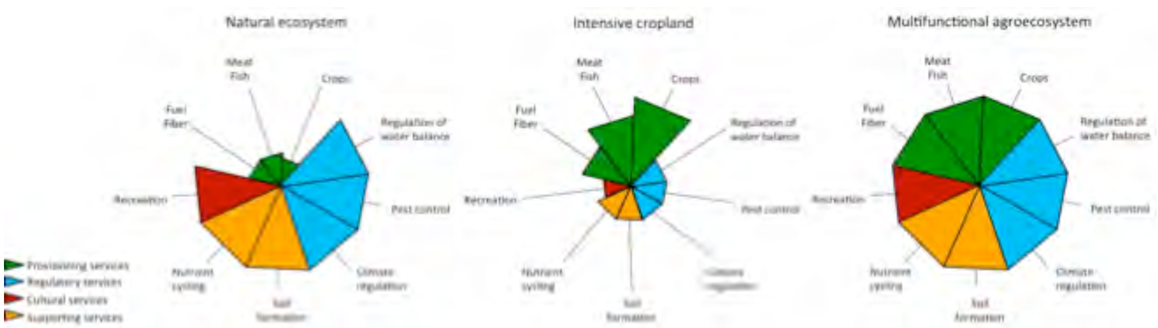
CRP5 appendices

Appendix 1 Supplementary scientific information

Appendix 1a) The science behind ecosystem services and resilience

The interest of agricultural development research in ecosystem services and resilience reflects a core idea well framed in the Millennium Ecosystem Assessment, that the human condition is tightly linked to environmental condition, and that services provided by nature have recently become so imperiled that we can expect negative feedbacks to people (MA, 2005). Agricultural ecosystems have been managed primarily to optimize provision of food, fiber and fuel. However, these services depend on a web of supporting and regulating services as inputs to production (soil fertility and pollination), and people's lives depend on a further web of services (flood control, climate regulation) to control risks and vulnerability or to be resilient to shocks (Zhang et al., 2007).

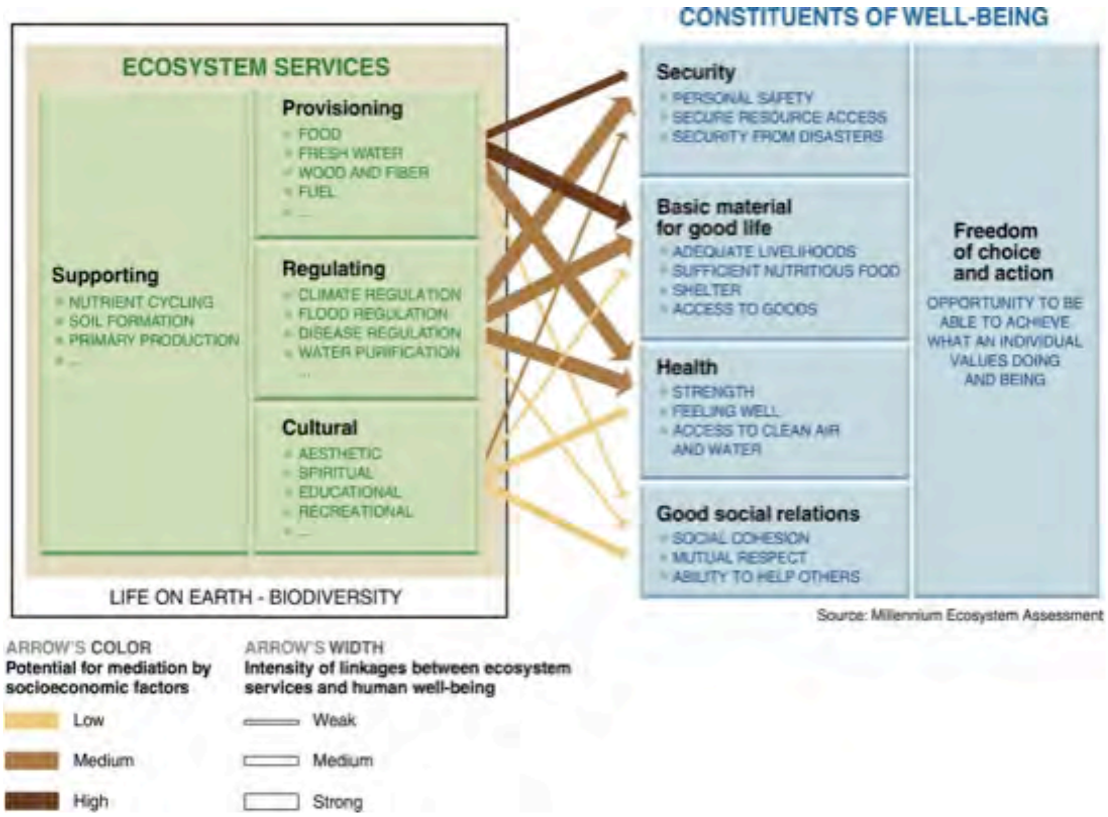


In most agricultural systems (center), provisioning ecosystem services are increased at the expense of regulatory, cultural and supportive ecosystem services, as compared to natural ecosystems (left). Managing for multifunctional agroecosystems (right) would help a more balanced provision of services (adapted from CA 2007 and Gordon et al. 2010).

Ecosystem services and resilience perspectives encompass a wide body of integrated research into sustainability, ecology and economics, and social-ecological systems. Sustainability science involves understanding the complex dynamics between human and environmental systems, which are tightly coupled (Clark, 2007; Tallis, et al., 2008). Sayer and Campbell (2004) review its application to sustainable development. Ecosystem services has become an important component in trade-off analysis and decision-making (Fischer et al., 2008; TEEB, 2010); and resilience, defined by Holling and Gunderson (2002:28) as "the magnitude of disturbance that can be absorbed before the system changes its structure by changing the variables and processes that control behavior," offers a vision of sustainability, not as stability, but as persistence borne out of change (Gunderson and Holling, 2002; Berkes and Seixas, 2005).

Sustainability science seeks to facilitate a 'transition toward sustainability,' improving society's capacity to simultaneously "meet the needs of a much larger but stabilizing human population . . . sustain the life support systems of the planet, and . . . substantially reduce hunger and poverty" (NRC,1999). In agricultural systems sustainability research is needed to underpin development that aims at sustainable intensification. The interpretation of sustainable intensification can be as narrow as that of Cassman (1999), where increased cereal production without ecological damage is emphasized, or as broad as Chevassus au Louis and Griffon: (2008) “intensification in the use of the natural functionalities that ecosystems offer.” On a practical level important steps have been taken towards making agriculture more sustainable by evaluating on-site and off-site effects of different farming systems. Advances are being made in measuring and monitoring trends and changes in important natural capitals including carbon stocks, hydrologic systems, biodiversity, soil health (Hansen, et al., 2008; Boettinger et al., 2010). Still much more can be done to make these evaluations address social and cultural outcomes and a comprehensive range of environmental impacts (Sachs, et al., 2010).

Ecosystem services have become an important area of research over the last decade (Fischer et al., 2008), bringing frameworks for more holistic analysis of on-site and off-site impacts of agriculture (Zhang, et al., 2007). A number of authors have recently argued that there are strong links between ecosystem services and sustainable development, and reduction of rural poverty (Kareiva and Marvier, 2007; Sachs and Reid, 2006; Kaimowitz and Sheil, 2007; TEEB, 2010). Daily (1977) defined ES as “the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human-life.” There are multiple frameworks for defining ecosystem services. The best known is that of the MA (2005), which has been very useful for thinking holistically about the range of ecosystem services people depend on for their livelihoods. To operationalize the measurement and valuing of services various researchers have proposed alternative frameworks such as intermediate and final services (Fisher, et al., 2008), and indirect and direct services that allow e.g. valuing services without ‘double counting’ (Fisher, et al., 2007), and very usefully Zhang et al. (2007) define ecosystem services and ecosystem dis-services, such that the flows of these ES and ESD’s rely on how agroecosystems are managed at the site scale and on the structure and functioning of the surrounding landscape (Tilman, 1999).



Much research has focused on biophysical mapping and valuation assessments of ecosystem services (Costanza, et al., 1997, Cowling et al., 2008; TEEB, 2010) and many notable examples are found in van Wilgen et al. (1996), Becker (1999), and Daily and Ellison (2002). This continues to be an important pursuit, bringing together the disciplines of ecology and economics, and underpins payment for environmental service schemes, and potentially large-scale investment in natural capital (Daily and Matson, 2008). Ecosystem services frameworks have also become the preferred tool for research into trade-off analysis and decision-making scenarios. It allowed for example Steffan-Dewenter et al. (2007) to evaluate tradeoffs along intensification gradients between income and biodiversity. It is also provides the conceptual framework for evaluating alternative 'multifunctional' landscapes and quantifying the generation, consumption and flow of ecosystem services through modeling tools such as InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs; Tallis and Polasky, 2009), ARIES (ARtificial Intelligence for Ecosystem Services), (Villa, et al., 2009), and POLYSCAPE (Sinclair, 2011).

Resilience has multiple definitions (Brand and Jax, 2007), and now underlies a broad body of work, including a considerable number of detailed studies of regional social-ecological systems (see any issue of *Ecology and Society,* and most of the chapters in Gunderson and Holling 2002 and Berkes et al. 2003). It is suggested that in a context of accelerating global change, and increasing evidence for non-linear responses in social-ecological systems, these approaches are needed to meet the natural resource – food - poverty challenge, in part because management has tended to focus on average conditions and on particular time and space scales, ignoring extreme events (Walker et al., 2010). Resilience frameworks have been applied in developing country agricultural contexts to analyze changes that result in degradation, and also changes then required to shift to a higher productivity, self-maintaining state (e.g. Fernandez et al., 2002;

Enfors and Gordon, 2007). Still, despite a wave of recent interest in resilience in agricultural development contexts (von Braun et al., 2009; FAO, 2008; IAASTD, 2009; UNEP 2009), empirical studies and evidence to demonstrate how resilience may be enhanced in developing country agricultural systems is lacking (Walker et al., 2010).

Appendix 1b) The science behind water scarcity

Water scarcity can be defined as a situation when a large number of people in an area are water insecure (lack of access to safe and affordable water to satisfy her or his needs for health and livelihoods) for a significant period of time (Rijsberman, 2006). Many indicators of scarcity have been suggested, including the widely used Falkenmark indicator (Falkenmark et al., 1989) relating renewable water resources to population; a number of indicators relating supply to demand (Shiklomanov, 1991, Raskin, 1997, Alcamo, 2000, Vorosmarty, 2000). IWMI (Seckler, 1998, Molden et al, 2007) define physical water scarcity in terms of supply and demand, but introduce an indicator for economic water scarcity, indicating situations where there are available water resources, but access to that water is difficult for reasons of financial, human or institutional capacity. WaterSim (de Fraiture et al, 2010) was used to map the situation of scarcity within major river basins of the world, concurring with other reports that there water scarcity is widespread. In addition to prospective views to explore various scenarios and strategies (Rosegrant et al, 2002, FAO 2006, de Fraiture et al, 2007), there is need for a better local strategies for adapting and coping with scarcity.

A critical response when water is scarce is to increase the productivity of water, defined as the ratio of benefits produced to the amount of water used to produce those benefits (Molden et al, 2010), where benefits are reported in terms of physical yield per cubic meter (kg/m3) or value per cubic meter. Zwart et al, (2010), used remote sensing for a global study that indicated a variation in water productivity for wheat between 0.2 to 1.8kg of harvestable wheat per cubic meter of ET, indicating large potential for improvement. There are a range of farm level practices to enhance water productivity including crop breeding to increase harvest index, or to reduce mortality caused by pests, disease and drought (Bennet et al, 2003), convert non-productive evaporation into productive transpiration through conservation practices (Rockström et al, 2007), water harvesting (Oweis and Hachum, 2003), alternating wet and dry irrigation of rice (Bouman et al, 2007), and improved soil nutrient management (Breman et al., 2001; Bindraban et al., 1999). There are practices in livestock (Peden et al, 2007), fisheries (Verdegem, 2006) and integrated systems that raise both physical and economic productivity of water (Mainuddin and Kirby 2009).

Gains at the farm level aimed increasing water productivity or aimed at harvesting additional rainwater do not necessarily relieve basin wide water scarcity because of a high degree of reuse prevalent (Ahmad, 2007, Loeve et al, 2007), and that a change in water use often impacts other users (Seckler, 1996, Molle et al, 2004. Practices that increase productivity create an incentive for farmers to produce more, and use more water. Developing solutions requires a combined hydrologic-economic- ecological analysis that analyzes changes in quality, quantity and timing of water for different uses combined with a valuation exercise to assess marginal water productivity and the nonmarketable values associated with water use such as the those derived from ecosystem services (Ward and Michelsen, 2002). A starting point is water accounting, a topic receiving increasing attention (Perry 2007 , Molden 1997, Godfrey and Chalmers 2011, ABS 2006, UN 2007 and 2009). These need to be expanded to better include landscapes and rainfed agriculture. Flow and ET estimates are particularly challenging in data scarce environments, but remote sensing techniques hold promise (Bastiaanssen, 2005, Ahmad et al, 2009, Cai et al, 2010) fill the data gap.

Uptake of water productivity enhancing approaches is slow in spite of the urgency. Factors that influence the uptake of practices that that enhance water productivity include costs, profitability, risks, access to markets, water availability, education, incentives and institutional structures (Molden et al, 2010). Incentives for water productivity increases are rarely in place, and there are questions as to the viability of pricing or administrative allocation of water (Chartres and Varma, 2011, Hellegers and Perry, 2006; Molle and Berkoff, 2006). Clearly there is further research to be done on these enabling conditions including economic incentives that take into consideration risk.

Appendix 1c) The science behind managing land degradation

Land (terrestrial ecosystem) degradation is decline in land health – the capacity of land to sustain delivery of essential ecosystem services (Millennium Ecosystem Assessment, 2003). Major processes include loss of biodiversity, reduction in vegetation cover, reduced hydrological regulation in landscapes, decline in soil nutrient and water retention capacity and supply, soil salinization, and accelerated soil erosion. Desertification results when several degradation processes acting locally combine over large areas in drylands (UNEP, 2007). Land degradation is recognized as a major global environmental and development problem, undermining productivity, food security, ecosystem resilience, and resulting in off-site damage such as reduced water quality, lowering of groundwater, siltation of water bodies, and increased greenhouse gas emissions. However, despite much investment in research and assessments, the degree, extent and impacts of land degradation remain controversial, especially in developing countries (Young, 1998; UNEP, 2007, Vogt et al., 2011). This is largely due to a lack of standardized sampling frames, measurement methods, and reference values. The lack of specific evidence and information at all scales makes it difficult for international and governmental policy makers to prioritise and direct interventions to improving and protecting land health.

Responses to land degradation have tended to focus on treating the problem. There is increasing recognition of the value of integrated and landscape level approaches to improved land management, such as integrated soil fertility management (Vanlauwe et al., 2010), agroforestry (Garrity, 2004), ecoagriculture (Scherr, 2009), and agroecology (Wezel and Soldat, 2009). However, individual soil improving technologies (e.g. fertilizers, conservation agriculture, improved tree fallows) often have a high failure rate, especially in Africa where variation in soil mineralogy produces high spatial variability in limiting factors at a site (Voortman, 2010), resulting in slow adoption rates. A lack of objective and systematic multisite research and intervention evaluation is limiting researcher's ability to provide information on conditions for success and advise land users and planners on benefits and how to reduce investment risks.

There has been much less attention paid to preventive actions, which require understanding and acting on drivers and risk factors associated with land degradation. The principal driver is unprecedented land-use change to meet the demands of a burgeoning population, economic development and global markets (UNEP, 2007), but a number of social, economic and biophysical factors operate at local, national and regional scales (Geist and Lambin 2004). However, what counts most is not so much what land is used for but on how well it is managed, and yet there is limited systematic information on quality of management and its determining factors. Generally, factors that reduce incentives for investment in land include insecure resource tenure, high prices of agricultural inputs, and limited infrastructure and market access; however, education and access to information are also important factors. Better and more specific evidence is needed for the design of preventive policies.

New science and technology are providing unprecedented opportunities for overcoming the limitations to evidence-based land and water management. Advances in remote sensing, accurate georeferencing of field observations, and high-throughput light-based methods of soil analysis, coupled with scaling theory and data mining methods, can enable land and water surveillance systems for guiding policy and practice (Wagner et al., 2009; UNEP, 2011). Mobile phone technology and internet services are providing new opportunities for getting high value information to users even in remote areas. What is missing is a coherent effort to harness these advances to provide systematic, science-based approaches that generate and communicate consistent data and knowledge on land and water degradation, their risk factors, and the performance and impact of rehabilitative and preventive interventions.

Types of degradation

Loss of forests, grasslands and wetlands reduce habitat, biodiversity, stored carbon, and soil water retention and regulation, and contribute to both local and global climate change (MA, 2005; UNEP, 2007). About 30% of greenhouse gas emissions derive from land use and land use change. Loss of continuous vegetative cover reduces organic inputs to soils, reduces nutrient recycling, and exposes soil to erosion.

Loss of soil organic matter and soil biological and physical degradation not only reduce nutrient availability but also have significant negative impacts on: infiltration and porosity that consequently impact local and regional water productivity; the resilience of agroecosystems; and global carbon cycles; 41% of sub-Saharan Africa land mass is threatened by degradation (Vlek *et al*., 2008b).

Soil nutrient depletion and chemical degradation. Annually, 230 million tons of nutrients are removed from agricultural soils in terms of agricultural products (Vlek et al., 1997). Further losses result from erosion, leaching and burn-off, but are difficult to calculate. Globally, there is sufficient fertilizer supply to meet growing demand. However, many poor farmers do not have sufficient finance to purchase fertilizer and consequently their soils are becoming increasingly nutrient poor and susceptible to erosion. Phosphate deficiency continues to be a major factor limiting yields over much of Africa (Sanchez, 2002).

Soil erosion and sedimentation. Accelerated on-farm soil erosion leads to substantial yield losses and contributes to downstream sedimentation and the degradation of water bodies, a major cause of investment failure in water and irrigation infrastructure. Across Asia, 7,500 million tons of sediments flow to the ocean (see Vlek, 2010).

Water pollution and salinization. Globally, agriculture is the main contributor to non-point-source water pollution while urbanization contributes increasingly large volumes of wastewater. Water quality problems can often be as severe as those of water availability, but have yet to receive as much attention. Global net outflows of dissolved inorganic nitrogen to the oceans have been estimated at 18,300 tons.

Salinization and waterlogging. Globally, secondary soil salinization and waterlogging in irrigated areas are major threats to existing production and productivity gains. Few irrigation schemes have managed to overcome them completely, but innovative technical measures and cropping practices can often minimize their impact.

Disturbances in water, carbon and nutrient cycles. The integrity of water, carbon and nutrient cycles determine the health and resilience of ecosystems, and their capacity to provide services. Land-use change has been responsible for about one-third of the increase in atmospheric carbon dioxide over the last 150 years, mainly through loss of soil organic carbon. Also well established are the links between soil erosion and sediment deposition, between nitrogen and phosphorus fertilizers and eutrophication, and between emissions of sulphur and nitrogen oxides to the atmosphere and acid contamination of land and water (UNEP, 2007). Harmful and persistent pollutants are still being released to the land, air and water from mining, manufacturing, sewage, energy and transport emissions; from the use of agrochemicals (UNEP, 2007).

Appendix 2 CRP5 Development Processes

Appendix 2a) Recognizing regional priorities

To align the overall and specific CRP5 strategic research portfolios with regional needs, the strategic plans of the regional and subregional NARES fora under the umbrella of GFAR were consulted. The consultation showed a high degree of commonality in problem identification and research priority setting:

- The Forum for Agricultural Research in Africa (**FARA**) highlights in its 2007-2016 Strategic Plan key areas which require attention. CRP5 will address 4 of the identified 11 areas, namely stress on land and water resources and accelerated soil degradation, water becoming an increasingly scarce commodity, crops/livestock practices and systems, and the conservation and sustainable use of water catchments and biodiversity (www.fara-africa.org/about-us/strategic-plan/strategic-plan-download/). FARA's strategic plan was based on the targets and aims of the CAADP, and aligned with the strategic plans of the African Sub-Regional Organizations.

- The Vision 2025 of the Asia Pacific Association of Agricultural Research Institutions (**APAARI**) fosters novel partnerships among NARES and other organizations for sustainable improvements in the productivity of agricultural systems and improved quality of the natural resource base which underpins agriculture. In its *Research Need Assessment and Agricultural Research Priorities for South and West Asia* which was jointly organized with the CGIAR, the need for INRM to address degradation of natural resource, water scarcity, and low productivity was highlighted (www.apaari.org/wp-content/uploads/2009/05/sw-asia-needs-assessment.pdf).

- The Central Asia and the Caucasus Association of Agricultural Research Institutions (**CACAARI**) highlights in its *Priorities for Agricultural Research-for-development in Central Asia and the Caucasus* (Dec. 2009) soil salinity and water and irrigation management, livestock research including rangelands, and the protection of biodiversity as priority research areas (www.cacaari.org/filesarchive/publications/GCARD_CAC_Final_Report_En.pdf).

- The Forum for the Americas on Agricultural Research and Technology Development (**FORAGRO**) describes its research priorities in its *FORAGRO Position 2010* document. The preservation and sustainable management of natural resource: i) Technologies and good practices for the use of soil and water; ii) Use of environmentally friendly practices; iii) Preservation and sustainable use of biodiversity; iv) Promotion of agro-ecological production systems, is one of its seven priority subjects and action areas. Other action areas include better exploitation of productive lands and protection of fragile ecosystems or highlight urban farming systems (http://infoagro.net/shared/docs/a2/Summary%20FORAGRO%20Position_Eng.pdf).

- The Association of Agricultural Research Institutions in the Near East and North Africa (**AARINENA**) emphasizes in its Vision 2025 the fragility of its natural resource base with especially acute shortage of water and arable land. Opportunities for *expanding* cultivated rain-fed or irrigated lands in the region are low, while most change can be realized through increasing factor productivity and technologies, enabling policies and appropriate institutions. The challenge for agricultural research is to increase productivity without further threatening natural resource while favoring the poor (www.aarinena.org/rais/documents/General/nars0059.PDF).

The regional stakeholder consultations during the preparation of CRP5 allowed fine-tuning the research agenda in order to cover more detailed regional challenges and priorities.

Appendix 2b) Participants who attended CRP5 Regional Development Workshops

Participants from online consultations and e-discussions
Dr.Angel Elias Daka (ACTESA); Kabatabazi Patricia, Community based Impact Assessment Network for Eastern Africa (CIANEA); Fernando Cesar Serafim Particular; Desta Gebremichael, Relief Society of Tigray; Ali Ünlükara, Erciyes University Agricultural Faculty Agricultural Structures and Irrigation; Ananda Wijayaratna, Daham Pasal; Raymond Ouedraogo, 1- PhD student at BOKU-University of Natural Resources& Life Sciences, Vienna, Austria, 2-Senior Offiecr of Fisheries at the Fisheries Department, Ministry of Agriculture, Water and Fish Resources, burkina Faso; Raga Mohamed Elzaki, University of Gezira – Sudan; Lalit Mohan Sharma, Institute of Rural Research and Development; Ben Aston, Gantry House; Dr. V.E.Nethaji Mariappan, Sathyabama University; K.D.N.Weerasinghe, University of Ruhuna; Abraham Ndungu, Rosedale College; Victor Kongo, Stockholm Environment Institute (SEI); Dr.Mustafa Yousif Mohamed, AA University; Elena Lopez-Gunn, FMB-Water Observatory and LSE; Gashaw Alemye Agegne, Mekelle university; Romel B. Armecin, Visayas State University – Philippines; Assem Tesfaw Ayelle, ORDA; Dov Pasternak, ICRISAT; Kristina Toderich, ICBA-CAC , under umbrellla of ICARDA, and Department of Desert Ecology and Water Resources Research, Samarkand Division of the Academy of Scinces of Uzbekistan, Central Asia; John Lamers, (ZEF/UNESCO); Mamadou Khouma, (IDEV); Palaniappan Venkatachalam, Tamil Nadu Agricultural University, Coimbatore, India; K.Palanisami (IWMI); Carlo Carli (CIP); Dr. Firdaus Fatima Rizvi, IIDS, New Delhi; Tilahun Amede, ILRI/ IWMI/ CPWF; Vladimir Smakhtin (IWMI); Luna Bharati (IWMI); Peter Messerli, Centre for Development and Environment (CDE), University of Bern Muhammad; Rafique, Villagers Development Organization; Gunnar Jacks, KTH; Nirad Chandra Nayak, CGWB, Min. of Water Resources; Lalit Mohan Sharma, Institute of Rural Research and Development; Anik Bhaduri, Center for Development Research (ZEF), University of Bonn; Shabbir Ahmad Shahid, ICBA, Dubai, UAE; Alim Pulatov, Tashkent Institute of Irrgation, EcoGIS center, Uzbekistan

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Aleppo: Dr. Awni Taimeh, University of Jordan, Jordan; Dr. Dia El Din Ahmed El-Qousy, National Water Research Center, Egypt; Dr. Ahmed Hachum, Mosul University, Iraq; Eng. Ali El-Zain, AGA

KHAN Foundation, Syria; Dr. Omran Al Shihabi, The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), Syria; Dr. Awadis Arslan, General Commission for Scientific Agricultural Research (GCSAR), Syria; Dr. Jamil Abbas, Aleppo University, Syria; Aleppo; Dr. Faisal K Taha, International Center for Biosaline Agriculture (ICBA). UAE; Dr. Ahmed Mohamed Abdelwahab, International Center for Agricultural Research in the Dry Areas (ICARDA), Syria; Dr. Theib Oweis, International Center for Agricultural Research in the Dry Areas (ICARDA), Syria; Dr. Fadi Karam, International Center for Agricultural Research in the Dry Areas (ICARDA), Syria; Dr. Fawzi Karajeh, Nile Valley and sub-Saharan Africa Regional Program (NVSSARP) International Center for Agricultural Research in the Dry Areas; Dr. Rolf Sommer, International Center for Agricultural Research in the Dry Areas (ICARDA), Syria; Dr.Ahmed M. Al-wadaey, International Center for Agricultural Research in the Dry Areas (ICARDA), Syria; Dr. Mohamed Al-Azhari Saleh, International Centre for Agricultural Research in the Dry Areas (ICARDA), Syria; Dr. Ahmed Amri, International Centre for Agricultural Research in the Dry Areas (ICARDA); Dr. Zieaoddin Shoaei (ICARDA – Tehran office), Iran; Dr. Michael C. Shannon, USAID.

Lusaka: Pius Chilonda (IWMI); Fred Kalibwani (IWMI); Seleshi Bekele Awulachew (IWMI); Rudo Makunike, NEPAD Planning & Coordinating Agency (NPCA), South Africa; Almeida Almeida, National Directorate of Agricultural Services, MINAG/DNSA, Mozambique; Andrew Sanewe, Water Research Commission (WRC), South Africa; Fhumulani Mashau, Southern Africa Confederation of Agricultural Unions (SACAU), South Africa; Alfred Mtukuso, Ministry of Agriculture and Food Security, Malawi; Ishmael Sunga, Southern Africa Confederation of Agricultural Unions (SACAU), South Africa; Graham Jewitt, University of KwaZulu-Natal; Helder Gemo (IWMI), South Africa; Elijah Phiri, AU-NEPAD/ CAADP Pillar 1/UNZA-SADC LWMP, University of Zambia, Zambia; Mwase Phiri, Ministry of Agriculture and Cooperatives, Zambia; Angel Daka, COMESA/ACTESA, Zambia; Simunji Simunji, Golden Valley Agriculture Research Trust (GART), Zambia; Moses Mwale, Zambia Agricultural Research Institute (ZARI), Zambia; Sesele B. Sokotela, Zambia Agricultural Research Institute (ZARI), Zambia; Peter Manda, CARE Zambia; Martin N. Sishekanu, Ministry of Agriculture and Cooperatives, Zambia; DCW Nkhuwa, University of Zambia, Lusaka; Sina Luchen (FAO); Andy Levin USAID - Zambia

Lima: Falberni De Souza Costa, EMBRAPA, Brazil; Marcos Ferreira, EMBRAPA, Brazil; Juan Carlos Alurralde, Agua Sustentable, Bolivia; Luis Acosta (CONDESAN) Peru; Luis Alban, Nature & Culture – NCI, Peru; Rodrigo Alvites, Ministry of Environment, Peru; María Teresa Becerra, General Secretariat – Andean Community, Peru; Edith Fernández Baca, (CONDESAN), Peru; Manuel Glave, GRADE, Peru; Sonia Gonzáles, Ministry of Environment, Peru; Braulio La Torre, UNALM, Peru; Carlos León Velarde, CIP, Peru; Víctor Mares, (CIP), Peru; Marcela Quintero, (CIAT), Peru; Roberto Quiroz, (CIP), Peru; Miguel Saravia, (CONDESAN), Peru; Thomas Walder, (SDC) Peru, Corinne Valdivia, University of Missouri; Roberto Valdivia, CIRNMA, Peru; Emilio Ruz, (PROCISUR), Uruguay

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Lands; Charles Gachoki, Ministry Environment And Natural Resources, Kenya; Callist Tindimugaya, Ministry of Water and Environment, Uganda; Daniel Atula, National Irrigation Board; Emmanuella Olesambu (FAO); Michael Gitonga (FAO); Tara Garnett, Food Climate Research Network (FCRN); Steve Twomlow (UNEP); Jane W. Wamuongo (KARI); Edward Mare Muya (KARI); James K. Ndufa, Kenya Forestry Research Institute (KEFRI); John Mulumba, NARO, Uganda; Emmanuel Mwendera (IUCN); Byron Anangwe, Regional Centre for Mapping of Resources for Development; Finn Davey, Wajibu MS, Kenya.

Delhi: Arun Pal (ICRISAT); Ashutosh Sarker (ICARDA); Dar MH (IRRI); Dindo M Campilan (CIP); Iain A Wright (ILRI); Jagat Devi Ranjit, Nepal Agricultural Research Council (NARC); Lalit Mohan Sharma, Institute of Rural Research and Development; Kuhu Chatterjee, Australian Centre for International (ACIAR); Mathur PN (Bioversity); Minhas PS, Indian Council of Agricultural Research (ICAR); Munasinghe MAK, Natural Resources Management Centre, Sri Lanka; Parvati Krishnan, Coca-Cola India Inc.; Pawan Kumar, Institute of Rural Research and Development; Peter Q Craufurd (ICRISAT); Prabhat Kumar (ICRISAT); Ramesh Rawal , BAIF Development Research Foundation; Ruchi Srivastava (ICRISAT); Virendra Sharma (DFID-India); Sharma KD, National Rainfed Area Authority (NRAA); Tewari RK , Department. of Agriculture & Co-operation; Upali Amarasinghe (IWMI); Venkateswarlu B, Central Research Institute for Dryland Agriculture; Wani SP (ICRISAT)

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Cali: José Manuel Sandoval, Ministry of Environment, Colombia; Wilson Otero, FUNDESOT, Colombia; Jose Antonio Gomez, PNUD-GEF-Federacion Nacional de Cafeteros Colombia; Christopher Hansen, IICA, Colombia; Jorge Rubiano Professor, Universidad del Valle Colombia; Alex Bustillo, CENICANA (sugarcane research center –Colombia) Colombia; Inés Restrepo, CINARA, Colombia; Fernando Gast, CENICAFE, Colombia; Andrés Felipe Batancourth, Red Interinstitucional para el Oriente de Caldas, Colombia; Robert Hofstede, Ecuador; Juan Rodríguez (GTZ –GESOREN), Ecuador; Martha Liliana Cediel, Ministry of Environment – Ecosystems Division, Colombia; Jorge Uribe Calle, ANALAC, Colombia; Luis Alberto Duicela, COFENAC, Ecuador, Ruben Dario Estrada, Colombia; Rao Idupulapati, (TSBF CIAT); Steve Fonte (TSBF CIAT); Aracely Castro (TSBF CIAT); Jeimar Tapasco (CIAT)

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Appendix 3 Integration of CPWF in CRP5

The Consortium Board has directed that the CPWF work be fully integrated into CRP5. This has been considered in detail between the CPWF Board, Advisory Committee and Management Team and IWMI, its host. There is agreement for the following actions:

- CPWF is one year into its Phase 2 Projects that involve very significant external partnerships. We see the CPWF model as a good guide to the development of effective implementation partnerships. The Phase 2 projects will be allowed to continue for the next 15-18 months to their natural conclusion. However, they will operate primarily, but not exclusively within the SRP on Basins and will be enhanced by, and in turn enhance new CRP5 projects. We consider that building improved scientific capacity and more focused hypotheses into this framework will be highly beneficial.
- There will be a gradual merging of CPWF management and support functions with those of CRP5 and IWMI respectively to ensure continuity and accountability at CPWF level and to enhance the new CRP5 Management Committee. IWMI has commissioned a review being conducted by Accenture Development partnerships to advise on the most effective ways to enhance support of CRP5 at all levels and to suggest optimum management and support structures for the program taking into account the skill base in IWMI and CPWF.
- The CPWF Board has been merged (effective August 1st, 2011) with the IWMI Board. The merged Board will have full accountability for the continued delivery of CPWF outputs and for CRP5 from the perspective of the lead center. This merger will reduce dual lines of reporting.
- The CPWF Advisory Committee lead by Johann Rockstrom from the Stockholm Environment Institute will cease to function separately, but will become part of the new Steering Committee for CRP5. Responsibilities of this Committee are defined in the section on Governance and management. The aim of the merger is to increase synergy and to assist focus on the new directions predicated in this proposal.
- CPWF ongoing funding is included in the CRP5 budget request.

Appendix 4 Work plan for CRP5

	Activities	Year 1				Year 2				Year 3				Year 4				Year 5			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	Confirm teams																				
2	Restructuring and setting up systems																				
3	Development of indicators for outputs all levels (Inception Workshop)																				
4	Overall Management, Coordination & Integration																				
5	Development of Regional Plans																				
6	Integration of existing projects near completion into new portfolio																				
7	Implementation of new – fully aligned - CRP5 projects																				
8	Implementation of quality and impact enhancement activities																				
Milestones																					
A	CRP5 Inception Workshop	X																			
B	Strategies / Frameworks approved by Steering Committee			X																	
C	Annual (rolling) Workplan approved by Steering Committee				X				X				X				X				X
D	CRP 5 Mid-term Science Forum											X									
E	Mid-term Evaluation											X									
F	CRP5 Synthesis Forum																			X	
G	End of First Phase Evaluation																				X

1. **Confirm teams:** The proposal requires that teams be established to start working on Overall management, Coordination of SRPs and regions, gender and equity, ME&L, communications and uptake and capacity building. This requires reallocation of workloads for existing staff and some new recruitment.
2. **Restructuring and setting up systems:** At the start of CRP 5 a number of activities will need to take place. For example, mapping of existing projects and linking to SRPs including analysis of overlap in existing projects and plan for integration and sharing of experiences; inventory of present partnerships and stakeholders and gap analysis, further development of the partnership strategy; development of ME&L framework; further development of gender and equity strategy; development of overall communication strategy, uptake strategy.
3. **Overall Management, Coordination & Integration:** Immediate deployment of CRP5 coordination team, SRP and Regional Leaders; establishment of Management Committee, Science and Impact Advisory Committee and Steering Committee.
4. **Development of Regional Plans:** Each region will require a set of research questions based on assessment, prioritization and synthesis unique to that region and the natural resource challenges of its farming systems. Based on this, specific uptake strategies will be formulated with partners. Research sites will often overlap with other CRPs and within each site there will be interaction among and between SRPs.
5. **Transition from existing projects to the new portfolios:** Existing projects will continue to be implemented and their outputs synthesized through SRPs.
6. **Implementation of new – fully aligned - CRP5 projects:** Develop and implement a coherent set of new projects to deliver CRP5.
7. **Implementation of quality and impact enhancement activities:** Officially launch platforms and strategies for ME&L, gender, new partnerships and enhanced capacity building and continue with implementation.

A. **Inception Workshop:** In Year 1, an Inception Workshop will be organized to gain support and input from all partners, stakeholders and anticipated users of research results.
B. **Strategies / frameworks approved by Science and Impact Advisory Committee**: The ME&L framework, partnership strategy, gender and equity strategy and uptake strategy and resultant implementation plans will be presented to and approved by the Science and Impact Advisory Committee.
C. **Annual (rolling) workplan approved by Steering Committee:** The Management Committee will prepare annual (rolling) workplans with the support of the SRP managers and Regional Leaders. These will be presented to the Steering Committee for approval.
D. **Mid-term Science Forum:** In Year 3 a mid-term Science Forum will be held to present and discuss research results.
E. **Mid-term Evaluation:** The Management Committee must commission a full-scale mid-term evaluation and report its findings. Terms of Reference have to be written for the evaluation and a team selected to conduct it.
F. **Synthesis Forum:** In Year 5 a Synthesis Forum will be held to present and discuss research results, synthesize lessons and plan for future priorities.

G. **End of First Phase Evaluation:** The Management Committee must commission a full-scale evaluation and report its findings. Terms of Reference have to be written for the evaluation and a team selected to conduct it.

Immediate funding is required to establish Strategic Research Portfolio teams, gender and ME&L (including partnerships) working groups to ensure this transition happens as quickly and efficiently as possible.

Principles for phasing out old and phasing in new activities

In the revised draft of this proposal, we have emphasized the new activities that will be undertaken. We recognize, however, that currently all CGIAR centers involved have existing portfolios of projects that must be completed. Our aim is to map these projects to the new SRPs. In the vast majority of cases these projects are funded by restricted bilateral funding. However, many of these projects provide essential building blocks for the new activities. As the projects are completed in 2012 and 2013, the SRP leaders and regional directors will be asked to ensure that new proposals are developed that are aligned with the SRP objectives and outcomes required. The detailed timelines for this process will be compiled during the inception phase. The Program Director and Steering Committee will oversee the process to ensure that all partners adhere to these principles. The key principles to be followed are:

- Map all projects to new SRPs;
- Consider relevance to new objectives;
- Identify termination dates for work that will be discontinued based on restricted funding agreements;
- Identify projects that may need to be renewed to deliver against new objectives of the SRPS/CRP and develop new partnerships/proposals to seek restricted funds;
- Identify gaps in the portfolio that have to be filled to deliver against CRP objectives;
- Develop teams of CGIAR and external partners to fill these gaps and seek additional restricted funding;
- Ensure that the emerging new portfolio is aligned with the overall CRP global and regional goals.