems models/tools across CRPs. The intended approach will mitigate the risk of individual CRPs not integrating operations and enhance a global knowledge sharing as per CGIAR mandate. The Platform develops specific governance and management structure applying the wider CGIAR principles/strategies to ensure compliance with the consortium (see Figure 2).

The effective governance is achieved through 2 main bodies: a Steering Group (SG) and a Management Committee (MC) see Figure 2. The MC reviews the Plan of Work and Budget (POWB) to ensure consistency, and integration among the five WPs. It also endorses the budget allocation that is then reviewed by the SG before final approval by the Lead Center Board of Trustees (BOT). The MC is chaired by a non-CG Partner on a yearly rotation, and is comprised by its Co-Chair, Lead Center Principal Investigator and the 5 WP Managers and Co-Manager. The Lead Center will provide a Secretariat to document and follow up the Committee deliberations. The MC meets once a year (October) in Montpellier and twice a year using videoconference (March – June).

The SG is appointed by the Consortium (Chief Science Officer) among current members of the CGIAR Independent Science and Partnership Council (ISPC) and Independent Evaluation Arrangement (IEA). It is chaired by an Independent Member from Partner Institutions and its secretary is the Platform Chairman. Membership is established on a two year rotation with the opportunity of a second term only. Members profile are public and available on a dedicated page on the CGIAR website. ToR for the SG and MC are approved by the Consortium and the BOT. The SG meets once a year in person (November) in Montpellier and twice a year using videoconference (April – July).

Each SG and MC meeting is open to observers and notification is sent to Fund Donors.

At WP level, the planning and implementation body is the WP Committee (WPC). This body is chaired by the WP Manager and Co-Manager appointed by the MC and SG Chairs. WPC members are CRPs Focal Points and non-CG Partners. This body drafts the POWB in accordance with its objective for the upcoming year and monitoring the implementation. All key positions have defined ToRs with responsibilities and accountabilities to be approved by the SG.

The Platform will ensure Monitoring and Evaluation of its activities with an open platform established at CGIAR level (http://mel.cgiar.org). The MC will define indicators harmonizing the current CGIAR SRF ones and the specific ones developed by CRPs. As part of the M&E process the MC will identify risks and related plans to mitigate them.

RESOURCES

Estimated resources requested (annual budget)

Item	Amount
Platform Management Unit and Overarching Research	$ 600,000
Focal points time for CoP (not of PMU) work	$ 100,000
Travel & related for platform meetings, PI/CoP presentations in key meetings of CRPs and related international conferences/symposia	$ 50,000
Additional ICT/Cyberinfrastructure facilities needed*	$ 170,000
Objective 1: Identify needs and gaps of information to be fulfilled by the Socio-ecological Informatics Platform (joint partners' activities)**	$ 50,000
Objective 2: Characterize the Global IntegratedlAgro-Informatics Platform (joint partners' activities)***	$ 80,000
Objective 3: Discover global patterns of spatio-temporal trends and impacts (partners' activities)	$ 600,000
Objective 4: Develop and implement use-cases library (partners' activities)	$ 800,000
Objective 5: Facilitate system-wide co-learning activities towards co-producing IPGs (partners' activities)	$ 500,000
Overall institutional overhead at 20%	$ 590,200
Total	**$ 3,540,000**

* All invested in the 1st year = $ 510,000; ** All invested in the 1st year = $ 105,000; All invested in the 1st year = $ 240,000

The total annual budget is of 7 Full Time Equivalent (FTE) units for IRS. Contributions from partner CRPs (WHEAT, MAIZE and DCLAS) is about 20% of the total budget. The new WHEAT CRP confirmed to contribute $500,000 p.a. Non-CGIAR partners share about 20% of the budget by in-kind contributions.

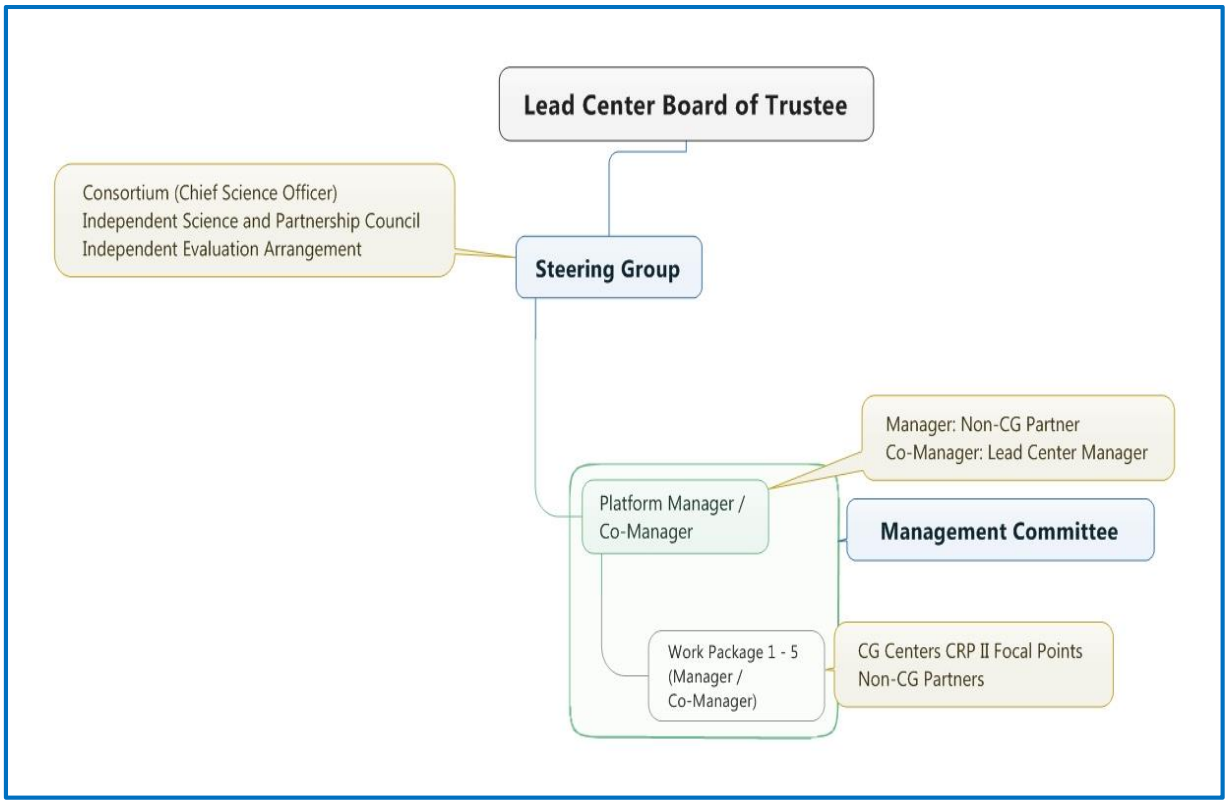


Figure 2. Proposed governance & management structure